B.L.D.E.A's V.P.Dr.P.G.HALAKATTI COLLEGE OF ENGINERING AND TECHNOLOGY VIJYAPUR 586103

QUESTION PAPERS INDEX JUN/JUL 2023

ELECTRONICS AND COMMUNIATION DEPARTMENT

2018
III Sem. EC

USN ⬚⬚⬚⬚⬚⬚⬚⬚⬚⬚ 18EC33

Third Semester B.E. Degree Examination, June/July 2023
Electronic Devices

Time: 3 hrs.   Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1   a.   Explain direct and indirect semiconductors with neat sketches and giving examples.
                                                                              (06 Marks)
    b.   Define:
         i)   Intrinsic semiconductor
         ii)   Amphoteric Impurity
         iii) Electron mobility
         iv)   Hall Effect.   **(08 Marks)**
    c.   A silicon is doped with 10^{17} Arsenic atoms/cm³. What is the equilibrium hole concentration p_o at 300°K? Sketch the resulting band diagram showing where is E_F relative to E_i. Assume $n_i^2 = 2.25 \times 10^{20}$.   **(06 Marks)**

OR

2   a.   Explain effects of temperature and doping on mobility.   **(08 Marks)**
    b.   Explain the formation of extrinsic semi conductor with covalent bonding model diagram.
                                                                              (06 Marks)
    c.   Consider a semiconductor bar with W = 0.1mm, t = 10mm and L = 5mm. For B_2 = 10kG in the direction shown in Fig.Q.2(c) and a current of 1mA, V_{AB} = -2mV, and V_{CD} = 100mV. Find the type of semiconductor carriers and mobility of the majority carrier. Given $1KG = 10^{-5}$ wb/cm².   **(06 Marks)**
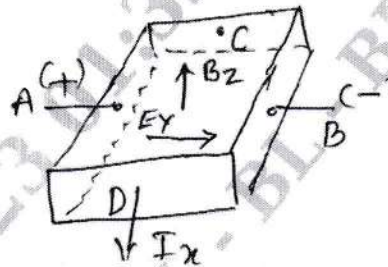
Fig.Q.2(c)

Module-2

3   a.   Differentiate Zener and Avalanche breakdown.   **(06 Marks)**
    b.   Explain the requirement for the design of rectifier diode.   **(06 Marks)**
    c.   Explain the working of solar cell and mention the applications of LED. **(08 Marks)**

OR

4   a.   Mention the applications of photo diode.   **(06 Marks)**
    b.   Explain the current and voltage in an illuminated junction by deriving the expression for V_{OC}.   **(08 Marks)**
    c.   A solar cell has a short circuit current of 100mA, and an open circuited voltage of 0.8V under full solar illumination. What is the power delivered by the cell which is having a fill factor of 0.7?   **(06 Marks)**

3

Module-3

5 a. Derive the relationship between α and β of a transistor. **(06 Marks)**
   b. Explain switching action of transistor. **(08 Marks)**
   c. A symmetrical p^+np^- bipolar transistor has the following properties:

	Emitter	Base
$A = 10^{-4}$ cm^2	$N_a = 10^{17}$	$N_d = 10^{15}$ cm^{-3}
$W_b = 1\mu m$	$t_n = 0.1\mu s$	$t_p = 10\mu s$
	$\mu_p = 200$	$\mu_n = 1300$cm^2 v.s
	$\mu_n = 700$	$\mu_p = 450$cm^2 v.s

Assume $ni = 1.5 \times 10^{10}$/cm^3. Find base current. **(06 Marks)**

OR

6 a. Explain the working of pnp transistor with necessary figures. **(08 Marks)**
   b. Explain BJT fabrication process. **(06 Marks)**
   c. Explain drift in the base region. **(06 Marks)**

Module-4

7 a. Explain n-channel PNJFET operation with its characteristics. **(10 Marks)**
   b. Mention the difference between JFET and MOSFET. **(04 Marks)**
   c. Explain the MOS structure with aid of parallel plate capacitor. **(06 Marks)**

OR

8 a. Explain the operation of p-channel depletion and enhancement type MOSFET with neat sketches. **(10 Marks)**
   b. Mention the applications of MOSFET. **(04 Marks)**
   c. Draw and explain small signal equivalent circuit of a n-channel PNJFET. **(06 Marks)**

Module-5

9 a. Mention the advantages of IC's over discrete components. **(06 Marks)**
   b. Explain photolithography process. **(06 Marks)**
   c. Explain the working of CMOS inverter with neat diagram. **(08 Marks)**

OR

10 a. Explain thermal oxidation and diffusion process of the semiconductor fabrication. **(08 Marks)**
    b. Explain integration of other circuit elements. **(08 Marks)**
    c. Define: i) Etching   ii) Metallization. **(04 Marks)**

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CBCS SCHEME

18EC34

USN ☐☐☐☐☐☐☐☐☐☐

Third Semester B.E. Degree Examination, June/July 2023
Digital System Design

Time: 3 hrs.   Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1   a. A switching circuit has four inputs A, B, C and D and one output F. Inputs A and B represent the bits of number N_1, and C and D represent the bits of number N_2. The output is to be logic 1 only if the product $N_1 \times N_2$ is lesser than 2. Obtain the minterm and maxterm expressions in decimal notation for the output F. **(06 Marks)**

   b. Simplify $f(A, B, C, D) = \Sigma m (1, 2, 3, 5, 6, 7, 9, 10, 11)$ using K-map to get the minimum SOP expression, as well as minimum POS expression. Among the two expressions, find out which one requires lesser number of gates for implementation? **(10 Marks)**

   c. Convert $X = \bar{a}\,b + bc$ to canonical SOP form. **(04 Marks)**

OR

2   a. Four chairs A, B, C and D are placed in row. Each chair may be occupied (logic 1) or not occupied (logic 0). The output Y should go high only when adjacent chairs are occupied. Draw the truth table, obtain the maxterm expression and simplify the expression using K-map to get minimum POS expression. **(08 Marks)**

   b. Simplify the function $f(A, B, C, D) = \Sigma m(9, 12, 13, 15) + \Sigma d(1, 4, 5, 7, 8, 11, 14)$ using QM technique. Identify the essential prime implicant, if any, and obtain at least two solutions. **(12 Marks)**

Module-2

3   a. Give the truth table of full adder, derive the expressions for the outputs, and design a logic circuit for the same using minimum number of 2-input NAND gates only. **(10 Marks)**

   b. Draw the block diagram of 4-bit look ahead carry adder. Derive the expressions for the carry outputs using propagate and generate inputs. **(10 Marks)**

OR

4   a. Implement full-subtractor circuit using one 3:8 decoder having active-low outputs. **(06 Marks)**

   b. Implement the Boolean function $f(w, x, y, z) = \Sigma m(3, 5, 6, 8, 11, 13, 14, 15)$ using one 4 to 1 multiplexer and additional gates. Connect w and x inputs to select lines. **(06 Marks)**

   c. Explain what is FPGA? Show how a 6-variable function can be implemented using 4-input function generators and additional hardware and implemented as FPGA. **(08 Marks)**

Module-3

5   a. Show how an SR latch can be used for switch debouncing. Explain with waveforms. **(06 Marks)**

   b. Bring out the differences between gated SR latch and master-slave SR flip-flop. Draw the circuits of both. **(06 Marks)**

   c. Draw the block diagram of 3-bit bidirectional shift register capable of serial and parallel load and explain its operation. **(08 Marks)**

5

OR

6 a. Draw the Q and $\overline{Q}$ output waveforms if the waveforms given in Fig.Q.6(a) is fed to a positive edge-triggered JK flip flop.
(04 Marks)

Fig.Q.6(a)
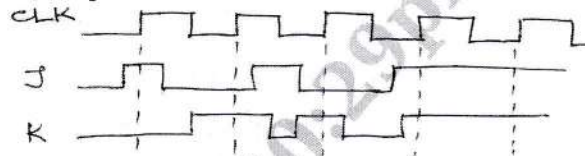
b. Using K-map simplification, obtain the characteristic equations of SR, JK and T flip-flops, and hence construct SR, JK and T flip flops using edge-triggered D flip flop.   (10 Marks)

c. Construct a ripple counter that counts from 111 to 000 and repeats, using negative edge-triggered toggle flip-flops. Draw the waveforms showing one complete count cycle.
(06 Marks)

Module-4

7 a. Design a synchronous counter using JK flip flops, having the count sequence: 0, 1, 3, 5, 7 and repeats. The counter should be self-correcting if in case it goes into an unused state.
(12 Marks)

b. Construct the transition table, state table and state diagram for the sequential circuit shown in Fig.Q.7(b).
(08 Marks)

Fig.Q.7(b)
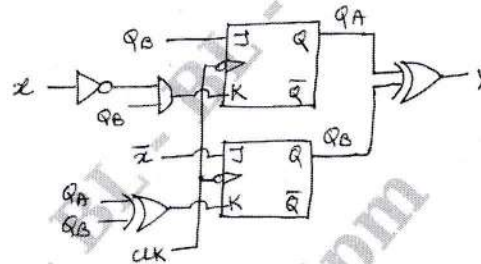
OR

8 a. Design a sequential circuit using JK flip flops for the state diagram shown in Fig.Q.8(a).
(12 Marks)

Fig.Q.8(a)
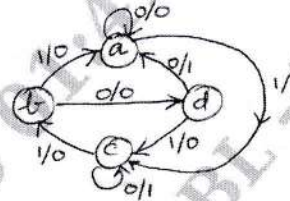
b. With block diagrams, explain what are Moore and Mealy models of sequential circuits. Explain with one simple example each. What difference do you notice in drawing the state diagrams for both the models?
(08 Marks)

Module-5

9 a. Design a Mealy sequential circuit with one input and one output, using D flip flops, to detect the sequence 10110 with overlap.
(14 Marks)

b. Draw the block diagram of a serial adder capable of adding two 4-bit numbers. Illustrate its working with an example.
(06 Marks)

OR

10 a. Obtain the state diagram, state table and reduced state table for a 4-bit BCD to excess-3 sequential circuit with one input and one output.
(12 Marks)

b. Draw the block diagram of a serial multiplier that can multiply two 4-bit unsigned numbers. Illustrate by multiplying the numbers 1011 and 1101.
(08 Marks)

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CBCS SCHEME

15EC35

USN ☐☐☐☐☐☐☐☐☐☐

Third Semester B.E. Degree Examination, June/July 2023
Electronic Instrumentation

Time: 3 hrs.   Max. Marks: 80

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1 a. Define the following terms as applied to an instrumentation:
   (i)   Accuracy
   (ii) Precision
   (iii) Resolution
   (iv) Gross Errors
   (v)   Absolute Errors
   (vi) Relative Errors   **(06 Marks)**
   b. Convert a basic D'Arsonval movement with an internal resistance of $100\,\Omega$ and a full scale deflection of 10 mA into a multi-range dc voltmeter with ranges from 0-5V, 0-50V and 0-100V.   **(06 Marks)**
   c. What is loading effect?   **(04 Marks)**

OR

2 a. Explain with neat diagram the operation of true RMS voltmeter.   **(08 Marks)**
   b. Explain different types of thermocouples used for RF current measurements.   **(08 Marks)**

Module-2

3 a. What is 3½ digit digital voltmeter? Define its sensitivity.   **(04 Marks)**
   b. Describe with a diagram the operation of a voltage to time conversion (dual ramp) type DVM.   **(06 Marks)**
   c. Explain successive approximation type DVM (Digital Voltmeter) with a neat diagram.
                                                                                            (06 Marks)

OR

4 a. Explain Digital frequency meter with its neat block diagram.   **(08 Marks)**
   b. Explain the working of digital pH meter.   **(08 Marks)**

Module-3

5 a. Explain the CRT features.   **(06 Marks)**
   b. Draw the block diagram of a CRO and explain the function of each block.   **(10 Marks)**

OR

6 a. Explain the conventional standard signal generator with a neat block diagram.   **(08 Marks)**
   b. Explain the AF sine and square wave generator with a neat block diagram.   **(08 Marks)**

Module-4

7 a. Explain with a neat diagram the operation of Q meter.   **(10 Marks)**
   b. Find the resistance and inductance of the coil for Maxwell's bridge, if bridge constants are $C_1 = 0.5\,\mu F$, $R_1 = 1200\,\Omega$, $R_2 = 700\,\Omega$ and $R_3 = 300\,\Omega$.   **(06 Marks)**

7

OR

8 a. Derive the balance equation for Wheat stone's bridge. **(08 Marks)**
b. Explain the working of Megger. **(08 Marks)**

Module-5

9 a. List the factors to be considered while selecting transducers. **(08 Marks)**
b. What is a thermistor? Explain different types of thermistors. **(08 Marks)**

OR

10 a. Explain with a neat sketch the piezoelectric transducer. **(08 Marks)**
b. Explain the working of LVDT with neat diagrams. **(08 Marks)**

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18EC36

USN

Third Semester B.E. Degree Examination, June/July 2023
Power Electronics and Instrumentation

Time: 3 hrs.   Max. Marks: 100

Note: *Answer any FIVE full questions, choosing ONE full question from each module.*

Module-1

1 a. What is Power Electronic Converter System? Mention any four application of such system. **(04 Marks)**
   b. Using two transistor model, explain the operation of SCR and derive anode current and gate relation. **(08 Marks)**
   c. Explain different types of Power Electronic Converter Systems. Draw their Input / Output characteristics. **(08 Marks)**

OR

2 a. Mention different Thyristor turn – ON method. Mention the advantages of gate triggering. **(04 Marks)**
   b. Explain the operation of Self Commutation by LC Circuit {Class – B} with relevant circuit and waveforms. **(08 Marks)**
   c. With a neat circuit and waveforms, explain the operation of RC Full wave firing circuit. **(08 Marks)**

Module-2

3 a. Explain the effect of Free Wheeling Diode used in Controlled Rectifier. **(04 Marks)**
   b. With a neat circuit diagram and waveform, explain the principle operation of Step – down Chopper. Derive the expression for average and r.m.s output voltage. **(08 Marks)**
   c. A single phase half wave controlled rectifier has a purely resistive load of R and the delay angle is $\alpha = \pi/3$. Determine Efficiency, Form Factor , Transformer Utilization Factor and Ripple Factor. **(08 Marks)**

OR

4 a. A Step – up Chopper is used to deliver load voltage of 500V from a 220V d.c source. If the blocking period of the thyristor is 80μF, compute the required pulse width. **(04 Marks)**
   b. With a neat circuit diagram and wave form, explain the operation of Step Up / Down Choppers. Derive the expression for average output voltage. **(08 Marks)**
   c. Explain with the help of neat circuit diagram, the operation of a single phase full converter with resistive load. Draw the associated waveform. Derive expression for r.m.s and average output voltage. **(08 Marks)**

Module-3

5 a. Define Inverters. Classify the inverts according to the input source. **(04 Marks)**
   b. What are Static Errors? Explain them in details. **(08 Marks)**
   c. Explain Multirange Ammeter and Multirange Voltmeter. **(08 Marks)**

OR

9

6 a. Define the terms : i) Measurement   ii) Resolution   iii) Precision   iv) Sensitivity.
(04 Marks)

b. Explain the Operation of Single Phase Half Bridge Inverter connected to resistive load with the help of circuit diagram and waveforms. Derive the r.m.s output voltage. (08 Marks)

c. Explain with a neat circuit and waveforms, the Operation of Flyback Converters. (08 Marks)

Module-4

7 a. The wheat stone's bridge consists of following parameters $R_1 = 10k\Omega$, $R_2 = 15k\Omega$ and $R_3 = 40k\Omega$. Find the unknown resistance R_X. (04 Marks)

b. With a neat block diagram, explain the working of Function Generator. (08 Marks)

c. Explain with a block diagram, the Operating principle of Ramp type DVM. (08 Marks)

OR

8 a. A Wein bridge circuit consists of the following : $R_1 = 4.7k\Omega$, $C_1 = 5nf$, $R_2 = 20k\Omega$, $C_2 = 10nf$, $R_3 = 10k\Omega$, $R_4 = 100k\Omega$. Determine the frequency of the circuit. (04 Marks)

b. Explain with a neat block diagram, the Operation of Successive Approximations type DVM.
(08 Marks)

c. Explain with a neat circuit inductance comparison bridge. Also find the equivalent series circuit off the unknown impedance. An inductance comparison bridge is used to measure inductive impedance at a frequency of 5KHz. The bridge constant at balance are $L_S = 10mA$, $R_1 = 10k\Omega$, $R_2 = 40k\Omega$ and $R_3 = 10k\Omega$. (08 Marks)

Module-5

9 a. Define Transducers. List the important parameters of Electrical transducer. (04 Marks)

b. Explain Construction and Principle Operation of LVDT. (08 Marks)

c. Explain the Operation of a Resistance thermometer and mention its advantages. (08 Marks)

OR

10 a. What are features of Instrumentation Amplifiers? How it differs from the Ordinary Op Amp? (04 Marks)

b. Explain with neat diagram the PLC structure. (08 Marks)

c. Explain Instrumentation Amplifier using transducer bridge with the help of circuit diagram.
(08 Marks)

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CBCS SCHEME

18MAT31

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Third Semester B.E. Degree Examination, June/July 2023
Transform Calculus, Fourier Series and Numerical Techniques

Time: 3 hrs.   Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1 a. Find $L\left(\dfrac{\cos at - \cos bt}{t}\right)$.   **(06 Marks)**

   b. Express the function in terms of unit step function and hence find Laplace transform of
      $$f(t) = \begin{cases} \sin t & 0 < t < \frac{\pi}{2} \\ \cos t & \frac{\pi}{2} < t < \pi \end{cases}$$ **(07 Marks)**

   c. Solve $y''(t) + 4y'(t) + 3y(t) = e^t$, $y(0) = y'(0) = 1$ by using Laplace transform method.   **(07 Marks)**

OR

2 a. Find : (i) $L^{-1}\left(\log\left(\dfrac{s+b}{s+a}\right)\right)$ (ii) $L^{-1}\left(\dfrac{s+3}{s^2 - 4s + 13}\right)$ **(06 Marks)**

   b. Find $L^{-1}\left(\dfrac{s}{(s^2 + a^2)^2}\right)$ by using convolution theorem.   **(07 Marks)**

   c. Given $f(t) = \begin{cases} t & 0 < t < a \\ 2a - t & a < t < 2a \end{cases}$

      where $f(t) = f(t + 2a)$ then show that $L(f(t)) = \dfrac{1}{s^2} \tan h\left(\dfrac{as}{2}\right)$ **(07 Marks)**

Module-2

3 a. Obtain Fourier series for $f(x) = \dfrac{\pi - x}{2}$, $0 < x < 2\pi$.   **(06 Marks)**

   b. Find Fourier series for $f(x) = 2x - x^2$, $0 < x < 2$.   **(07 Marks)**

   c. Find half range Fourier cosine series for
      $$f(x) = \begin{cases} x, & 0 < x < \frac{\pi}{2} \\ \pi - x, & \frac{\pi}{2} < x < \pi \end{cases}$$ **(07 Marks)**

OR

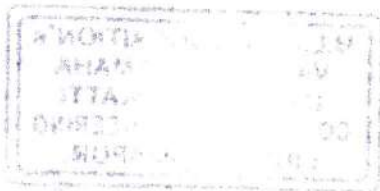4 a. Find Fourier series for $f(x) = |x|$, $-\pi < x < \pi$.   **(06 Marks)**

   b. Obtain Fourier series for $f(x) = \begin{cases} 0 & -2 < x < 0 \\ 1 & 0 < x < 2 \end{cases}$.   **(07 Marks)**

   c. Find the Fourier series upto first harmonic from the following table:

x	0	1	2	3	4	5
y = f(x)	4	8	15	7	6	2

(07 Marks)

Module-3

5 a. Find Fourier transform of f(x), given:

$$f(x) = \begin{cases} 1, & |x| \le 1 \\ 0, & |x| > 1 \end{cases} \quad \text{and hence deduce that } \int_0^\infty \frac{\sin x}{x} dx = \frac{\pi}{2}.$$

(06 Marks)

b. Find the Fourier cosine transform of

$$f(x) = \begin{cases} 4x & 0 < x < 1 \\ 4 - x & 1 < x < 4 \\ 0 & x > 4 \end{cases}$$

(07 Marks)

c. Solve $u_{n+2} + 4u_{n+1} + 3u_n = 3^n$, given $u_0 = 0$, $u_1 = 1$ using Z - transform. (07 Marks)

OR

6 a. Find the Fourier sine transform of $e^{-|x|}$ and hence evaluate $\int_0^\infty \frac{x \sin mx}{1 + x^2} dx$. (06 Marks)

b. Find Z-transform of $\cos n\theta$ and $a^n \cos n\theta$. (07 Marks)

c. Obtain the inverse Z-transform of $\dfrac{2z^2 + 3z}{(z+2)(z-4)}$. (07 Marks)

Module-4

7 a. Find the value of y at x = 0.1 and x = 0.2 given $\dfrac{dy}{dx} = x^2 y - 1$, y(0) = 1 by using Taylor's series method. (06 Marks)

b. Compute y(0.1), given $\dfrac{dy}{dx} = \dfrac{y - x}{y + x}$, y(0) = 1 taking h = 0.1, by using Runge-Kutta 4th order method. (07 Marks)

c. Find the value of y at x = 0.4, given $\dfrac{dy}{dx} = 2e^x - y$ with initial conditions y(0) = 2, y(0.1) = 2.010, y(0.2) = 2.04, y(0.3) = 2.09 by using Milne's predictor and corrector method. (07 Marks)

OR

8 a. Using modified Euler's method, find the value of y at x = 0.1, given $\dfrac{dy}{dx} = -xy^2$, y(0) = 2 taking h = 0.1. (06 Marks)

b. Solve $\dfrac{dy}{dx} = 3e^x + 2y$, y(0) = 0 at x = 0.1 taking h = 0.1, by using Runge-Kutta 4th order method. (07 Marks)

c. Find the value y at x = 0.8 given $\dfrac{dy}{dx} = x - y^2$ and

x	0	0.2	0.4	0.6
y	0	0.0200	0.0795	0.1762

By using Adam's Bashforth predictor and corrector method. (07 Marks)

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18MAT31

Module-5

9 a. Solve $\dfrac{d^2y}{dx^2} = x\left(\dfrac{dy}{dx}\right)^2 - y^2$ for x = 0.2 given x = 0, y = 1 and $\dfrac{dy}{dx} = 0$ by using Runge-Kutta method. **(07 Marks)**

b. Derive Euler's equation in the standard form $\dfrac{\partial f}{\partial y} = \dfrac{d}{dx}\left(\dfrac{\partial f}{\partial y'}\right) = 0$. **(06 Marks)**

c. Find the extremal of the function $\int_0^1 [(y')^2 + 12xy]dx$ with y(0) = 0 and y(1) = 1. **(07 Marks)**

OR

10 a. Find the value of y at x = 0.8, given $\dfrac{d^2y}{dx^2} = 2y\dfrac{dy}{dx}$ and

x	0	0.2	0.4	0.6
y	1	0.2027	0.4228	0.6841
y′	1	1.041	1.179	1.468

by using Milne's method. **(07 Marks)**

b. Prove that the shortest between two points in a plane is a straight line. **(06 Marks)**

c. Find the curve on which the functional $\int_0^1 [x + y + (y')^2]dx$ with y(0) = 1, y(1) = 2. **(07 Marks)**

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CBCS SCHEME

USN ☐☐☐☐☐☐☐☐☐☐

Question Paper Version : D

Third/Fourth Semester B.E./B.Tech. Degree Examination, June/July 2023
CONSTITUTION OF INDIA AND PROFESSIONAL ETHICS

[Time: 1 hrs.]

[Max. Marks: 50]

INSTRUCTIONS TO THE CANDIDATES

1. Answer all the Fifty questions, each question carries one mark.
2. Use only **Black ball point pen** for writing / darkening the circles.
3. **For each question, after selecting your answer, darken the appropriate circle corresponding to the same question number on the OMR sheet.**
4. Darkening two circles for the same question makes the answer invalid.
5. **Damaging/overwriting, using whiteners** on the **OMR** sheets are strictly prohibited.

1. The tenure of the Council of state is,
   a) Not subject to dissolution b) 2 years   c) 5 years   d) 4 years

2. When elections are held in one or a few constituencies due to death or resignation of candidates, it is called as _____ .
   a) General election   b) Primary election
   c) By election   d) Midterm election

3. Fundamental Rights are borrowed from the constitution of,
   a) UK   b) USA   c) Germany   d) Ireland

4. What is the minimum age to become Judges of Supreme Court of India?
   a) 25 years   b) 30 years   c) 35 years   d) None of these

5. The Indian constitution gives the power of amending the constitution to,
   a) The people of India   b) The president
   c) The Parliament   d) Supreme Court of India

6. Right to Education (RTE) was introduced in _____ Amendment,
   a) 86th b) 42nd c) 44th d) 61st

7. How many types of writs can be issued by the Supreme Court for the protection of Fundamental Rights?
   a) Four   b) Five   c) One   d) Six

8. Who presides over the sessions of Rajya Sabha?
   a) Speaker   b) Home minister   c) Vice-president   d) President

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9. Who appoints the Vice-Chancellors of the state universities?
a) Education minister b) District commissioner c) Chief minister d) Governor

10. Election commission is a _____ body and the term of election commission is _____ years or _____ years of age whichever is earliear.
a) Uni-member, 4 years or 62 years   b) Multi-member, 6 years or 65 years
c) Constitutional body, 5 years or 60 years   d) None of these

11. Which of the following is not the concept of responsibilities?
a) Minimalist   b) Reasonable care   c) Utilitarianism   d) Good works

12. Lying means,
a) Intentionally conveying false information to others   b) Fabrication
c) Plagarism   d) All of these

13. The three types of Justice reffered in our preamble are :
a) Social, Economic and Religious   b) Social, Economic and Natural
c) Social, Economic and International   d) Social, Economic and Political

14. An arrested person must be produced before a magistrate within _____ hours of arrest.
a) 12   b) 24   c) 36   d) 48

15. Election commission conducts the election as per which act?
a) Parliament act   b) People's representative act of 1982
c) Code of conduct act   d) State representative act

16. When the office of the president, falls vacant, the same must be filled up with in?
a) 3 months   b) 6 months   c) 1 year   d) 9 months

17. Who among the following are not entitled to form Union or Association,
a) Police   b) Teachers   c) Workers   d) Doctors

18. The MLA's of various state legislative assemblies are varying between,
a) 40 to 450   b) 50 - 500   c) 28 - 12   d) 60 - 500

19. A bill cannot become an act of parliament, unless and until _____?
a) it is passed by Lok Sabha   b) it is passed by Rajya Sabha
c) it gets assent from President   d) it gets approved by Supreme Court

20. Who hoisted the National Flag during 74th Republic day function in New Delhi?
a) Prime Minister   b) President
c) Vice-President   d) Chief justice of India

21. The member to be nominated by the President for the council of states are from,
a) Literature   b) Science   c) Sports   d) All of these

22. Which of the following Pairs is not property matched ,
a) 44th Amendment-citizenship act   b) 52nd Amendment-Anti Defection Law
c) 42nd Amendment-Fundamental duties   d) 73rd Amendment-Local self Government

23. The speaker of Lok Sabha,
a) is appointed by the President   b) is nominated by the Vice-President
c) is choosen by the members of Lok Sabha d) is elected by the members of parliament

24. Financial Emergence has been imposed in India,
    a) Once   b) Never   c) Twice   d) Thrice

25. Respect for the National Flag and the National Anthem is,
    a) a Fundamental right   b) a Fundamental Duty
    c) a Directive principle   d) an ordinary duty

26. A non-member of the state legislature can be the minister for a period not exceeding,
    a) Six month   b) One year   c) Six weeks   d) Three months

27. Engineering ethics is a,
    a) developing ethics   b) Preventive ethics
    c) natural ethics   d) Scientifically developed ethics

28. Risk estimation can be done by using,
    a) Cooking   b) Trimming   c) Event tree   d) Both (a) and (b)

29. The Patent holder does not allow others to use patented information for _____ years from the date of filing.
    a) 25   b) 30   c) 50   d) 20

30. The use of intellectual property of others without their permission or credit is referred to as,
    a) Cooking   b) Plagiarism   c) Patents   d) Formulae

31. How many members were nominated to the parliament by the president of India?
    a) 14 members   b) 12 members   c) 2 members   d) 6 members

32. Who among the following distribute portfolious for the council of minister,
    a) President   b) Vice president   c) Prime Minister   d) Speaker of Lok Sabha

33. The chief justice and other judges of the supreme court hold office till they complete,
    a) Sixty years   b) Sixty five years   c) Sixty two years   d) Seventy years

34. The council of ministers are responsible to the,
    a) Rajya Sabha   b) Vidhan Parshid   c) Lok Sabha   d) Supreme court

35. The Vice-President of India is elected by the,
    a) Judges of the supreme court   b) President
    c) Prime Minister   d) Members of parliament

36. Who can issue ordinance when the parliament is not in session:
    a) President   b) High court judges   c) Home minister   d) Finance minister

37. In case of the violation of the Fundamental Rights we may approach the,
    a) Civil Courts   b) Supreme Court   c) High Court   d) Both (a) and (b)

38. Which of the following equalities is/are included in the Right to Equality?
    a) Equality before law   b) Equal protection of law
    c) Equal opportunities in the public employment   d) All of these.

39. Prohibition of trafficking in human beings and forced labour comes under which of the following fundamental right?
    a) Right to freedom   b) Right against exploitation
    c) Cultural & Educational Right   d) Right to equality.

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40. There is no provision in the constitution for the impeachment of the,
   a) President   b) Vice President   c) Governor   d) Supreme court Judges

41. When was the Indian constitution enacted and adopted?
   a) 26/10/1949   b) 26/11/1949   c) 26/4/1949   d) 26/01/1950

42. 'We the people of India' are the opening words of the,
   a) Preamble of the Indian constitution   b) Article 21 of the Indian constitution
   c) Fundamental rights   d) Directive principles of state policy

43. Which one of these is the primary source of the Indian constitution?
   d) British constitution   b) Irish constitution
   c) Charter Act of 1833   d) Government of India Act of 1935

44. The original Indian constitution had :
   a) 12 parts, 6 schedule and 320 Articles   b) 20 parts, 8 schedule and 380 Articles
   c) 12 parts, 8 schedule and 396 Articles   d) 12 parts, 10 schedule and 300 Articles

45. The word 'Sovereign' means that,
   a) Supreme in nature   b) A country is under dictatorship
   c) A country is poor of weak   d) A country is strong and powerfull

46. Directive principles are,
   a) Justiciable   b) Not practiced at rural levels
   c) Non-justiciable   d) Associated to the Government worker's

47. How much time was taken for training the constitution?
   a) 1 year, 11 months, 18 days   b) 5 year, 11 months, 18 days
   c) 2 year, 11 months, 18 days   d) 3 year, 11 months, 18 days

48. India is a Sovereign, socialist, selular, democratic and republic in the Indian constitution this expression occurs in,
   a) Citizenship   b) Preamble
   c) Fundamental rights   d) Directive principles

49. Who among the following is the supreme commander of the Armed forces?
   a) Air Chief Marshal   b) Prime Minister
   c) Defense Minister   d) President

50. The 91st Amendment Act (2003) is associated with,
   a) Size of the council of ministers   b) Primary education
   c) Fundamental Duty   d) Powers of the President

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Ver D – 4 of 4

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21MAT31

Third Semester B.E. Degree Examination, June/July 2023
Transform Calculus, Fourier Series and Numerical Techniques

Time: 3 hrs.

Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1 a. Find the Laplace transform
$$2^t + \frac{\cos 2t + \cos 3t}{t}$$
(06 Marks)

   b. Find the Laplace transform of the triangular wave of period 2C given by
$$f(t) = \begin{cases} t & 0 < t < c \\ 2c - t & c < t < 2c \end{cases}$$
(07 Marks)

   c. Using convolution theorem find the inverse Laplace transform of
$$\frac{s}{(s^2 + a^2)^2}$$
(07 Marks)

OR

2 a. Express the function f(t) in terms of unit step function and hence find the Laplace transform
of $f(t) = \begin{cases} \sin t & 0 < t < \pi \\ \sin 2t & \pi < t < 2\pi \\ \sin 3t & t \geq 2\pi \end{cases}$
(06 Marks)

   b. Find the inverse laplace transform $\dfrac{2s^2 - 6s + 5}{(s-1)(s-2)(s-3)}$
(07 Marks)

   c. Solve the using Laplace transform method
$$y''(t) + 4y'(t) + 4y = e^{-t} \qquad y(0) = 0 \qquad y'(0) = 0$$
(07 Marks)

Module-2

3 a. Obtain the Fourier series of $f(x) = \dfrac{\pi - x}{2}$ in $0 < x < 2\pi$. Hence deduce that
$$1 - \frac{1}{3} + \frac{1}{5} - \frac{1}{7} + \dots = \frac{\pi}{4}$$
(06 Marks)

   b. Obtain the half range cosine series for the function $f(x) = 2x - 1$ in $0 < x < 1$
(07 Marks)

   c. Obtain the Fourier series of y upto the first harmonic for the following values:

x°	45	90	135	180	225	270	315	360
y	4.0	3.8	2.4	2.0	-1.5	0	2.6	3.4

(07 Marks)

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OR

4 a. Obtain the Fourier series of $f(x) = x \cos x$ in the interval $-\pi \le x \le \pi$. **(06 Marks)**

b. Obtain the sine half range Fourier series for the function,

$$f(x) = \begin{cases} \dfrac{2Kx}{\ell} & \text{in } 0 \le x \le \dfrac{\ell}{2} \\ \dfrac{2K}{\ell}(\ell - x) & \text{in } \dfrac{\ell}{2} \le x \le \ell \end{cases}.$$

(07 Marks)

c. Obtain the constant term and the first three coefficients in the Fourier cosine series of y in the following data :

x	0	1	2	3	4	5
y	4	8	15	7	6	2

(07 Marks)

Module-3

5 a. Find the complex Fourier transform of the function,

$$f(x) = \begin{cases} a^2 - x^2 & \text{for } |x| < a \\ 0 & \text{for } |x| > a \end{cases}.$$

Hence evaluate $\displaystyle\int_0^\infty \left(\frac{\sin s - s\cos s}{s^3}\right) ds = \frac{\pi}{2}$. **(06 Marks)**

b. Find the Fourier sine transform of e^{-ax}. **(07 Marks)**

c. Find the z-transform of $\cos n\theta$ and $\sin n\theta$. **(07 Marks)**

OR

6 a. Find the Fourier cosine transform of the function, $f(x) = \begin{cases} 4x & 0 < x < 1 \\ 4-x & 1 < x < 4 \\ 0 & x > 4 \end{cases}$. **(06 Marks)**

b. Find the inverse z-transform of $\dfrac{2z^2 + 3z}{(z+2)(z-4)}$. **(07 Marks)**

c. Solve by using z-transform $y_{n+2} - 4y_n = 0$ given that $y_0 = 0$ and $y_1 = 2$. **(07 Marks)**

Module-4

7 a. Classify the following partial differential equation

i) $\dfrac{\partial^2 u}{\partial x^2} + 4\dfrac{\partial^2 u}{\partial x \partial y} + 4\dfrac{\partial^2 u}{\partial y^2} - \dfrac{\partial y}{\partial x} + 2\dfrac{\partial u}{\partial y} = 0$

ii) $x^2 \dfrac{\partial^2 u}{\partial x^2} + (1 - y^2)\dfrac{\partial^2 u}{\partial y^2} = 0 \ -\infty < x < \infty, \ -1 < y < 1$

iii) $(1 + x^2)\dfrac{\partial^2 u}{\partial x^2} + (5 + 2x^2)\dfrac{\partial^2 u}{\partial x \partial t} + (4 + x^2)\dfrac{\partial^2 u}{\partial t^2} = 0$

iv) $(x + 1)\dfrac{\partial^2 u}{\partial x^2} - 2(x + 2)\dfrac{\partial^2 u}{\partial x \partial y} + (x + 3)\dfrac{\partial^2 u}{\partial y^2} = 0$ **(10 Marks)**

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b. Find the values of u(x, t) satisfying the parabolic equation $\dfrac{\partial^2 u}{\partial x^2} = 2\dfrac{\partial u}{\partial t}$ and its boundary conditions u(0, t) = 0 = u(4,t) and u(x, 0) = x(4 − x) by taking h = 1 find the value up to t = 5. **(10 Marks)**

OR

8 a. Solve $\dfrac{\partial u}{\partial t} = \dfrac{\partial^2 u}{\partial x^2}$ in 0 < x < 5, t ≥ 0 given that u(x, 0) = 20 u(0, t) = 0 u(5,t) = 100 compute U for the time step h = 1 by crank Nicholson method. **(10 Marks)**

b. Solve the wave equation $\dfrac{\partial^2 u}{\partial t^2} = 4\dfrac{\partial^2 u}{\partial x^2}$ subject to the condition u(0, t) = 0 u(4, t) = 0 u_t(x, 0) = 0 and u(x, 0) = x(4 − x) by taking h = 1, K = 0.5 up to four steps. **(10 Marks)**

Module-5

9 a. Given $\dfrac{d^2 y}{dx^2} - x^2\dfrac{dy}{dx} - 2xy = 1$, y(0)) = 1, y′(0) = 0 evaluate y(0.1) using Runge-Kutta method of order 4. **(06 Marks)**

b. Derive the Euler's equation of the form $\dfrac{\partial t}{\partial y} - \dfrac{d}{dx}\left(\dfrac{\partial t}{\partial y1}\right) = 0$. **(07 Marks)**

c. Find the extremal of the functional $I = \int_0^{\pi/2}(y^2 - y'^2 - 2y\sin x)dx$ under the conditions y(0) = y(π/2) = 0. **(07 Marks)**

OR

10 a. Apply Milne's predictor corrector method to solve $\dfrac{d^2 y}{d^2 x} = 1 - 2y\dfrac{dy}{dx}$ at 0.8 given that

y(0) = 0,   y(0.2) = 0.02,   y(0.4) = 0.0795,   y(0.6) = 0.1762,
y′(0) = 0,   y′(0.2) = 0.1996,   y′(0.4) = 0.3937,   y′(0.6) = 0.5689. **(06 Marks)**

b. Show that the geodesics on a plane are straight line. **(07 Marks)**

c. Which curve the functional $\int_0^{\pi/2}(y'^2 - y^2 + 2xy)dx$, y(0) = 0, y(π/2) = 0 be extremized.

(07 Marks)

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CBCS SCHEME

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21EC32

Third Semester B.E. Degree Examination, June/July 2023
Digital System Design Using Verilog

Time: 3 hrs.

Max. Marks: 100

Note: *Answer any FIVE full questions, choosing ONE full question from each module.*

Module-1

1 a. Define combinational logic circuit and place the following equation into the proper canonical form,
  (i) $P = f(a, b, c) = a\bar{b} + a\bar{c} + bc$.
  (ii) $Q = f(a, b, c) = (a + \bar{b})(\bar{b} + c)$
  (iii) $Z = f(a, b, c, d) = (a + \bar{b})(a + \bar{b} + d)$ **(10 Marks)**

  b. Find all the prime implicants of the function using Quine-McClusky method.
  $Z = f(a, b, c, d) = \sum m(7, 9, 12, 13, 14, 15) + d(4, 11)$ **(10 Marks)**

OR

2 a. Simplify the following expression using K-map. Implement the simplified expression using basic gates only $F = f(a, b, c, d) = \sum m(0, 1, 2, 5, 6, 7, 8, 9, 10, 13, 14, 15)$. **(10 Marks)**

  b. Design a logic circuit that has 4 inputs, the output will be high when the majority of the inputs are high. Use K-map to simplify. **(10 Marks)**

Module-2

3 a. Implement the following Boolean function using 8 : 1 multiplexer and 4 : 1 multiplexer.
  $M = f(a, b, c, d) = \sum m(0, 1, 2, 4, 6, 9, 12, 14)$ **(10 Marks)**

  b. Explain 4-bit carry look ahead adder with neat diagram and relevant expressions. **(10 Marks)**

OR

4 a. Implement full adder and full subtractor using 74138 decoder. **(10 Marks)**
  b. Design 2-bit magnitude comparator. **(10 Marks)**

Module-3

5 a. Explain Master Slave JK flip flop with the help of circuit diagram and waveforms. **(10 Marks)**
  b. Design a mod-6 synchronous counter using JK flip flop. **(10 Marks)**

OR

6 a. Find characteristic equations for SR, T, D and JK flip flop with the help of function table. **(10 Marks)**

  b. Explain four bit binary ripple counter with logic and timing diagram. **(10 Marks)**

Module-4

7 a. List all the data types available in verilog HDL and explain any three data types with examples. **(10 Marks)**
  b. Explain various descriptive styles available for hardware modeling using verilog HDL with an example. **(10 Marks)**

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OR

8 a. Explain the different types of logical operators with an example program. **(10 Marks)**

   b. Write a full subtractor verilog program using dataflow type of description. **(10 Marks)**

Module-5

9 a. With a neat block diagram, explain the components of a verilog module by highlighting mandatory blocks.

   b. Write a verilog behavioural code for 4 to 1 multiplexer using case statement. **(10 Marks)**

(10 Marks)

OR

10 a. Write a verilog structural code for four bit ripple carry adder. **(10 Marks)**

   b. Explain the highlights of structural description with an example. **(10 Marks)**

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21EC33

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Third Semester B.E. Degree Examination, June/July 2023
Basic Signal Processing

Time: 3 hrs.   Max. Marks: 100

Note: *Answer any FIVE full questions, choosing ONE full question from each module.*

Module-1

1 a. Define vector space and list out the eight rules that satisfies addition and scalar multiplication. **(05 Marks)**

   b. For which right hand side vector (b_1, b_2, b_3) have solution to the system.

   $$\begin{bmatrix} 1 & 4 & 2 \\ 2 & 8 & 4 \\ -1 & -4 & -2 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} = \begin{bmatrix} b_1 \\ b_2 \\ b_3 \end{bmatrix}$$
   (08 Marks)

   c. Define column space and null space of the matrix. **(07 Marks)**

OR

2 a. Determine the complete solution $x = x_n + x_p$ to the system

   $$\begin{bmatrix} 1 & 2 & 2 \\ 2 & 4 & 5 \end{bmatrix} \begin{bmatrix} u \\ v \\ w \end{bmatrix} = \begin{bmatrix} 1 \\ 4 \end{bmatrix}$$
   (05 Marks)

   b. Find the best straight line fit (least square) to the measurement $b = 4$ at $t = -2$, $b = 3$ at $t = -1$, $b = 1$ at $t = 0$ and $b = 0$ at $t = 2$. Then find the projection of b on to the column space of A. **(08 Marks)**

   c. Apply the Gram – Schmidt process for the independent vectors

   $$a = \begin{bmatrix} 1 \\ 0 \\ 1 \end{bmatrix}, \ b = \begin{bmatrix} 1 \\ 0 \\ 0 \end{bmatrix}, c = \begin{bmatrix} 2 \\ 1 \\ 0 \end{bmatrix}$$ to obtain an orthonormal basis. **(07 Marks)**

Module-2

3 a. Find the eigen values and eigen vectors of $A = \begin{bmatrix} 3 & 4 & 2 \\ 0 & 1 & 2 \\ 0 & 0 & 0 \end{bmatrix}$. Check that $\lambda_1 + \lambda_2 + \lambda_3$ equals the trace and $\lambda_1 \ \lambda_2 \ \lambda_3$ equals the determinent. **(08 Marks)**

   b. For the matrix $A = \begin{bmatrix} 1 & -1 \\ 2 & 4 \end{bmatrix}$, solve the differential equation $\dfrac{du}{dt} = Au$, $u(0) = \begin{bmatrix} 0 \\ 6 \end{bmatrix}$. What are the two pure exponential solutions? **(12 Marks)**

OR

4 a. If $A = \begin{bmatrix} 4 & 2 & -2 \\ -5 & 3 & 2 \\ -2 & 4 & 1 \end{bmatrix}$ and eigen vector matrix $S = \begin{bmatrix} 2 & 1 & 0 \\ 1 & 1 & 1 \\ 4 & 2 & 1 \end{bmatrix}$. Determine the diagonalization matrix $\wedge = S^{-1}AS$ **(08 Marks)**

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b. For the matrix $A = \begin{bmatrix} 1 & 2 \\ 3 & 6 \end{bmatrix}$, find the eigen values, eigen vector v_1, v_2 and $A^T A$. Then find u_1, u_2 and recover A using Singular Value Decomposition (SVD). **(12 Marks)**

Module-3

5 a. Define signals and systems. **(04 Marks)**

b. $x(n) = [2, 2, 2, 2, -2, -2, -2, -2]$. Sketch i) $x(n-3)$ ii) $x(2n+3)$. **(06 Marks)**

c. Determine whether the system $y(n) = nx(n)$ is
  i) Stable
  ii) Memory
  iii) Causal
  iv) Time invariant
  v) Linear **(10 Marks)**

OR

6 a. Sketch the signal $x(n) = u(n + 10) - 2u(n) + u(n - 6)$
$$y(n) = 2n[u(n) - u(n) - 6)]$$
(10 Marks)

b. Sketch the following signals
  i) $x(2n)$
  ii) $x(3n - 1)$
  iii) $x(n) u(1 - n)$ if $x(n) = [3, 2, 1, 0, 1, 2, 3]$ **(10 Marks)**

Module-4

7 a. Derive an expression for convolution sum for Linear Time Invariant (LTI) system. **(04 Marks)**

b. Compute $y(n) = u(n) * u(n)$ using graphical method. **(08 Marks)**

c. Compute $y(n) = x(n) * h(n)$, where $x(n) = u(n)$ and $h(n) = \left(\frac{3}{4}\right)^n u(n)$ using graphical method.

(08 Marks)

OR

8 a. Show that convolution posses the associative and distributive property. **(08 Marks)**

b. For the impulse response $h(n) = 2u(n) - 2u(n - 5)$. Determine whether the system
  i) Memoryless
  ii) Stable
  iii) Causal **(06 Marks)**

c. What is step response? Evaluate the step response of the LTI system whose impulse response in $h(n) = \left(\frac{1}{2}\right)^n u(n)$. **(06 Marks)**

Module-5

9 a. Find the z-transform and mention ROC of the following signals
  i) $x(n) = [1, 2, 3, 4, 0, 7]$

  ii) $x(n) = [1, 2, 3, 4, 0, 7]$

  iii) $x(n) = [1, 2, 3, 4, 0, 7]$ **(03 Marks)**

b. Find the z-transform of the signal $x(n) = a^n u(-n-1)$ with ROC diagram. **(05 Marks)**

c. Using the properties of the z-transform, find the z-transform of the following signals

   i) $x(n) = a^n \cos \Omega_0 n\, u(n)$

   ii) $x(n) = u(n-2) * \left(\dfrac{2}{3}\right)^n u(n)$ **(12 Marks)**

OR

10 a. Using partial fraction expansion method find the inverse z-transform of

$$x(z) = \frac{1 - z^{-1} + z^{-2}}{\left(1 - \dfrac{1}{2}z^{-1}\right)(1 - 2z^{-1})(1 - z^{-1})} \quad \text{for}$$

   i) ROC $1 < |z| < 2$

   ii) ROC $\dfrac{1}{2} < |z| < 2$

   iii) ROC $|z| < \dfrac{1}{2}$ **(08 Marks)**

b. A causal system has an input $x(n) = \delta(n) + \dfrac{1}{4}\delta(n-1) + \dfrac{1}{\delta}\delta(n-2)$ and output

   $y(n) = \delta(n) - \dfrac{3}{4}\delta(n-1)$. Find the transfer function of the system. **(04 Marks)**

c. The LTI system is $H(z) = \dfrac{3 - 4z^{-1}}{1 - 3.5z^{-1} + 1.5z^{-2}}$. Specify ROC of H(z) and determine h(n) for

   the following conditions

   i) The system is stable

   ii) The system is causal

   iii) The system is anticausal **(08 Marks)**

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21EC34
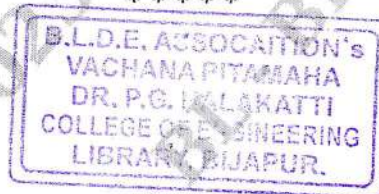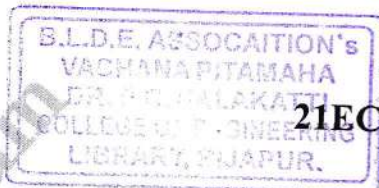
Third Semester B.E. Degree Examination, June/July 2023
Analog Electronic Circuits

Time: 3 hrs.

Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1 a. Explain the classical biasing for BJTs using a single power supply with circuit and relevant equations. How is bias current stabilized? **(08 Marks)**

b. Design collector-to-base feedback resistor circuit to obtain a dc emitter current of 1mA and to ensure $V_{CE} = 2.3V$. Let $V_{CC} = 10V$ and $\beta = 100$. **(04 Marks)**

c. Considering the conceptual circuit of common emitter amplifier, derive the expression for small-signal input resistance between base and emitter resistance. Mention the relation between r_π and r_e. **(08 Marks)**

OR

2 a. Why biasing by fixing V_{GS} is not a good approach? Explain biasing by fixing V_G and connecting a resistance in the source. **(10 Marks)**

b. Design Drain-to-Gate feedback resistor biasing circuit to operate at a dc drain current of 0.5mA. Assume $V_{DD} = 5V$, $K'_n W/L = 1mA/V^2$, $V_t = 1V$ and $\lambda = 0$. Use standard value for R_D and give actual values obtained for I_D and V_D. **(06 Marks)**

c. A BJT having $\beta = 100$ is biased at a dc collector current of 1mA. Find the value of g_m, r_e and r_π. Assume $V_T = 25mV$. **(04 Marks)**

Module-2

3 a. Obtain the expression for characteristic parameters of the CS amplifier with circuit diagram and its equivalent circuit. **(08 Marks)**

b. A CS amplifier utilizes a MOSFET biased at $I_D = 0.25mA$ with $V_{OV} = 0.25V$ and $R_D = 20K\Omega$. The device has $V_A = 50V$. The amplifier is fed with a source having $R_{sig} = 100K\Omega$ and a 20-$K\Omega$ load is connected to the output. Find R_{in}, A_{vo}, R_o, A_v and G_v. **(05 Marks)**

c. Explain the internal capacitances of a MOSFET and hence draw the high frequency small signal model of MOSFET. **(07 Marks)**

OR

4 a. Find the mid band gain A_M and the upper 3-dB frequency f_H of a CS amplifier fed with a signal source having an internal resistance $R_{sig} = 100K\Omega$. The amplifier has $R_G = 4.7M\Omega$, $R_D = R_L = 15K\Omega$, $g_m = 1mA/V$, $r_0 = 150K\Omega$, $C_{gs} = 1pF$ and $C_{gd} = 0.4pF$. **(06 Marks)**

b. Explain the working of FET – based RC phase shift oscillator with circuit diagram. In an RC phase shift oscillator, $R = 200K\Omega$ and $C = 200pF$. Find the frequency of the BJT-based oscillator. **(08 Marks)**

c. Explain the working of clapp oscillator with a circuit diagram. **(06 Marks)**

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Module-3

5. a. Explain general feedback structure of the feedback amplifier with a signal flow diagram and mathematical expressions. **(08 Marks)**

   b. Explain noise reduction with the application of negative feedback in amplifiers. **(08 Marks)**

   c. A class B push-pull amplifier is supplied with $V_{CC} = 50V$. The signal brings the collector voltage down to $V_{min} = 5V$. The total dissipation from both transistors is 40W. Find the total power and conversion efficiency. **(04 Marks)**

OR

6. a. Explain transconductance amplifier with a neat block diagram. **(06 Marks)**

   b. Explain class-B transformer-coupled amplifier. Prove that the maximum conversion efficiency of a class B transformer coupled amplifier is 78.5%. **(08 Marks)**

   c. Explain class C output stage with a neat diagram. **(06 Marks)**

Module-4

7. a. Explain inverting amplifier with external offset null circuit and relevant expressions for output voltage and closed loop gain. **(07 Marks)**

   b. Explain successive-approximation type A/D converter with a neat diagram. **(07 Marks)**

   c. Explain positive small-signal half-wave rectifier circuit with waveforms. **(06 Marks)**

OR

8. a. Explain the working of a second order high pass Butterworth filter with a neat circuit diagram and frequency response. Write the relevant design equations. **(08 Marks)**

   b. Design second order low-pass filter at a high cutoff frequency of 1kHz. Choose capacitance value 0.0047μF. **(05 Marks)**

   c. Explain the operation of 555 timer as astable multivibrator with relevant expressions. **(07 Marks)**

Module-5

9. a. Explain the classification of power electronic convertors. **(06 Marks)**

   b. With the help of elementary circuit and static V-I characteristics, explain the three regions of operation of the SCR. **(08 Marks)**

   c. Explain class-A commutation with necessary circuit diagram and waveforms. **(06 Marks)**

OR

10. a. Write a note on basic requirements for the successful firing of a thyristor. **(04 Marks)**

    b. Explain RC firing circuit with necessary circuit diagram and waveform. Write the relevant design equations. **(08 Marks)**

    c. Explain UJT relaxation oscillator with a neat circuit diagram. Derive the expression for frequency of oscillation. **(08 Marks)**

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CBCS SCHEME

18EC42

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Fourth Semester B.E. Degree Examination, June/July 2023
Analog Circuits

Time: 3 hrs.　　　　　　　　　　　　　　　　　　　　　Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1 a. What is meant by biasing of a transistor? Explain the classical bias arrangement for BJT and derive the expressions for collector current and collector-emitter voltage. **(08 Marks)**

　 b. Design a collector-base feedback bias circuit to obtain $I_E = 1$ mA and $V_{CE} = 2.3$ V, assuming $V_{CC} = 10$ V, $\beta = 100$ and $V_{BE} = 0.7$ V. **(06 Marks)**

　 c. For the conceptual amplifier circuit shown in Fig. Q1 (c), draw the hybrid - π model. Suppose if $I_C = 1$ mA, $\beta = 100$ and $V_T = 26$ mV, calculate the input resistance at the base and voltage gain.

Fig. Q1 (c)　　　　　　　　　　　　　　　　　　　　　**(06 Marks)**

OR
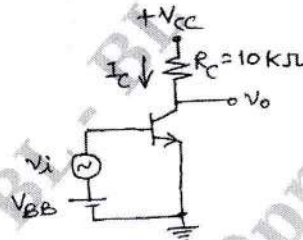
2 a. In the classical MOSFET bias arrangement, explain how the source resistor provides negative feedback action. How does this stabilize the variations in the bias current? **(04 Marks)**

　 b. Design a voltage divider biasing arrangement to establish a drain current of 2 mA. The MOSFET has $V_t = 1$ V, K'_n W/L = 1 mA/V^2. Assume $V_{DD} = 12$ V, $V_{DS} = 5$ V and $V_S = 2$ V. **(10 Marks)**

　 c. Starting from the conceptual MOSFET amplifier circuit, draw the small-signal model of MOSFET with $\lambda \neq 0$ and derive the expressions for g_m and A_V. **(06 Marks)**

Module-2

3 a. With a neat circuit diagram and ac equivalent circuit, derive the expressions for R_{in}, R_o, A_{VO} and A_V in a common–source MOSFET amplifier with un-bypassed source resistor. **(07 Marks)**

　 b. For the common drain circuit shown in Fig. Q3 (b), if $I_D = 8$ mA, $V_{OV} = 1$ V and $\lambda = 0$, determine the values of R_{in}, R_0, A_{VO} and A_V. Draw the ac equivalent circuit.
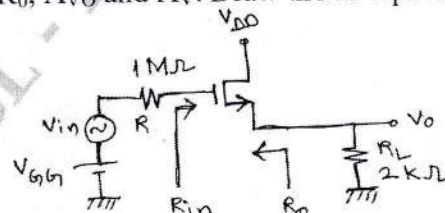
Fig. Q3 (b)　　　　　　　　　　　　　　　　　　　　　**(07 Marks)**

　 c. For n-channel MOSFET with $t_{ox} = 10$ nm, W = 10 μm, L = 1 μm, $L_{ov} = 0.05$ μm, $C_{Sbo} = C_{dbo} = 10$ fF, $V_O = 0.6$ V, $V_{SB} = 1$ V and $V_{DS} = 2$ V, calculate C_{OX}, C_{OV}, C_{gs}, C_{gd}, C_{sb} and C_{db} in saturation region. Assume $\varepsilon_{ox} = 3.45 \times 10^{-11}$ F/m. **(06 Marks)**

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CBCS SCHEME

18EC43

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Fourth Semester B.E. Degree Examination, June/July 2023
Control Systems

Time: 3 hrs.

Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1 a. Define control system and explain with an example. (04 Marks)
   b. Compare open loop and closed loop control system. (06 Marks)
   c. Find the transfer function of the electromechanical system shown in Fig.Q1(c).
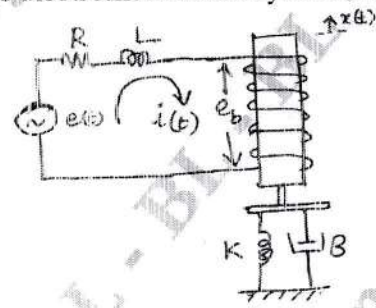
Fig.Q1(c) (10 Marks)

OR

2 a. What are the effects of feedback in a control system? (06 Marks)
   b. Write the differential equation for the given mechanical system shown in Fig.Q2(b). Find the analogous electrical circuit based on Force-Voltage analogy.
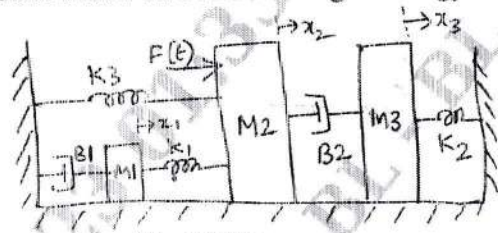
Fig.Q2(b) (10 Marks)

   c. Find the Torque - Voltage Analogous circuit for the Fig.Q2(c) shown.
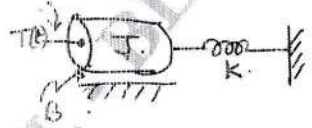
Fig.Q2(c) (04 Marks)

Module-2

3 a. Find the overall transfer function $\dfrac{C(s)}{R(s)}$ for the block diagram shown in Fig.Q3(a).
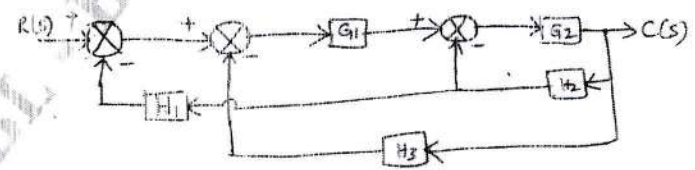
Fig.Q3(a) (10 Marks)

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b. Find the transfer function by constructing a block diagram for the circuit shown in Fig.Q3(b)
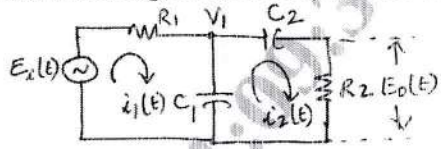
Fig.Q3(b)　　　　　　　(10 Marks)

OR

4 a. Find $\dfrac{C(s)}{R(s)}$ when $N(s) = 0$ for the diagram shown in Fig.Q4(a).
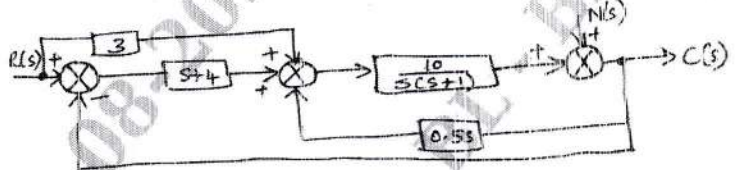
Fig.Q4(a)　　　　　　(10 Marks)

b. Find $\dfrac{C}{R}$ using Mason's Gain formula for the signal flow graph shown in Fig.Q4(b).
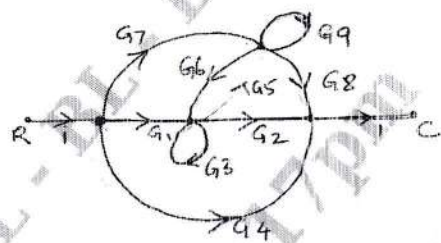
Fig.Q4(b)　　　　　　(10 Marks)

Module-3

5 a. A unity feedback system is characterized by an open loop transfer function

$$G(s) = \frac{K}{s(s+10)}$$

Find the value of K so that the system will have a damping ratio of 0.6, for this value of K find M_p, T_p and T_s for a unit step input. (08 Marks)

b. Find the error constants k_p, k_v and k_a for the unity feedback control system whose open loop transfer function

$$G(s) = \frac{100}{s^2(s+2)(s+5)}$$

Find the steady state error when the input $r(t) = 1 + t + 2t^2$. What is the type and order of the system? (08 Marks)

c. With the neat diagram write a note on PID controller. (04 Marks)

OR

6 a. Starting from output equation C(t), derive the expression for peak time, peak overshoot, settling time of an under damped second order system subjected to unit step input. (10 Marks)

b. Obtain rise time, peak time, % peak overshoot, settling time for the unit step response of a closed loop system given by

$$\frac{C(s)}{R(s)} = \frac{25}{s^2 + 6s + 25}$$

Also find the expression for the output. (10 Marks)

2 of 3

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18EC43

Module-4

7 a. For a unity feedback system whose open loop transfer function is $G(s) = \dfrac{k(s+4)}{s(s+1)(s+2)}$
   Find the range of k that keeps the system stable using R-H criteria. **(08 Marks)**

   b. Sketch the Root Locus diagram for the unity feedback control system with
   $G(s) = \dfrac{k}{s(s^2+8s+17)}$. Determine the value of k for a damping ratio of 0.5. **(12 Marks)**

OR

8 a. For a system having open loop transfer function given by $G(s) = \dfrac{10(1+0.125s)}{s(1+0.5s)(1+0.25s)}$
   Draw the Bode magnitude and phase plot. Determine the Phase margin and Gain margin. Comment on the stability. **(10 Marks)**

   b. Find the transfer function of the system whose Bode diagram is shown in Fig.Q8(b).
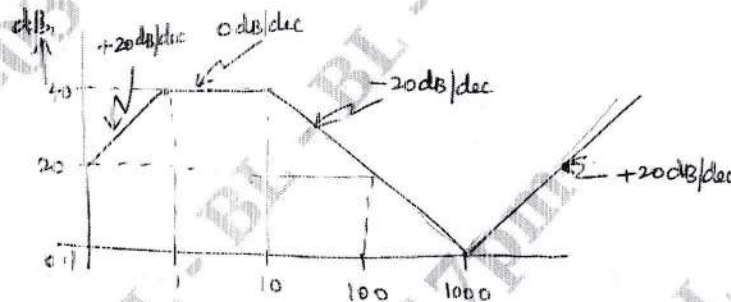
Fig.Q8(b) **(10 Marks)**

Module-5

9 a. The open loop transfer function of a unity negative feedback control system is given by
   $G(s) = \dfrac{k(s+3)}{s(s^2+2s+2)}$
   using Nyquist criteria find the value of k for which the closed loop system is stable. **(10 Marks)**

   b. Explain lead-lag compensating network. **(04 Marks)**

   c. Represent the differential equation given below in state model
   $$\frac{d^3 y(t)}{dt^3} + 3\frac{d^2 y(t)}{dt^2} + 6\frac{d y(t)}{dt} + 7y(t) = 2u(t)$$ **(06 Marks)**

OR

10 a. Mention the properties of State Transition Matrix. **(04 Marks)**

   b. Obtain the state model of the given network shown in Fig.Q10(b) in standard form.
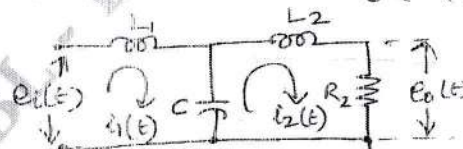
Fig.Q10(b) **(08 Marks)**

   c. Find the state transition matrix for the state equation given below.
   $$\begin{bmatrix} \dot{x}_1 \\ \dot{x}_2 \end{bmatrix} = \begin{bmatrix} 1 & 0 \\ 1 & 1 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix} + \begin{bmatrix} 1 \\ 1 \end{bmatrix} u(t)$$ **(08 Marks)**

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CBCS SCHEME

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18EC44

Fourth Semester B.E. Degree Examination, June/July 2023
Engineering Statistics and Linear Algebra

Time: 3 hrs.

Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1 a. Discuss the CDF and PDF of a random variable. List the properties of PDF. **(08 Marks)**

b. Given the data in the following table:

k	1	2	3	4	5
y_k	2.1	3.2	4.8	5.4	6.9
$P\{y_k\}$	0.2	0.21	0.19	0.14	0.26

i) Plot the PDF and CDF of the discrete random variable Y.
ii) Write expressions for PDF and CDF using unit delta and unit-step functions.

(08 Marks)

c. A continuous random variable X has a PDF, $f_x(x) = 3x^2$ $0 \le x \le 1$. Find 'a' such that $P\{x > a\} = 0.05$. **(04 Marks)**

OR

2 a. Define an exponential random variable. Obtain the characteristic function of an exponential random variable and using the characteristic function derive its mean and variance.

(10 Marks)

b. Given the data in the following table:

k	1	2	3	4	5
y_k	2.1	3.2	4.8	5.4	6.9
$P(y_k)$	0.2	0.21	0.19	0.14	0.26

i) What are the mean and variance of Y.
ii) If $W = y^2 + 1$, what are mean and variance of W.

(10 Marks)

Module-2

3 a. Define correlation coefficient of random variables x and y. Show that it is bounded by limits ±1. **(05 Marks)**

b. The joint PDF $f_{xy}(x, y) = C$, a constant when $0 < x < 3$ and $0 < y < 3$ and is '0' otherwise.
i) What is the value of the constant 'C'?
ii) What are the PDFs for X and Y?
iii) What $F_{xy}(x, y)$ when $0 < x < 3$ and $0 < y < 3$?
iv) What are $F_{xy}(x, \infty)$ and $F_{xy}(\infty, y)$?
v) Are x and y independent? **(10 Marks)**

c. Prove that COV (ax, by) = ab cov(xy). **(05 Marks)**

OR

4 a. Define central limit theorem and show that the sum of two independent Gaussian random variables is also Gaussian. **(06 Marks)**

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b. For a bivariate random variable CDF is given by $c(x+1)^2(y+1)^2$ for $\begin{Bmatrix} -2 < x < 4, \\ -1 < y < 2 \end{Bmatrix}$ and "0" outside. Find:
  i) The value of 'c'
  ii) Bivariate PDF
  iii) $F_x(x)$ and $F_y(y)$
  iv) Evaluate $P\{(x \le 2) \cap (y \le 1)\}$
  v) Are there variables independent?   (10 Marks)

c. Explain briefly the following random variables:
  i) Chi-square random variable
  ii) Student-t random variable.   (04 Marks)

Module-3

5 a. Define random process, with help of examples discuss different types of random processes.   (08 Marks)

b. Explain strict-sense-stationary and wide-sense-stationary random process.   (04 Marks)

c. A random process is defined by $x(t) = A \sin(w_c t + \Theta)$ where A, w_c are constants and Θ is a uniformly distributed random variable, distributed between $-\pi$ and π. Check whether $x(t)$ is WSS. If yes list its mean and ACF.   (08 Marks)

OR

6 a. Define Auto Correlation Function (ACF) of a random process and discuss its properties.   (10 Marks)

b. The random process $x(t)$ and $y(t)$ are jointly wide-sense stationary and independent. Given that $W(t) = x(t) + y(t)$ and

$R_x(\tau) = 10\,e^{-\frac{|\tau|}{3}}$

$R_y(\tau) = 10^{\left(\frac{3-|\tau|}{3}\right)}$ $-3 \le \tau \le 3$
      $= 0$ (otherwise).

For $W(t)$, find i) ACF   ii) Total power   iii) ac power   iv) dc power   v) check whether $W(t)$ is W.S.S.   (10 Marks)

Module-4

7 a. Define vector space and explain four fundamental subspaces with example.   (08 Marks)

b. Determine the column space and null space of the matrix $B = \begin{bmatrix} 0 & 0 & 3 \\ 1 & 2 & 3 \end{bmatrix}$.   (06 Marks)

c. Reduce the matrix $A = \begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 7 & 8 & 9 \end{bmatrix}$ to the Echelon (u) form and find the rank of the matrix.

                                                                        (06 Marks)

OR

8 a. What is basis for a vector space? Explain.   (06 Marks)

b. Given the vectors (1, -3, 2), (2, 1, -3) and (-3, 2, 1). Identify the basis. Verify they are independent or not.   (08 Marks)

c. Determine orthonormal vectors for $u = \begin{bmatrix} 4 \\ 2 \\ -1 \end{bmatrix}$ and $v = \begin{bmatrix} 1 \\ -3 \\ -2 \end{bmatrix}$. **(06 Marks)**

Module-5

9 a. By applying row operations to produce upper triangular matrix u, compute $|A|$ (det A).

$$A = \begin{bmatrix} 3 & 1 & 4 & 2 \\ 1 & 5 & 2 & 6 \\ 2 & 3 & 7 & 1 \\ 4 & 1 & 2 & 3 \end{bmatrix}.$$

(08 Marks)

b. For the given upper triangular matrix, determine i) $|u|$ ii) $|u^T|$ iii) $|u^{-1}|$.

$$u = \begin{bmatrix} 4 & 4 & 2 & 8 \\ 0 & 1 & 2 & 2 \\ 0 & 0 & 2 & 6 \\ 0 & 0 & 0 & 2 \end{bmatrix}$$

(06 Marks)

c. What is cofactor? Explain with an example. **(06 Marks)**

OR

10 a. Find x, y and z using CRAMER's rule for the system of equations,
x + 4y − z = 1
x + y + z = 0
2x + 3z = 0. **(06 Marks)**

b. Determine the eigen values of matrix $A = \begin{bmatrix} 3 & 2 \\ -1 & 0 \end{bmatrix}$. **(04 Marks)**

c. i) List the properties of Singular Value Decomposition (SVD).
ii) Prove that Identity matrix is positive definite using all required tests.

(10 Marks)
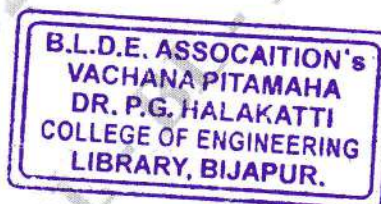
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CBCS SCHEME

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Fourth Semester B.E. Degree Examination, June/July 2023
Principles of Communication Systems

Time: 3 hrs.   Max. Marks: 80

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1   a. Describe the generation of an AM wave using switching modulator. Draw neat sketches and give relevant mathematical analysis and draw frequency spectrums to substantiate your answer.   **(06 Marks)**

    b. Explain the operation of envelope detector with neat diagrams and waveforms. Bring out the significance of RC time constant of the circuit in detection of the message signal without distortion.   **(05 Marks)**

    c. A sinusoidal carrier voltage is amplitude modulated as,
       $v_c = [1000 + 700 \cos 6000\pi t] \cos 2000 k\pi t$
       Determine the following:
       i)   Unmodulated carrier voltage
       ii)   Modulating voltage
       iii) Modulation index
       iv)   LSB and USB frequencies
       v)   Bandwidth of operation.   **(05 Marks)**

OR

2   a. With a neat sketch and analysis, explain the generation of a DSB-SC wave using ring modulator.   **(06 Marks)**

    b. Explain the method of obtaining a practical synchronous receiving system with DSB – SC modulated wave using costas loop.   **(06 Marks)**

    c. Consider the message signal, $m(t) = 20\cos(2\pi t)$ volts and a carrier signal, $c(t) = 50 \cos(100\pi t)$ volts.
       i)   Sketch to scale, the resulting AM wave and determine modulation index.
       ii)   Determine the power delivered across a load of 10Ω due to transmission of this AM wave.   **(04 Marks)**

Module-2

3   a. Explain the following terms associated with FM systems,
       i)   Maximum frequency deviation
       ii)   Carrier swing
       iii) NBFM and WBFM
       iv)   Carson's rule.   **(05 Marks)**

    b. A Frequency Modulated (FW) wave is represented by the voltage waveform,
       $v = 12 \sin(6 \times 10^8 t + 5 \sin 1250t)$.
       i)   Determine the carrier and modulating frequencies.
       ii)   Modulation index.
       iii) Maximum frequency deviation.
       iv)   Carrier swing.
       v)   Transmission bandwidth.
       vi)   Power dissipated in 10Ω resistor.   **(06 Marks)**

    c. Show that the spectrum of an FM wave contains infinite number of sidebands.   **(05 Marks)**

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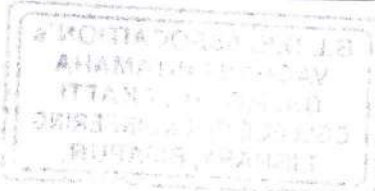
OR

4 a. With a neat schematic and frequency response, explain the operation of balanced frequency discriminator for demodulation of FM wave. **(06 Marks)**
  b. Discuss 'Non-Linear Effects' in FM systems. **(04 Marks)**
  c. With relevant block diagrams, explain FM stereo multiplexing used in FM radio broadcasting. **(06 Marks)**

Module-3

5 a. Define and explain Mean, Correlation and Covariance of a Random Process. **(06 Marks)**
  b. Define 'Auto-Correlation' function of the random process x(t). Explain the properties of Auto-Correlation functions **(06 Marks)**
  c. Compare Auto-correlation and cross-correlation functions. **(04 Marks)**

OR

6 a. Explain the following types of Noise that affect communication systems and give their mathematical expressions.
   i) Short Noise   ii) Thermal Noise   iii) White Noise **(08 Marks)**
  b. Explain 'Noise Equivalent Bandwidth'. Derive an expression for the same. **(08 Marks)**

Module-4

7 a. Show that the Figure – of – Merit (FOM) of DSB – SC system is unity. **(08 Marks)**
  b. With relevant diagrams, explain the concepts of Pre-Emphasis and De-Emphasis in FM systems. **(08 Marks)**

OR

8 a. Derive the expression for Figure – of – Merit (FOM) of SSB Receivers. **(10 Marks)**
  b. Write explanatory note on 'Capture Effect' in FM systems. **(06 Marks)**

Module-5

9 a. State 'Sampling Theorem' for band-limited signals. Explain the sampling process. **(06 Marks)**
  b. With a neat block diagram, explain the process of Time-Division Multiplexing (TDM). **(06 Marks)**
  c. Twelve different message signals, each with a bandwidth of 10KHz, are to be multiplexed and transmitted. Determine the minimum bandwidth required for the two methods, if the multiplexing modulation method used is : i) FDM, SSB ii) TDM, PAM. **(04 Marks)**

OR

10 a. With neat diagrams, explain the process of generation and reconstruction of PCM signal. **(06 Marks)**
   b. Explain 'Quantization' process used in PCM. **(05 Marks)**
   c. With neat diagrams and waveforms, the generation of PPM waves. **(05 Marks)**

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18EC46

Fourth Semester B.E. Degree Examination, June/July 2023
Microcontrollers

Time: 3 hrs.

Max. Marks: 100

Note: *Answer any FIVE full questions, choosing ONE full question from each module.*

Module-1

1 a. Write and explain the pin diagram of 8051 microcontroller. **(10 Marks)**
  b. With a neat diagram, explain the Block diagram 8051 microcontroller. Also explain PSW, RAM memory organization. **(10 Marks)**

OR

2 a. Describe the features of 8051 microcontroller with a neat diagram. **(10 Marks)**
  b. Explain the external interfacing of 16KB of ROM, 32KB of RAM to 8051 microcontroller such that the starting address of ROM is 0000H and RAM 8000H. **(10 Marks)**

Module-2

3 a. What are the addressing modes supported by 8051? Explain with example. **(10 Marks)**
  b. Write an assembly language program along with flow chart to divide the data in RAM location 41H by the data in 20H. Store the quotient on 70H and remainder in 71H. **(10 Marks)**

OR

4 a. Explain the following instructions with example
  i) DJNZ Rn, rel   ii) MOVC A, @A + DPTR   iii) RRC A   iv) PUSH 02   v) DAA.
  (10 Marks)
  b. Write a program segment to copy the value 55h into RAM memory locations 40h to 44h using i) Direct addressing mode   ii) Register indirect addressing mode without a loop iii) and with a loop.
  (10 Marks)

Module-3

5 a. Explain the role of CALL and subroutines in 8051 microcontroller programming. Give an example. **(10 Marks)**
  b. Write on ALP along with flow chart to find smallest number in an array of 10bytes of data stored in external memory location starting with 3000H. Store the result in internal memory 30H. Show the results obtained with sample data given. **(10 Marks)**

OR

6 a. Explain the operation of PUSH, POP, LCALL, ACALL and RET instructions of 8051 giving all the steps involved with suitable examples. **(10 Marks)**
  b. Write an assembly language program to toggle all the bits of P0, P1 and P2 every 1/4th of a second. Assume crystal frequency is 11.0592MHz. **(10 Marks)**

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Module-4

7 a. Explain TMOD register format of 8051. **(04 Marks)**

   b. Explain MODE-1 programming of timers in 8051. **(06 Marks)**

   c. Write an ALP to generate square wave of frequency 1KHz on P1.3. Assume crystal frequency, XTAL = 22MHz. User Timer 1 in mode 1. **(10 Marks)**

OR

8 a. Write an 8051 program to transfer "YES" serially at 9600 baud, 8 bit data, 1 stop bit, do this continuously. **(05 Marks)**

   b. Explain SCON register with its bit pattern. **(05 Marks)**

   c. Write the steps required for programming 8051 to transmit and receive the data serially and what is the role of PCON register in serial communication. **(10 Marks)**

Module-5

9 a. Assume that the INTI pin is connected to a switch that is normally high. Whenever it goes low, it should turn on the LED. The LED is connected to P1.3 and is normally off. When it is turned on it should stay on for a fraction of a second. As long as the switch is pressed low, the LED should stay on. Write on ALP for this. **(05 Marks)**

   b. Write a program in which the 8051 reads data from P1 and writes it to P2 continuously; while giving a copy of it to the serial comport to be transferred serially. Assume that XTAL = 11.0592MHz. Set the baud rate at 9600. **(05 Marks)**

   c. Explain the structure of Interrupt Priority (IP) and Interrupt Enable (IE) SFR. **(10 Marks)**

OR

10 a. Explain DAC interface with diagram and also write a program to generate stair case waveform. **(10 Marks)**

   b. Explain stepper motor interface with diagram and also write C program to monitor the status of switch and rotate clockwise if status of switch is zero and anticlockwise if status of switch is one. **(10 Marks)**

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CBCS SCHEME

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18MATDIP41

Fourth Semester B.E. Degree Examination, June/July 2023
Additional Mathematics – II

Time: 3 hrs.

Max. Marks: 100

Note: *Answer any FIVE full questions, choosing ONE full question from each module.*

Module-1

1 a. Find the rank of the matrix by applying elementary row operations :

$$A = \begin{bmatrix} 0 & 2 & 3 & 4 \\ 2 & 3 & 8 & 4 \\ 4 & 8 & 13 & 12 \end{bmatrix}$$

(06 Marks)

b. Test for consistency and solve the system :
$$x + y + z = 6$$
$$x - y + 2z = 5$$
$$3x + y + z = 8.$$

(07 Marks)

c. Find the eigen value and the corresponding eigen vectors of the matrix :

$$A = \begin{bmatrix} -2 & 2 & -3 \\ 2 & 1 & -6 \\ -1 & -2 & 0 \end{bmatrix}.$$

(07 Marks)

OR

2 a. Reduce the matrix A to the echelon firm, where

$$A = \begin{bmatrix} 2 & -1 & -3 & -1 \\ 1 & 2 & 3 & -1 \\ 1 & 0 & 1 & 1 \\ 0 & 1 & 1 & -1 \end{bmatrix}.$$

(06 Marks)

b. Find the values of λ and μ such that the system
$$x + y + z = 6$$
$$x + 2y + 3z = 10$$
$$x + 2y + \lambda z = \mu$$

may have
i) unique solution
ii) infinite solution
iii) no solution.

(07 Marks)

c. Solve :
$$2x + y + 4z = 12$$
$$4x + 11y - z = 33$$
$$8x - 3y + 2z = 20$$

By Gauss elimination method.

40

18MATDIP41

Module-2

3   a.   The area of a circle (A) corresponding to diameter (D) is given in the following table :

D	80	85	90	95	100
A	5026	5674	6362	7088	7854

   Find the area when D = 105 using an appropriate interpolation formula.   **(06 Marks)**

   b.   Find the real root of the equation $\cos x = 3x - 1$ correct to three decimal places using Regula – Falsi method.   **(07 Marks)**

   c.   Evaluate $\int_{0}^{1} \frac{x\,dx}{1+x^2}$ using Weddle's rule. Take seven ordinates.   **(07 Marks)**

OR

4   a.   Find $u_{0.5}$ from the data $u_0 = 225$, $u_1 = 238$, $u_2 = 320$, $u_3 = 340$ by using an appropriate interpolation formula.   **(06 Marks)**

   b.   Use Newton – Raphson method to find a real root of the equation $x^3 + 5x - 11 = 0$ correct to the three decimal places.   **(07 Marks)**

   c.   Using Simpson's $1/3^{rd}$ rule, evaluate $\int_{0}^{1} \frac{dx}{1+x^2}$ by dividing the interval [0, 1] into six equal parts. Hence deduce the value of $\log_e 2$.   **(07 Marks)**

Module-3

5   a.   Solve $(D^3 - 6D^2 + 11D - 6)\, y = 0$.   **(06 Marks)**

   b.   Solve $(D^2 - 4)y = \cos h\,(2x - 1) + 3^x$.   **(07 Marks)**

   c.   Solve $\frac{d^2 y}{dx^2} + 3\frac{dy}{dx} + 2y = 4\cos^2 x$.   **(07 Marks)**

OR

6   a.   Solve $\frac{d^3 y}{dx^3} + y = 0$.   **(06 Marks)**

   b.   Solve $y'' + 9y = \cos 2x \cdot \cos x$ **(07 Marks)**

   c.   Solve $y'' - (a + b)y' + aby = e^{ax} + e^{bx}$.   **(07 Marks)**

Module-4

7   a.   Form a partial differential equation by eliminating the arbitrary constants in $ax^2 + by^2 + z^2 = 1$.   **(06 Marks)**

   b.   Form the partial differential equation by eliminating the arbitrary function from $\ell x + my + nz = \phi(x^2 + y^2 + z^2)$.   **(07 Marks)**

   c.   Solve $\frac{\partial^2 z}{\partial x^2} = a^2 z$, given that when $x = 0$, $z = 0$ and $\frac{\partial z}{\partial x} = a \sin y$.   **(07 Marks)**
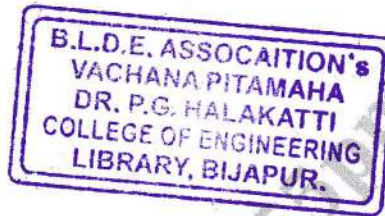
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OR

8 a. Form a partial differential equation by eliminating the arbitrary constructs from :

$z = xy + y\sqrt{x^2 - a^2} + b$.

(06 Marks)

   b. Solve $\dfrac{\partial^2 z}{\partial x^2} = x + y$ by direct integration.

(07 Marks)

   c. Solve $\dfrac{\partial^2 z}{\partial y^2} = z$, given that $z = 0$, $\dfrac{\partial z}{\partial y} = \sin x$, when $y = 0$.

(07 Marks)

Module-5

9 a. Define :
   i)   Sample space
   ii) Mutually exclusive events
   iii) Mutually independent events.

(06 Marks)

   b. A box contains 4 black, 5 white and 6 red balls. If 2 balls are drown at random, what is the probability that :
   i)   both are red
   ii) one black and one white.

(07 Marks)

   c. State and prove Baye's theorem.

(07 Marks)

OR

10 a. If A and B are events with $P(A \cup B) = \frac{7}{8}$, $P(A \cap B) = \frac{1}{4}$ and $P(A \cap \bar{B}) = \frac{1}{3}$.
   Find :
   i)   P(A)
   ii) P(B)
   iii) $P(\bar{A} \cap B)$.

(06 Marks)

   b. A problem is given to four students A, B, C, D whose chances of solving it are $\frac{1}{2}, \frac{1}{3}, \frac{1}{4}, \frac{1}{5}$ respectively. Find the probability that the problem is solved.

(07 Marks)

   c. Three machines A, B and C produce 50%, 30% and 20% of the items in a factory. The percentage of defective outputs of these machines are 3, 4, and 5 respectively. If an item is selected at random, what is the probability that it is defective? If a selected item is defective, what is the probability that it is from machine A?

(07 Marks)

* * * * *

42

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Question Paper Version : A

Third/Fourth Semester B.E Degree Examination, June/July 2023
Constitution of Indian, Professional Ethics and Cyber Law
(COMMON TO ALL BRANCHES)

Time: 2 hrs.]   [Max. Marks: 100

INSTRUCTIONS TO THE CANDIDATES

1. Answer all the hundred questions, each question carries **ONE mark**.

2. Use only **Black ball point pen** for writing / darkening the circles.

3. **For each question, after selecting your answer, darken the appropriate circle corresponding to the same question number on the OMR sheet.**

4. Darkening two circles for the same question makes the answer invalid.

5. **Damaging/overwriting, using whiteners** on the **OMR** sheets are strictly prohibited.

---

1. The constitution of India was enacted by a constitution assembly set up,
    a) Union Cabinet mission plan 1946.
    b) Under Indian Independence Act 1947
    c) Under resolution of provincial government.
    d) By Indian National Congress.

2. On December 11, 1946 the Constituent Assembly elected _____ as its permanent chairman.
    a) Jawaharlal Nehru   b) Dr. Rajendra prasad
    c) Dr. B. R. Ambedkar   d) K. M. Munshi

3. The drafting committee of the constitution including the chairman comprised of,
    a) 7 members   b) 9 members
    c) 11 members   d) 5 members

4. The constitution of India is,
    a) Rigid   b) Flexible
    c) Partly rigid partly flexible   d) Very very rigid

5. The preamble of constitution declares India to be,
    a) Sovereign democratic republic
    b) Socialist democratic republic
    c) Sovereign, Socialist, Secular democratic and Republic
    d) None of these

6. In which case did the supreme court give a ruling preamble was part of the constitution.
   a) Berubari case
   b) Golaknath case
   c) Keshavananda Bharathi case
   d) None of these

7. What is the chief source of political powers in the country?
   a) The constitution
   b) The people
   c) The legislature
   d) The parliament

8. The original constitution classified. The "Fundamental Rights" into seven categories but now there are.
   a) 4 categories
   b) 5 categories
   c) 6 categories
   d) 7 categories

9. Which one of the following fundamental Right was described by Dr.B.R. Ambedkar as "the heart and soul of constitution".
   a) Right to Equality
   b) Right to constitutional Remedies
   c) Right to Freedom
   d) Right to Religion

10. The main objective of cultural and educational right granted to the citizens is,
    a) To preserve rich cutlture and heritage of India.
    b) To evolve single integrated Indian culture
    c) To help minorities to conserve their culture.
    d) All the above

11. For enforcement of fundamental Right the court can issue,
    a) A Decree
    b) An ordinance
    c) A writ
    d) A notification

12. Which of the following literally means you may have the body,
    a) A Mandomus
    b) Habeaus corpus
    c) Prohibition
    d) Quo-warranto

13. "Equal work for equal pay" is a
    a) Fundamental Right
    b) Directive principle
    c) Fundamental duty
    d) Statutory provision is labour law

14. 73rd and 74th amendment is pertaining to
    a) Stalehood of Goa
    b) Extention of reservation to SC and ST
    c) Local self government
    d) Land reforms

15. The enforcement of Directive principles depends upon,
    a) The resources available with the Government
    b) The president
    c) The Court
    d) Chief justice of India

16. Common Civil code means,
    a) Common civil procedure code
    b) Common civil law applicable to all
    c) Civil law applicable to common man
    d) None of the above

17. The concept of DPSP is borrowed from the constitution of,
    a) Ireland
    b) Russia
    c) Great Britain
    d) USA

18. The constitution of India adopted fundamental duty from,
   a) America　　　b) Russia　　　c) Ireland　　　d) Britain

19. Fundamental duties did not form to be original part of Indian constitution they were added under _____ amendment.
   a) 42ⁿᵈ Amendment Act
   c) 86ᵗʰ Amendment Act
   b) 44ᵗʰ Amendment Act
   d) None of these

20. At present how many "Fundamental duties" are their in the constitution of India.
   a) 6 duties　　　b) 8 duties　　　c) 10 duties　　　d) 11 duties

21. Article 370 which gave special status to Jammu and Kashmir existed in the Indian constitution because of the agreement between,
   a) Jawaharlal and Farukh Abdullah
   c) Vallabh bhai Patel and Maharaj Harising
   b) Jawaharlal and Maharaja Hari sing
   d) Mohammed Ali Jinnah and J.L.Nehru

22. Which is the Indian constitution day?
   a) Jan-26　　　b) August-15　　　c) November-26　　　d) April-20

23. Legislate means,
   a) Make law
   c) Form government
   b) Make constitutional amendment
   d) Put administrative machinery into action

24. The Parliamentary form of government in India is based on,
   a) Great Britain　　　b) Japan　　　c) Russia　　　d) France

25. What is the system used to elect the president of India?
   a) Preferential system
   c) Direct election
   b) Secret Ballot
   d) Proportional representation

26. Who discharge the duty of the president in the event of president and vice president being not available?
   a) The prime minister
   c) The speaker of lok sabha
   b) The chief justice of India
   d) Vice president

27. Who represents the nation but does not rule the nation?
   a) President　　　b) Attorney general　　　c) Chief Justice of India　　　d) Vice President

28. Which one of the following house is presided by a non member?
   a) Rajya Sabha　　　b) Lok Sabha　　　c) Vidhana Sabha　　　d) Vidhana parishad

29. Respite means,
   a) Painless death
   c) Due to stragulation
   b) Death due to drowning
   d) awarding lesser punishment

30. The total number of union council of minister including the prime minister shall not exceed.
   a) 10% of loksabha strength
   c) 18% of loksabha strength
   b) 15% of loksabha strength
   d) no such restriction

31. Uni-Cameral means,
a) Presence of no house in the state
b) Presence of one house in the state
c) Presence of two house in the state
d) Present of half house in the state

32. The age qualification for becoming the member of Rajya Sabha and Lok Sabha is,
a) 25 yrs and 30 yrs
b) 30 yrs and 25 yrs
c) 35 yrs and 30 yrs
d) 30 yrs and 40 yrs

33. The state legislative Assembly is prorogued by,
a) Governor
b) Chief minister
c) Speaker of assembly
d) Chief justice of High court

34. Which of the following statement is not correct?
a) Money bill cannot be introduced in legislative council
b) The money bill is presented by chief minister of the state
c) The legislative council has no right to change the money bill
d) All of the above

35. Power of the supreme court to decide the dispute between the centre and the state fall under its,
a) Constitutional jurisdiction
b) Appellate jurisdiction
c) Advisory jurisdiction
d) Original jurisdiction

36. The High court judge unless resign earlier retire at the age of,
a) 58 years
b) 60 years
c) 62 years
d) 65 years

37. A bill presented in the parliament becomes law.
a) If passed by both the houses
b) The prime minister has signed it
c) The supreme court has decided or declared it.
d) When the president gives his assent

38. The judges of Supreme Court after retirement are not permitted to carry on practice before.
a) Supreme Court of India
b) High Court
c) District and Session Court
d) Any of these

39. One third of Rajya Sabha member retires,
a) Every year
b) Every two year
c) Every three years
d) Every four years.

40. Which among following is not a standing committee?
a) Public Committee
b) Ethics Committee
c) Railway convention Committee
d) Business advisory Committee

41. Election to the local self government is conducted by,
a) State Election Commission
b) Regional EC
c) Election commission
d) Governor

42. The citizens of India have got a right to cast his vote after attaining the age of _____ years.
a) 16 years
b) 18 years
c) 21 years
d) 24 years

43. Election to Loksabha and Legislative Assembly in India are conducted on the basis of,
    a) Single transferable vote
    b) Proportional representation
    c) Limited Suffarage
    d) Audult franchise

44. The Election Commissioner hold office till,
    a) For 5 years
    b) For 6 years
    c) During the pleasure of president
    d) 6 years or 65 years whichever is early

45. This is not a ground to declare National Emergency.
    a) Internal disturbance
    b) War
    c) External agression
    d) Armed rebellion

46. How many times has a National Emergency has been declared so far?
    a) Once
    b) Twice
    c) Thrice
    d) Never

47. Break down of constitutional machinery in a state is popularly known as,
    a) State Emergency
    b) National Emergency
    c) Financial Emergency
    d) All of these

48. When National Emergency declared, the following Fundamental Right is suspended.
    a) Right to Equality (Art 14)
    b) Title (Art 18)
    c) Right to Freedom (Art 19)
    d) Right to life (Art 21)

49. Which type of emergency has not yet declared till now?
    a) National Emergency
    b) State Emergency
    c) Financial Emergency
    d) None of these

50. Who is considered to be a Vulnerable group?
    a) Women and Children
    b) SCs
    c) STs
    d) All of these

51. How many members will be nominated by President / Governor from Anglo Indian community?
    a) 2 / 1
    b) 1 / 2
    c) 3 / 2
    d) 2 / 3

52. Seats for SCs and STs are not reserved in,
    a) Lok Sabha
    b) Legislative Assembly
    c) Rajya Sabha
    d) All of these

53. Which of the Constitutional amendment reduced the voting right from 21 years to 18 years?
    a) 54th Amendment
    b) 36th Amendment
    c) 62th Amendment
    d) 61st Amendment

54. Which of the following amendment Act makes the Right to education as the fundamental right to all the children under the age of 6 to 14 years by inserting Art 21A to the constitution.
    a) 86th Amendment Act 2002
    b) 87th Amendment Act 2003
    c) 88th Amendment Act 2003
    d) 89th Amendment Act 2003

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55. Which of the following amendment was passed during the emergency?
a) 42nd Amendment Act
b) 44th Amendment Act
c) 47th Amendment Act
d) 50th Amendment Act

56. In how many ways the constitutional amendments in India can take place?
a) 2
b) 3
c) 4
d) 5

57. The 7th Amendment of Indian constitution was done to implement recommendations of state on the basis of,
a) linguistic
b) Religion
c) Population
d) All of these

58. Which constitutional Amendment is done to pass the GST bill?
a) 101st
b) 120th
c) 122nd
d) 115th

59. The Ninety fourth Amendment of the constitution of India made provision for the appointment of minister in charge of tribal welfare in the state of,
a) Bihar
b) Chattisgarh and Jarkhand
c) Madya Pradesh
d) All the above

60. The 10th Amendment of the constitution of India Act 1961 incorporated _____ as seventh union territory of India.
a) Dadar & Nagar Haveli
b) Daman & Diu
c) Andaman & Nicobar
d) None of these

61. Engineering ethics is,
a) Scientifically developed ethics
b) Preventive ethics
c) Developing ethics
d) Natural ethics

62. A Fault tree is used to,
a) Improve safety
b) Take free consent
c) Claim compensation
d) Assess the risk involved

63. One of the characteristic of profession is
a) It demands hard work
b) It is based on honesty
c) It is having taught competation
d) usually its is having monopoly

64. One of impediment to responsibility is,
a) Rampant corruption at higher level
b) Self defection
c) Interference by higher officers
d) Interference by politicians

65. Good work means,
a) Superior work done with great care and skill
b) Work above and beyond the call of duty.
c) Responsible work
d) Work involving high risk

66. "Egocentric tendencies" means
a) Interpreting situation from limited view
b) Superior complex
c) Arrogant and irresponsible behaviour
d) habit of condemning the view of other

67. Tight couple means,
    a) Erecting two pillars side by side
    b) binding two beam tightly
    c) Process tightly coupled
    d) strong adhesive material

68. Lying is,
    a) intentionally conveying false or misleading information
    b) deception
    c) False hood
    d) None of these

69. Trimming is,
    a) Smoothing of irregularities to make the data appear accurate and precise
    b) Retaining the entire data
    c) Consolidating the data
    d) None of these

70. As applies to responsibility avoiding blame or being safe is the prime concern in,
    a) Minimalistic approach
    b) Considerable view
    c) Good work view
    d) Resonable care view

71. It is not a kind of trade mark.
    a) symbols
    b) designs
    c) good will
    d) sounds

72. Conflicts of interest may be,
    a) potential
    b) false
    c) created
    d) imaginary

73. The owner of patent right retains his patent right for _____ years.
    a) 20
    b) 50
    c) 75
    d) 100

74. _____ protects the expression of the Ideas but not the ideas themselves is,
    a) Plagiarism
    b) Patent
    c) Copy right
    d) Trade mark

75. Risk estimation can be done by,
    a) Cooking
    b) Trimming
    c) Event tree
    d) None of these

76. A compound measure of the probability and magnitude of adverse effect is known as,
    a) benefit
    b) risk
    c) accident
    d) compensation

77. The formula for MTR sambar masala is example of,
    a) Patent
    b) Copy right
    c) Trade mark
    d) Trade secret

78. Purpose of professional code is to,
    a) Guide themselves
    b) Educate the members
    c) Discipline the members
    d) All of these

79. What does NSPE stands for,
    a) National science professional engineers
    b) National society of professional engineers
    c) National science personal ethics
    d) National society of professional educator

80. The obligation and prerogatives associated with a specific role is referred to as,
    a) duty
    b) responsibility
    c) role morality
    d) none of these
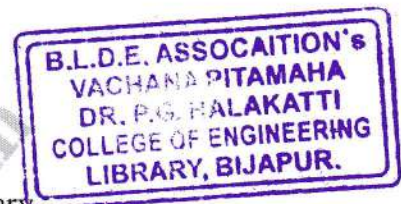
81. The first publicity available internet service in India was launched by _____ on 15 August 1995.
    a) Bharath Sanchar Nigam limited
    b) Videsh Sanchar Nigam limited
    c) Indian Institute of technology
    d) None of these

82. Which is the Act which provides legal frame work for e-Governance in India?
    a) Indian Penal Code
    b) IT (amendment) Act 2008
    c) IT Act 2000
    d) None of these

83. Which of the following is an example of Intellectual property?
    a) Trade mark   b) Copy right   c) Patent   d) All of the these

84. Which is the appeal court on the orders issued by cyber appealate tribunal?
    a) Munciff court   b) District court   c) High court   d) Supreme court

85. What are the types of cyber terror capability?
    a) Simple unstructured
    b) Simple unstructured and Advanced structured
    c) Complex co-ordinated
    d) Simple unstructured, Advanced structured, Complex co-ordinated

86. The mechanism for establishing net neutrality in India are at present mainly enforced by the,
    a) Telecom Regulatory Authority of India (TRAI)
    b) Bharatiya Sanchar Nigam Ltd. (BSNL)
    c) Videshi Sanchar Nigam Ltd. (VSNL)
    d) All the above

87. An attempt to harm damage or cause threat to a system or network is broadly termed as,
    a) Cyber crime   b) System hijacking   c) Cyber attack   d) Digital crime

88. Criminal minded individuals who work for terrorist organization and stean information if nation are,
    a) State sponspored hackers
    b) Cyber terrorist
    c) Blue hat hackers
    d) White hat hackers

89. Cyber crimes can be classified into,
    a) 2   b) 3   c) 4   d) 5

90. What is the updated version of IT Act 2000?
    a) IT Act 2007
    b) IT Act 2008
    c) Advanced IT Act 2002
    d) Advanced IT Act 2001

91. TRAI has ruled in favour of,
    a) Net neutrality   b) Airtel zero   c) Free basics   d) None of the these

92. Which of the following is not a type of cyber crime,
    a) Data theft
    b) Forgery
    c) Damage to Data and System
    d) Installing antivirus for protection

93. The imaginary location where the word of the parties meet in conversation is referred to as,
    a) cyber space   b) Cyber net   c) Space   d) Cyber dyne

8 of 9

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94. Nitizen means,
    a) A person who is citizen of a country
    b) A person who has dual citizenship
    c) A person who uses internet
    d) None of these

95. What is the punishment for hacking of computers?
    a) Three years imprisonment or 10 lac rupees or both
    b) Life imprisonment
    c) Three lac rupees or 3 years imprisonment
    d) Three years imprisonment or 5 lac rupees penalty or both

96. What is the proposed punishment for cyber Terrorism in IT Act?
    a) 1 crore rupees penalty
    b) Life imprisonment
    c) 10 years imprisonment
    d) 6 years imprisonment

97. What is the term of office of the presiding officer of cyber appellate tribunal?
    a) 3 years
    b) 4 years
    c) 5 years
    d) 6 years

98. What is the full form of ITA 2000?
    a) Information tech act 2000
    b) Indian technology act 2000
    c) International technology act 2000
    d) Information technology Act 2000

99. The first computer virus is,
    a) I love you
    b) Blaster
    c) Sasser
    d) Creeper

100. Who is usually against net neutrality,
    a) Content providers
    b) Consumers / end users
    c) telecom companies
    d) All of these

* * * * *

CBCS SCHEME

21KSK47

Question Paper Version : B

USN | 2 | B | L | 2 | 1 | C | S | 0 | 2 | 1 |

Fourth Semester B.E/B.Tech Degree Examination, June/July 2023

ಸಾಂಸ್ಕೃತಿಕ ಕನ್ನಡ - **Samskruthika Kannada**

Time: 1 hrs.]

[Max. Marks: 50

ಸೂಚನೆಗಳು

1. ಎಲ್ಲ ಐ೦ ಪ್ರಶ್ನೆಗಳಿಗೂ ಉತ್ತರಿಸಿರಿ. ಪ್ರತಿ ಪ್ರಶ್ನೆಗೆ ಒಂದು ಅಂಕ.

2. ಓ.ಎಂ.ಆರ್ ಉತ್ತರ ಪತ್ರಿಕೆಯಲ್ಲಿ ಯು.ಎಸ್.ಎನ್ ಸಂಖ್ಯೆ ಹಾಗೂ ಪಶ್ನೆ ಪತ್ರಿಕೆಯ ಶ್ರೇಣಿಯನ್ನು ಅಂದರೆ A, B, C ಅಥವಾ D ಯನ್ನು ತಪ್ಪಿಲ್ಲದಂತೆ ಕಡ್ಡಾಯವಾಗಿ ಗುರುತಿಸುವುದು ಅಭ್ಯರ್ಥಿಯ ಜವಾಬ್ದಾರಿಯಾಗಿರುತ್ತದೆ.

3. ಓ.ಎಂ.ಆರ್ ಉತ್ತರ ಪತ್ರಿಕೆಯಲ್ಲಿ ನಿಗದಿಪಡಿಸಿರುವ ಸ್ಥಳದಲ್ಲಿ ಭರ್ತಿಮಾಡದೆ ಹಾಗೆಯೇ ಬಿಟ್ಟಲ್ಲಿ ಅಥವಾ ಭರ್ತಿಮಾಡಿದ ಮಾಹಿತಿಯಲ್ಲಿ ಯಾವುದೇ ವ್ಯತ್ಯಾಸವಿದ್ದಲ್ಲಿ ಅಂತಹ ಉತ್ತರ ಪತ್ರಿಕೆಗಳನ್ನು ರದ್ದು ಪಡಿಸಲಾಗುವುದು.

4. ಕೇವಲ ಒಂದು ಉತ್ತರವನ್ನು ಮಾತ್ರ ಉತ್ತರ ಪತ್ರಿಕೆಯಲ್ಲಿ ಗುರುತಿಸತಕ್ಕದ್ದು. ಒಂದೇ ಪ್ರಶ್ನೆಗೆ ಎರಡು ಉತ್ತರವನ್ನು ಗುರುತಿಸುವುದು ಅಮಾನ್ಯ.

5. ಎಲ್ಲಾ ಉತ್ತರಗಳನ್ನು ನಿಮಗೆ ಒದಗಿಸಲಾದ ಓ.ಎಂ.ಆರ್ ಉತ್ತರ ಪತ್ರಿಕೆಯ ಹಾಳೆಯ ಮೇಲೆ ಕಪ್ಪು ಅಥವಾ ನೀಲಿ ಶಾಹಿಯ ಬಾಲ್‌ಪಾಯಿಂಟ್ ಪೆನ್ನಿನಿಂದ ಗುರುತು ಮಾಡಬೇಕು.

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1. ಗೋಪಣ್ಣ ಮಾಸ್ತರರ ಮಗನ ಹೆಸರೇನು?

   a) ರಾಮ b) ರಾಜ c) ಪ್ರಹ್ಲಾದ d) ಪ್ರಭು

2. ಇಸ್ಮಾಯಿಲ್ _____ ಇಂಜಿನಿಯರಿಂಗ್ ಮಾಡುತ್ತಿದ್ದ.

   a) ಹಾರ್ಡ್ ವೇರ್ ಇಂಜಿನಿಯರ್ b) ಕಂಪ್ಯೂಟರ್ ಇಂಜಿನಿಯರ್

   c) ಸಿವಿಲ್ ಇಂಜಿನಿಯರ್ d) ಮೆಕ್ಯಾನಿಕಲ್ ಇಂಜಿನಿಯರ್

3. ಪ್ರಲ್ಲಾದನ ಹೆಂಡತಿಯ ಹೆಸರು _____

   a) ರೇಖಾ b) ಮಮತ c) ರಾಧ d) ರೋಹಿಣಿ

4. ಯುಗಾದಿ ಕಥೆಯನ್ನು ಬರೆದವರು_____

   a) ಕನಕದಾಸ b) ಡಿ.ವಿ.ಜಿ c) ವಸುಧೇಂದ್ರ d) ಕುವೆಂಪು

5. ಗೋಪಣ್ಣ ಮಾಡುತ್ತಿದ್ದ ವೃತ್ತಿ _____

   a) ವೈದ್ಯ b) ಮಾಸ್ತರ್ c) ಇಂಜಿನಿಯರ್ d) ಮೆಕ್ಯಾನಿಕಲ್

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6. ಮೆಗಾನೆ ಹಳ್ಳಿಯಲ್ಲಿ ಯಾವ ಜನಾಂಗ ವಾಸಿಸುತ್ತಿದ್ದರು
   a) ಗಿರಿಜನ   b) ಕಳ್ಳರು   c) ಕುಣಬಿ   d) ಕಾಡುಜನ

7. ಕುಣಬಿ ಜನಾಂಗದವರು ಯಾವ ರಾಜ್ಯಕ್ಕೆ ಸೇರಿದವರು.
   a) ಗೋವಾ   b) ತಮಿಳನಾಡು   c) ಆಂಧ್ರಪ್ರದೇಶ   d) ಮಧ್ಯಪ್ರದೇಶ

8. ಮೆಗಾನೆಯ ಕುಣಬಿಯ ಜನಸಂಖ್ಯೆ _____
   a) 190   b) 200   c) 180   d) 150

9. ಗಿರಿಜನರ ಜೀವನ ವಿಧಾನಗಳನ್ನು ಕುರಿತು ವೀಡಿಯೋ ಸಾಕ್ಷ ಚಿತ್ರಗಳನ್ನು ತಯಾರಿಸುವ ಯೋಜನೆ ರೂಪಿಸಿದವರು _____
   a) ಎಸ್.ಕೆ.ಕರೀಂಖಾನ್   b) ಗಾಂಧೀಜಿ
   c) ನೆಹರು   d) ಡಿ.ವಿ.ಜಿ

10. 'ಮೆಗಾನೆ ಎಂಬ ಗಿರಿಜನ ಪರ್ವತ' ಬರೆದ ಲೇಖಕರು _____.
    a) ಕನಕದಾಸರು   b) ಆಯ್ದಕ್ಕಿ ಲಕ್ಕಮ್ಮ   c) ಪುರಂದರದಾಸ   d) ಹಿ.ಚಿ.ಬೋರಲಿಂಗಯ್ಯ

11. ಮೊದಲಬಾರಿ ಜೋಗಜಲಪಾತ ಕಂಡು ವಿಶ್ವೇಶ್ವರಯ್ಯ ಅವರು ಉದ್ಗರಿಸಿದ್ದು
    a) ಎಷ್ಟೊಂದು ಶಕ್ತಿ ಪೋಲಾಗುತ್ತಿದೆ   b) ಎಷ್ಟೊಂದು ಭೀಕರವಾಗಿದೆ
    c) ಎಷ್ಟೊಂದು ಗಲಿಜಾಗಿದೆ   d) ಎಷ್ಟೊಂದು ಅದ್ಭುತವಾಗಿದೆ

12. ಡಾ. ವಿಶ್ವೇಶ್ವರಯ್ಯನವರು ----- ರಲ್ಲಿ ಸ್ವಂತ ಇಚ್ಛೆಯಿಂದ ದಿವಾನಗಿರಿಯನ್ನು ಬಿಟ್ಟುಕೊಟ್ಟರು.
    a) 1920   b) 1947   c) 1919   d) 1950

13. ಕ್ರಮ, ಶಿಸ್ತು, ತರ್ಕಬದ್ಧವಾದ ಆಲೋಚನೆ ನಿಷ್ಕ್ಯಷ್ಠತೆ ಇವು ----- ರವರ ಹುಟ್ಟು ಗುಣಗಳು
    a) ಗಾಂಧೀಜಿ   b) ದೇವೇಗೌಡ   c) ವಿಶ್ವೇಶ್ವರಯ್ಯ   d) ನೆಹರು

14. ಕೃಷ್ಣರಾಜಸಾಗರವನ್ನು ಕಟ್ಟಿಸಿದವರು ಯಾರು?
    a) ವಿಶ್ವೇಶ್ವರಯ್ಯ   b) ಗಾಂಧೀಜಿ   c) ನೆಹರು   d) ಮೋದಿ

15. ದುಡಿದವನಿಗೆ ಪ್ರತಿಫಲ ದೊರೆಯಲೇಬೇಕು ಎಂದು ಹೇಳಿದವರು

    a) ಕುವೆಂಪು   b) ದ.ರಾ.ಬೇಂದ್ರೆ   c) ಡಿ.ವಿ.ಜಿ.   d) ವಿಶ್ವೇಶ್ವರಯ್ಯ

16. ಭಾರತದಲ್ಲಿ ಯಾವ ವರ್ಷದಿಂದ ಕರಕುಶಲ ಕಲೆಗಳಿಗೆ ಬೇಡಿಕೆಯಿದೆ.

    a) 1800   b) 2500   c) 2200   d) 2900

17. ಹಳೆಬೇರು ಹೊಸಚಿಗುರು ಒಂದಾಗಿರಲು ಮರ ಸೊಬಗು ಎಂದು ಹೇಳಿದವರು.

    a) ಡಿ.ವಿ.ಗುಂಡಪ್ಪ   b) ಕುವೆಂಪು   c) ವಿಶ್ವೇಶ್ವರಯ್ಯ   d) ದ.ರಾ.ಬೇಂದ್ರೆ

18. _____ ಬಟ್ಟೆಯ ಮೇಲಿನ ಮುದ್ರಣ ಕಲೆಗೆ ಮೂಲನೆಲೆ.

    a) ಅಮೆರಿಕ   b) ಭಾರತ   c) ಶ್ರೀಲಂಕ   d) ಆಫ್ರಿಕ

19. ಭಾರತದಲ್ಲಿ ಬೇರೆ ಬೇರೆ ಬಣ್ಣಗಳನ್ನು ನೀಡುವ ಸುಮಾರು _____ ಗಿಡಗಳಿವೆ.

    a) 100   b) 200   c) 400   d) 300

20. ಕಬ್ಬಿಣ ಮತ್ತು ಉಕ್ಕಿನ ಕಾರ್ಖಾನೆ ಎಲ್ಲಿ ಇದೆ.

    a) ಭದ್ರಾವತಿ   b) ಶಿವಮೊಗ್ಗ   c) ಬೆಂಗಳೂರು   d) ಹರಿಹರ

21. ಆಯ್ದಕ್ಕಿ ಮಾರಯ್ಯನವರ ವಚನದಲ್ಲಿ ಯಾವುದಕ್ಕೆ ಅತ್ಯಂತ ಹೆಚ್ಚು ಮಹತ್ವವನ್ನು ನೀಡಲಾಗಿದೆ.

    a) ಒಡತನ   b) ಸಿರಿತನ   c) ಬಂಗಾರ   d) ವಜ್ರ

22. ಗುರು, ಲಿಂಗ ಮತ್ತು ಜಂಗಮ ಈ ಮೂರಕ್ಕಿಂತ ಅತ್ಯಂತ ಶ್ರೇಷ್ಠವಾದದ್ದು

    a) ಕಾಯಕ   b) ಮಾತು   c) ನಡೆನುಡಿ   d) ಸೋಮಾರಿತನ

23. ಅನ್ಯರನ್ನು ದೂಡಿಸಿದರೆ ಅಂಧವರನ್ನು ಚನ್ನಮಲ್ಲಿಕಾರ್ಜುನ ------ ತಳ್ಳುತ್ತಾನೆ.

    a) ಸ್ವರ್ಗಕ್ಕೆ   b) ಶ್ರಮಕ್ಕೆ   c) ನರಕ್ಕೆ   d) ಬಡತನಕ್ಕೆ

24. ಕುರಿತೋದದೆಯ ಕಾವ್ಯ ಪ್ರಯೋಗ ಪರಿಣತ ಮತಿಗಳ್ ಎಂದು ಕವಿರಾಜಮಾರ್ಗಕಾರ ----- ನೇ ಶತಮಾನದಲ್ಲಿ ಹೇಳಿದ್ದರು.

    a) 2   b) 4   c) 6   d) 9

25. ಬಡತನ ಸತ್ತರೆ ------ ಸೌದಿಲ್ಲ
   a) ನನಗೆ   b) ಸುಡಲಿಕೆ   c) ಸಾಯಲು   d) ನೆಗೆಯಲು

26. ದಾಸರು ------ ಭಕ್ತರು
   a) ಶಿವನ   b) ವಿಷ್ಣುವಿನ   c) ಸರಸ್ವತಿಯ   d) ಹರಿಯ

27. ತಲ್ಲಣಿಸಿದರು ಕಂದ್ಯ ತಾಳು ಮನವೇ ಎಂಬ ಕೀರ್ತನೆಯನ್ನು ಬರೆದವರು.
   a) ಪುರಂದರದಾಸ   b) ಬಸವಣ್ಣ   c) ಕನಕದಾಸ   d) ಅಕ್ಕಮಹಾದೇವಿ

28. ಗೂಗೆ ಕಣ್ಣ ಕಾಣಲರಿಯದೆ ರವಿಯ ಒಯ್ಯದು ಈ ವಚನವನ್ನು ಬರೆದವರು.
   a) ಅಕ್ಕಮಹಾದೇವಿ   b) ಅಲ್ಲಮಪ್ರಭು   c) ಬಸವಣ್ಣ   d) ದಾಸಿಮಯ್ಯ

29. ರಾಗಿ ಬೀಸುವ ಕಲ್ಲೆ ----- ಒಡೆಗಲ್ಲೆ
   a) ರಾಣಿಯ   b) ದಾಸನ   c) ರಾಜಾನ   d) ದೇವರ

30. ---------- ಒಲುಮೆ ಇದ್ದರೆ ಬಡತನ ನೀಗಿಸುವುದು ಕಷ್ಟವಲ್ಲ
   a) ತಾಯಿಯ   b) ತಂದೆಯ   c) ರಾಜಾನ   d) ದೈವದ

31. ಕರ್ನಾಟಕ ಗತವೈಭವ ಗ್ರಂಥವನ್ನು ರಚಿಸಿದವರು ----------
   a) ಶ್ರೀರಂಗ   b) ಆಲೂರು ವೆಂಕಟರಾಯ
   c) ಡಿ. ಎಲ್. ನರಸಿಂಹಚಾರ್ಯ   d) ಕುವೆಂಪು

32. 1955 ರಲ್ಲಿ ರಾಯಚೂರಿನಲ್ಲಿ ನಡೆದ ಕನ್ನಡ ಸಾಹಿತ್ಯ ಪರಿಷತ್ತಿನ ಸಮ್ಮೇಳದ ಅಧ್ಯಕ್ಷರು.
   a) ಕೆ.ಆರ್. ಕಾರಂತ   b) ಚಂಗಲರಾಯ ರೆಡ್ಡಿ   c) ಶ್ರೀರಂಗ   d) ಶಿವಮೂರ್ತಿ ಶಾಸ್ತ್ರಿ

33. ಕನ್ನಡ ಭಾಷೆಯ ಲಿಪಿಯನ್ನು 'ಲಿಪಿಗಳ ರಾಣಿ' ಎಂದು ಕರೆದವರು.
   a) ವಿನೋಬಾಬಾವೆ   b) ಸರೋಜಾದೇವಿ
   c) ಶಿವರಾಮ ಕಾರಂತ   d) ಎಸ್. ಎಸ್. ಹಿರೇಮಠ

34. ಧರ್ಮ ಸಹಿಷ್ಣತೆ ಕನ್ನಡಿಗರ ಪರಂಪರೆ ಎಂದು ಯಾವ ಶಾಸನ ಕೂಗಿ ಹೇಳುತ್ತದೆ.
   a) ಬೆಂಗಳೂರಿನ   b) ಬೇಲೂರಿನ   c) ಚಿಕ್ಕಮಗಳೂರಿನ   d) ದಾವಣಗೆರೆಯ

35. "ಹಸಿವಾದರೆ ಊರೊಳಗೆ ಭಿಕ್ಷಾನ್ನಗಳುಂಟು, ತೃಷೆಯಾದರೆ, ಕೆರೆಬಾವಿ ಹಳ್ಳಗಳುಂಟು, ಶಯನಕ್ಕೆ ಹಾಳು ದೇಗುಲಗಳುಂಟು ಎಂಬ ವಚನ ಬರೆದವರು.

a) ಬಸವಣ್ಣ   b) ಅಕ್ಕಮಹಾದೇವಿ   c) ಅಲ್ಲಮಪ್ರಭು   d) ಜೇಡರ ದಾಸಿಮಯ್ಯ

36. ಕವಿರಾಜಮಾರ್ಗದಲ್ಲಿ ಹೇಳಿರುವ ಕನ್ನಡಿಗರ ಸ್ವಭಾವವನ್ನು ಕುರಿತ ಪದ್ಯಗಳು ಯಾವ ಶತಮಾನದಲ್ಲಿ ರಚಿಸಲಾಗಿದೆ.

a) ಹತ್ತನೆಯ   b) ಎರಡನೆಯ   c) ಆರನೆಯ   d) ಒಂಬತ್ತನೆಯ

37. ಸರ್ ಥಾಮಸ್ ಮನ್ರೋ ಯಾರು -------

a) ಅಧಿಕಾರಿ   b) ವೈದ್ಯ   c) ಕಲೆಕ್ಟರ್   d) ಡಿಸಿ

38. ಕನ್ನಡ ಬರಹಗಳಿಗೆ ------ ವರುಷಗಳ ಚರಿತ್ರೆಯಿದೆ.

a) ಸಾವಿರದ ಐದುನೂರು   b) ಸಾವಿರದ ನೂರು

c) ಹತ್ತು ಸಾವಿರ   d) ಸಾವಿರದ ಎರಡುನೂರು

39. ಭಾರತದ ಸಂವಿಧಾನ ಅಸ್ತಿತ್ವಕ್ಕೆ ಬಂದ ವರ್ಷ ----------

a) 1947   b) 1950   c) 1998   d) 1945

40. "ಚಾಗದ ಭೋಗದಕ್ಕರದಗೇಯದ ಗೊಟ್ಟಿಯಲಂಪಿನಿಂಪುಗಳ್ಗೆ ಆಗರವಾದ ಮಾನಸರ್" ಎಂದು ಹೇಳಿದ ಕವಿ ----------

a) ರನ್ನ   b) ಪಂಪ   c) ಕುವೆಂಪು   d) ಬಸವಣ್ಣ

41. ನಗವು ಸಹಜ ಧರ್ಮ ನಗಿಸುವುದು ---------

a) ಮಾನವ   b) ಪರಧರ್ಮ   c) ಜೀವನ   d) ದೇವರವರ

42 ಅಂಬಿಕಾತನಯದತ್ತ ಎಂಬುದು ಯಾರ ಕಾವ್ಯನಾಮ.

a) ಪುರಂದರದಾಸ   b) ಕನಕದಾಸ   c) ದ.ರಾ.ಬೇಂದ್ರೆ   d) ಅಕ್ಕಮಹಾದೇವಿ

43. ರಾಷ್ಟ್ರಕವಿ ಎಂಬ ಬಿರುದು ಪಡೆದ ಕವಿ

a) ದ.ರಾ.ಬೇಂದ್ರೆ   b) ಬಸವಣ್ಣ   c) ಕುವೆಂಪು   d) ಅಕ್ಕಮಹಾದೇವಿ

56

44. ನಾಕ ಪದದ ಅರ್ಥ

    a) ನರಕ   b) ಸ್ವರ್ಗ   c) ಭೂಮಿ   d) ಮಣ್ಣು

45. ಮಂಕುತಿಮ್ಮನ ಕಗ್ಗ ಕೃತಿಯನ್ನು ಬರೆದವರು.

    a) ಕುವೆಂಪು   b) ದ.ರಾ.ಬೇಂದ್ರೆ   c) ಕನಕದಾಸ   d) ಡಿ.ವಿ.ಜಿ

46. ನಾಕುತಂತಿ ಕವನ ಸಂಗ್ರಹಕ್ಕೆ ------ ಪ್ರಶಸ್ತಿ ಬಂದಿದೆ.

    a) ಪದ್ಮಭೂಷಣ   b) ಪದ್ಮವಿಭೂಷಣ   c) ಜ್ಞಾನಪೀಠ   d) ಪದ್ಮಶ್ರೀ

47. ಸಾಬಾಣ ಪದದ ಅರ್ಥ

    a) ಸಾಬೂನು   b) ಅಕ್ಕಿ   c) ಕಾಯಿ   d) ಹಣ

48. ಕನ್ನಡಕ್ಕೆ ಮೊದಲ ಜ್ಞಾನಪೀಠ ಪ್ರಶಸ್ತಿಯನ್ನು ತಂದುಕೊಟ್ಟವರು

    a) ಡಿ.ವಿ.ಜಿ   b) ಕುವೆಂಪು   c) ದ.ರ.ಬೇಂದ್ರೆ   d) ಕನಕದಾಸ

49. ಕುರುಡು ಕಾಂಚಾಣವನ್ನು ಯಾವ ಕವನಸಂಕಲನೆದಿಂದ ಆಯ್ದುಕೊಳ್ಳಲಾಗಿದೆ

    a) ನಾಕುತಂತಿ   b) ನಾಟಕ   c) ಮಂಕುತಮ್ಮನ ಕಗ್ಗ   d) ನಾದಲೀಲೆ

50. ಡಿ.ವಿ.ಜಿಯವರ ಕಾವ್ಯನಾಮ

    a) ಮಂಕುತಿಮ್ಮ   b) ಕೂಡಲಸಂಗಮದೇವ

    c) ಚೆನ್ನಮಲ್ಲಿಕಾರ್ಜುನ   d) ರಾಮನಾಥ

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CBCS SCHEME

21MAT41

USN | | | | | | | | | | |

Fourth Semester B.E. Degree Examination, June/July 2023
Complex Analysis, Probability and Statistical Methods

Time: 3 hrs.

Max. Marks: 100

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. Use of Statistical table is permitted.

Module-1

1 a. Derive Cauchy – Riemann equations in Cartesian form. **(06 Marks)**

   b. Show that $f(z) = \sin z$ is analytic and hence find its derivative. **(07 Marks)**

   c. Evaluate $\int_{(0,3)}^{(2,4)} (2y + x^2)dx + (3y - x)dy$, along the parabola $x = 2t, y = t^2 + 3$ **(07 Marks)**

OR

2 a. Determine the analytic function $f(z) = u + iv$, whose imaginary part is

   $(x^2 - y^2) + \dfrac{x}{x^2 + y^2}$ by Milne – Thompson method. **(06 Marks)**

   b. State and prove Cauchy's integral theorm. **(07 Marks)**

   c. Evaluate $\int_c \dfrac{dz}{z^2 - 4}$ over $c : |z| = 1$ **(07 Marks)**

Module-2

3 a. Show that $J_{-\frac{1}{2}}(x) = \sqrt{\dfrac{2}{\pi x}} \cos x$ **(06 Marks)**

   b. If α and β are the two roots of $J_n(x) = 0$ then prove that $\int_0^1 x \ J_n(\alpha x) J_n(\beta x)dx = 0$ if $\alpha \neq \beta$. **(07 Marks)**

   c. Express $f(x) = 2x^3 - x^2 - 3x + 2$ in terms of Legendre polynomials. **(07 Marks)**

OR

4 a. Obtain the series solution of Bessel's differential equation $x^2 y'' + xy' + (x^2 + n^2)y = 0$ leading to $J_n(x)$. **(06 Marks)**

   b. Show that $J_{+\frac{1}{2}}(x) = \sqrt{\dfrac{2}{\pi x}} \sin x$ **(07 Marks)**

   c. Prove that , $x^3 + 2x^2 - 4x + 5 = \dfrac{2}{5}P_3(x) + \dfrac{4}{3}P_2(x) - \dfrac{17}{5}P_1(x) + \dfrac{17}{5}P_0(x)$ **(07 Marks)**

Module-3

5 a. Find the Karl Pearson's coefficient correlation for the following two groups.

A	92	89	87	86	83	77	71	63	53	50
B	86	83	91	77	68	85	52	82	37	57

(06 Marks)

58

b. Fit a straight line of the form $y = ax + b$ for the data by the least squares method.

x	0	1	2	3	4	5
y	9	8	24	28	26	20

(07 Marks)

c. Using the method of least squares fit a curve $y = ax^b$ for the data

x	1	2	3	4	5
y	0.5	2	4.5	8	12.5

(07 Marks)

OR

6 a. Ten students got the percentage of marks in two subjects x and y. Compute their rank correlation coefficient.

Marks in x	78	36	98	25	75	82	90	62	65	39
Marks in y	84	51	91	60	68	62	86	58	53	37

(07 Marks)

b. Compute the means $\bar{x}$, $\bar{y}$ and the coefficient of correlation r from the given regression lines $2x + 3y + 1 = 0$, $x + 6y - 4 = 0$.

(07 Marks)

c. Fit a second degree parabola $y = ax^2 + bx + c$ in the least square sense for the following data and hence estimate y at $x = 6$.

x	1	2	3	4	5
y	10	12	13	16	19

(06 Marks)

Module-4

7 a. A random variable X has the following probability function :

X	0	1	2	3	4	5	6	7
P(X)	0	k	2k	2k	3k	k^2	$2k^2$	$7k^2 + k$

Find k and evaluate $P(X \geq 6)$, $P(3 < X \leq 6)$.

(06 Marks)

b. Find the mean and standard deviation of Poisson distribution. (07 Marks)

c. The probability that a person aged 60 years will live upto 70 is 0.65. What is the probability that out of 10 persons aged 60 atleast 7 of them will live upto 70?

(07 Marks)

OR

8 a. Find a constant K such that

$$f(x) = \begin{cases} kx^2, & 0 \leq x \leq 3 \\ 0, & \text{otherwise} \end{cases} \text{ is a pdf.}$$

Also, compute : (i) $P(1 < x < 2)$ (ii) $P(x \leq 1)$ (iii) $P(x > 1)$

(06 Marks)

b. Find the mean and standard deviation of Binomial distribution. (07 Marks)

c. In a test of electric bulbs it was found that the lifetime of bulbs of a particular brand was normally distributed with an average life of 2000 hours and standard deviation of 60 hours. If a firm purchases 2500 bulbs, find the number of bulbs that are likely to last for

(i) More than 2100 hours
(ii) Less than 1950 hours
(iii) Between 1900 and 2100 hours

Given that, $\phi(1.67) = 0.4525$; $\phi(0.83) = 0.2967$

(07 Marks)

Module-5

9 a. The joint probability distribution of the random variables X and Y are given as follows:

X \ Y	1	3	9
2	$\frac{1}{8}$	$\frac{1}{24}$	$\frac{1}{12}$
4	$\frac{1}{4}$	$\frac{1}{4}$	0
6	$\frac{1}{8}$	$\frac{1}{24}$	$\frac{1}{12}$

Find (i) E(X) (ii) E(Y) (iii) E(XY) (iv) Cov(X, Y)
(v) Marginal distribution of X and Y
(06 Marks)

b. Define (i) Null hypothesis (ii) Type-I and Type-II error (iii) Level of Significance
(07 Marks)

c. A sample of 100 tyres is taken from a lot. The mean life of tyres is found to be 40,650 kms with a standard deviation of 3260. Can it be considered as a true random sample from a population with mean life of 40,000 kms (use 0.05 level of significance). (Given $z_{0.05} = 1.96$, $z_{0.01} = 2.58$)
(07 Marks)

OR

10 a. The joint probability distribution of two random variables X and Y are as follows:

X \ Y	-2	-1	4	5
1	0.1	0.2	0	0.3
2	0.2	0.1	0.1	0

Determine : (i) Marginal distribution of X and Y (ii) Find E(X), E(Y) and E(XY)
(iii) Covariance of X and Y
(06 Marks)

b. In the experiment of pea breeding the following frequencies of seeds were obtained.

Round and Yellow	Wrinkled and Yellow	Rounded Green	Wrinkled and Green	Total
315	101	108	32	556

Theory predicts that the frequencies should be in proportions 9:3:3:1. Examine the correspondence between theory and experiment. (Given $\chi^2_{0.05} = 7.815$ for 3df).
(07 Marks)

c. A group of 10 boys fed on a diet A and another group of 8 boys fed on a different diet B for a period of 6 months recorded the following increase in weight (lbs).

Diet A :	5	6	8	1	12	4	3	9	6	10
Diet B :	2	3	6	8	10	1	2	8	5	5

Test whether diets A and B differ significantly regarding their effect on increase in weight. (Given $t_{0.05}$ for 16 df = 2.12)
(07 Marks)

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CBCS SCHEME

USN ☐☐☐☐☐☐☐☐☐☐

21EC42

Fourth Semester B.E. Degree Examination, June/July 2023
Digital Signal Processing

Time: 3 hrs.

Max. Marks: 100

Note: *Answer any FIVE full questions, choosing ONE full question from each module.*

Module-1

1 a. Define. DFT and IDFT and solve for the 4-point DFT of the sequence x(n) = [0, 1, 2, 3] and also write program to find N-point DFT. **(10 Marks)**
   b. Explain the process of frequency domain sampling and reconstruction of discrete time signal. **(10 Marks)**

OR

2 a. Summarize multiplication of two DFT properties and also write a program to verify Pasval's theorem. **(08 Marks)**
   b. Make use of DFT and IDFT to compute circular convolution of the sequence. x(n) = [2, 3, 1, 1] and h(n) = [1, 3, 5, 3]. **(08 Marks)**
   c. The five samples of 8-point DFT X(K) are given X(0) = 0.5, X(1) = - j2, X(4) = X(6) = 0. X(5) = + j2. Make use property to find remaining Samples and also find x(0). **(04 Marks)**

Module-2

3 a. Explain the computational arrangement of 8-point DFT using Radix – 2 DIT-FFT algorithm. **(12 Marks)**
   b. Examine the o/p y(n) = x(n) * h(n) if x(n) = [1, 0] and h(n) – [1, 3, 1] using Radix – 2 DIT – FFT algorithm. **(08 Marks)**

OR

4 a. Examine the output of y(n) of a filter where impulse response h(n) = [3, 2, 1] input sequence x(n) = [2, 1, +1, –2, 3, 5, 6, –7, 2, 0, 2, 1]. Use 8-point circular convolution in your approach using overlap add method. **(08 Marks)**
   b. Solve for 8-point DFT of the sequence x(n) = [1, 1, 1, 1] using Radix – 2 DIT-FFT algorithm. **(08 Marks)**
   c. What is the speed improvement factor in calculating 128 point DFT of sequence using direct computation and FFT algorithm? **(04 Marks)**

Module-3

5 a. What are the different design techniques are available for FIR filter? Explain the four window techniques for the designing of FIR filter. **(08 Marks)**
   b. A low pass filter is to be designed with the following desired frequency response.

$$H_d(e^{f\omega}) = \begin{cases} e^{f3\omega} & \text{for } |\omega| \le 3\pi/4 \\ 0 & \text{for otherwise} \end{cases}$$

Determine H(e^{f\omega}) for M = 7 using Hamming window. **(08 Marks)**
   c. Determine the direct form Relaization of the following :
$$h(n) = \delta(n) + \frac{1}{2}\delta(n-1) - \frac{1}{4}\delta(n-2) + \frac{1}{2}\delta(n-3).$$ **(04 Marks)**

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OR

6   a.   Formulate the expression for symmetric FIR filter.   **(08 Marks)**
    b.   Write a program and design for FIR Lowpass filter using humming window for M = 7 and
         $$\omega_c = 3\pi/4 \quad H_d(\omega) = \begin{cases} e^{-t3\omega} & \text{for} \quad |\omega| \le \omega_c \\ 0 & \text{for} \quad \text{otherwise} \end{cases}.$$ **(08 Marks)**
    c.   Realize a linear phase FIR filter with following Impulse. Response
         $H(z) = 1 + \frac{3}{4}z^{-1} + 1\frac{7}{8}z^{-2} + \frac{3}{4}z^{-3} + z^{-4}$ in cascade form.   **(04 Marks)**

Module-4

7   a.   Given that $|H_a(\Omega)|^2 = \dfrac{1}{1 + 16\Omega^4}$. Determine the Analog filter system function $H_a(S)$.

    (08 Marks)
    b.   Develop an analog filter with maximally flat response. In pass band with acceptable, attenuation of 2dB at 20rad/sec, the alteration in stop band more than that 10dB beyond 30rad/sec.   **(08 Marks)**
    c.   Write program to implementation of IIR Butterworth Lowpass filter.   **(04 Marks)**

OR

8   a.   Realization of direct form – I and direct form – II of IIR filter is given by
         $$H(z) = \frac{3 + 4z}{z - \frac{1}{2}} - \frac{2}{z - \frac{1}{4}}.$$ **(06 Marks)**
    b.   Make use of Bilinear transformation to obtain digital filter with $w_r = \pi/2$ and $\Omega = 4$ form given analog filter $H_a(s) = \dfrac{s + 0.1}{(s + 0.1)^2 + 16}$.   **(08 Marks)**
    c.   Write a program. Design and implementation of high pass filter to meet specification.
         (06 Marks)

Module-5

9   a.   Describe the IEEE single precision floating point digital signal processors.   **(08 Marks)**
    b.   Describe the digital signal processes following units :
         i)   Multiplier and accumulator
         ii) Address generation unit.   **(08 Marks)**
    c.   Determine following number into Q_{15} notation.
         i) 0560123   ii) –0.160123.   **(04 Marks)**

OR

10 a.   Explain fixed point digital signal processors of TMS320 family.   **(08 Marks)**
    b.   Explain digital signal processor using Harvard architecture.   **(06 Marks)**
    c.   Write a program for linear convolution of two sequences. Using DSK6713 DSP processor.
         (06 Marks)

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21EC43

USN

Fourth Semester B.E. Degree Examination, June/July 2023
Circuits and Controls

Time: 3 hrs.

Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1 a. Find the loop currents i_1 and i_2 for the circuit shown in Fig.Q1(a).

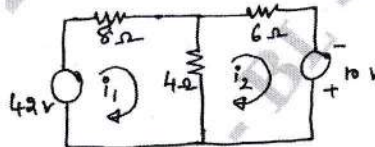Fig.Q1(a)   **(10 Marks)**

   b. Explain the verification of superposition with suitable circuit.   **(10 Marks)**

OR

2 a. State and explain Thevenin's theorem.   **(10 Marks)**
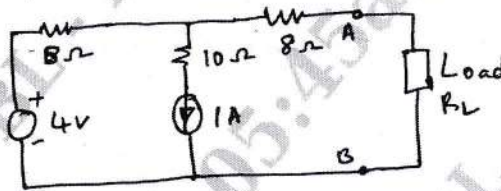   b. Solve and obtain Norton's equivalent circuit for the circuit shown in Fig.Q2(b).

Fig.Q2(b)   **(05 Marks)**

   c. Explain briefly node analysis method by considering suitable two loop DC circuit. **(05 Marks)**

Module-2

3 a. Find Z-parameters for the network shown in Fig.Q3(a).
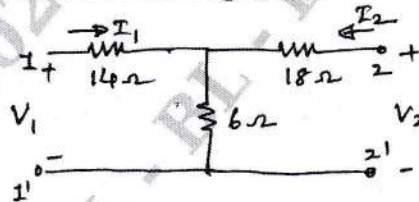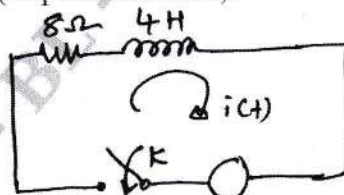

Fig.Q3(a)   **(10 Marks)**

   b. Find i(t) for the circuit shown in Fig.Q3(b) using Laplace Transform when the switch K is closed and $V(t) = \delta(t)$ (Impulse function).

$V(t) = \delta(t)$, $\delta(t)$ is impulse function

Fig.Q3(b)   **(10 Marks)**

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OR

4 a. Find Y-parameters for the network shown in Fig.Q4(a).
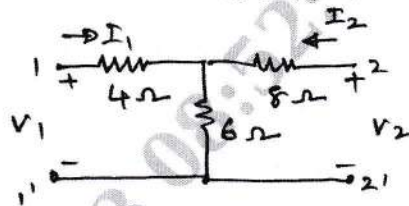
Fig.Q4(a)

b. State and explain Initial Value Theorem.

(10 Marks)
(10 Marks)

Module-3

5 a. Explain the different types of control system. (10 Marks)

b. Find the transfer function for the RLC circuit shown. Assume Initial condition as zero. RLC circuit consists of voltage source of V_i as show in the Fig.Q5(b) and find $\dfrac{V_0(s)}{V_i(s)}$.

Fig.Q5(b)

(10 Marks)

OR

6 a. Find the transfer function $\dfrac{C}{R}$ for the block diagram as shown in Fig.Q6(a).
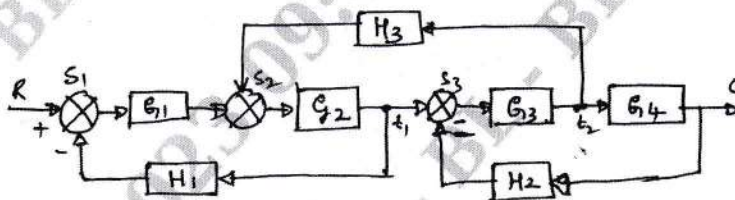
Fig.Q6(a)

(10 Marks)

b. Find the transfer function $\left(\dfrac{C}{R}\right)$ for the signal flow graph shown in Fig.Q6(b).

Fig.Q6(b)

(10 Marks)

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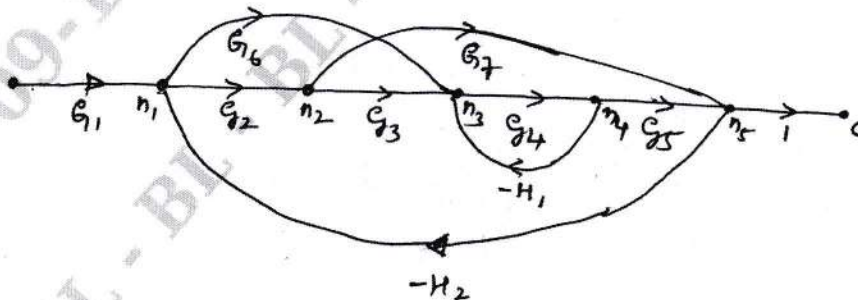
Module-4

7   a.   Find the output c(t) for the first order system, where

$$G(s) = \frac{a}{s+a} \quad \text{and} \quad R(s) = \frac{1}{s}$$

(10 Marks)

   b.   Explain the concept of stability and its stability necessary conditions.   (10 Marks)

OR

8   a.   Explain with a neat diagram of time response of second order system unit step function. Explain any five time specifications.   (10 Marks)

   b.   Find the range of K for system stability. Given

$$G(s) = \frac{K}{(s+2)(s+4)(s^2+6s+25)} \quad \text{and} \quad H(s) = 1.$$
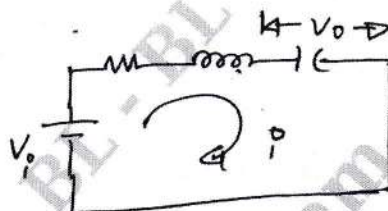
(10 Marks)

Module-5

9   a.   Explain any four root locus plot rules.   (10 Marks)

   b.   Find the state model of the given electrical system as shown in Fig.Q9(b).
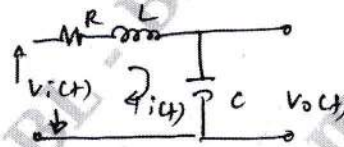
Fig.Q9(b)

Take state variables $X_1(t) = i(t)$ and $X_2(t) = V_0(t)$.   (10 Marks)

OR

10   a.   Find the state transition matrix for $A = \begin{bmatrix} 0 & -1 \\ 2 & -3 \end{bmatrix}$ (10 Marks)

   b.   Find the T. F (Transfer function) for the magnitude plot as shown in Fig.Q10(b).

Fig.Q10(b)

(10 Marks)

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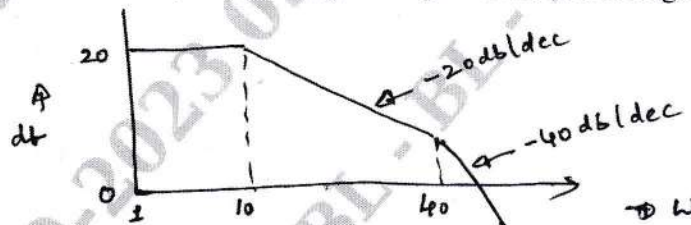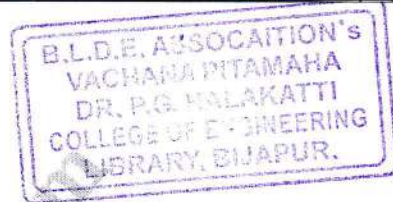
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21EC44

Fourth Semester B.E. Degree Examination, June/July 2023
Communication Theory

Time: 3 hrs.

Max. Marks: 100

Note: *Answer any FIVE full questions, choosing ONE full question from each module.*

Module-1

1   a.   Explain the time domain and frequency domain analysis of AM wave for a single modulating signal with neat diagrams and necessary equations. **(10 Marks)**

b.   Explain the operation of envelope detector with neat diagrams and waveforms. Also mention the significance of RC-time constant. **(05 Marks)**

c.   An audio frequency signal $10\sin 2\pi(500)t$ is used to amplitude modulate a carrier of $50\sin 2\pi(10^5)t$. Assume modulation index $= 0.2$. Determine sideband frequencies, amplitude of each side band, bandwidth required, Efficiency of AM wave. **(05 Marks)**

OR

2   a.   With relevant diagrams, explain the operation of the quadrature carrier multiplexing transmitter and receiver schemes. **(07 Marks)**

b.   Explain the concept of FDM with neat block diagram. **(06 Marks)**

c.   A carrier wave $4\sin(2\pi*500*10^3 t)$ volts is amplitude modulated by an audio wave $[0.2\sin 3(2\pi*500t)+0.1\sin 5(2\pi*500t)]$ volts. Determine upper and lower sidebands and sketch the complete spectrum of the modulated wave. Estimate the total power in the sideband $(R = 1\ \Omega)$. **(07 Marks)**

Module-2

3   a.   Define the following :
   (i)   Instantaneous frequency
   (ii)   Maximum frequency deviation
   (iii)   Modulation index. **(06 Marks)**

b.   Explain the generation of narrow band FM wave with neat block diagram, necessary equations and phasor diagrams. **(08 Marks)**

c.   When a 50.4 MHz carrier is frequency modulated by a sinusoidal AF modulating sinal, the highest frequency reached is 50.405 MHz. Calculate
   (i)   The frequency deviation produced.
   (ii)   Carrier swing of the wave.
   (iii)   Lowest frequency reached. **(06 Marks)**

OR

4   a.   Explain the demodulation of FM signal using the nonlinear and linear model of PLL with neat diagrams and equations. **(10 Marks)**

b.   Explain the FM stereo multiplexer and demultiplexer operation with neat diagrams. **(08 Marks)**

c.   An FM wave is defined by $s(t)=10\cos[2+\sin 6\pi t]$. Find the instantaneous frequency of $s(t)$. **(02 Marks)**

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Module-3

5 a. Write short notes on :
    (i)   Thermal noise
    (ii) Shot noise.
    (iii) White noise. **(06 Marks)**

   b. Derive the noise equivalent bandwidth equation $B = \dfrac{1}{4CR}$ Hz for low pass filter. **(08 Marks)**

   c. Three 5 KΩ resistors are connected in series. For room temperature $(KT = 4 \times 10^{-21})$ and an effective noise bandwidth of 1 MHz, determine
    (i)   The noise voltage appearing across each resistor.
    (ii) The noise voltage appearing across the series combination.
    (iii) What is the rms noise voltage which appears across same three resistors connected in parallel under the same conditions? **(06 Marks)**

OR

6 a. Show the figure of merit for DSBSC system is unity. **(08 Marks)**
   b. Obtain the expression for FOM of AM receivers using envelope detector. **(08 Marks)**
   c. An AM receiver operating with a sinusoidal wave of 80% modulation has an output signal to noise ratio of 30 dB. Calculate the corresponding channel S/N ratio. **(04 Marks)**

Module-4

7 a. What are the advantages of digitizing the analog sources? **(06 Marks)**
   b. State and explain the sampling theorem for the band limited signal. Also explain the under sampling, over sampling and Nyquist rate with neat diagram. **(14 Marks)**

OR

8 a. Explain the pulse amplitude modulation with neat diagram and equations. **(08 Marks)**
   b. Explain the Time Division Multiplexing (TDM) with neat block diagram. **(08 Marks)**
   c. An analog signal is expressed by the equation, $x(t) = \dfrac{1}{2\pi}\cos(4000\pi t)\cos(1000\pi t)$. Calculate the nyquist rate and nyquist interval for this signal. **(04 Marks)**

Module-5

9 a. Explain the construction and regeneration of PCM signal. **(10 Marks)**
   b. Explain the different line codes. To transmit a bit sequence 01101001 draw the resulting waveforms using,
    (i)   Unipolar NRZ
    (ii) Polar NRZ.
    (iii) Unipolar RZ
    (iv) Bipolar RZ
    (v)   Manchester **(10 Marks)**

OR

10 a. Explain the concept and operation of delta modulation in detail. **(10 Marks)**
   b. Explain quantization process with neat diagrams. Also explain the types of quantizer with neat diagrams. **(06 Marks)**
   c. Write a short note on Vocoder. **(04 Marks)**

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CBCS SCHEME

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21BE45

Fourth Semester B.E./B.Tech. Degree Examination, June/July 2023
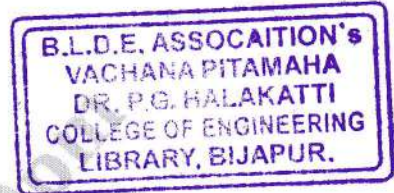## Biology for Engineers

Time: 3 hrs.

Max. Marks: 100

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. M : Marks , L: Bloom's level , C: Course outcomes.

		Module – 1	M	L	C
Q.1	a.	What is a biomolecule? Explain the classification of biomolecule.	07	L2	CO1
	b.	Explain the role of DNA vaccine for rabies and RNA vaccine for COVID-19.	07	L2	CO1
	c.	Write a short note on cellulose based bio-filters.	06	L2	CO1
		OR			
Q.2	a.	Explain the DNA finger printing in forensic applications.	07	L2	CO1
	b.	Explain the role of lipids and its application in cleaning agents.	07	L2	CO1
	c.	Write a short note on biosensors and bioplastics.	06	L2	CO1
		Module – 2			
Q.3	a.	Explain brain as a CPU system.	07	L3	CO1
	b.	Explain eye as a camera system.	07	L3	CO1
	c.	Write a short note on cardiac pacemaker.	06	L2	CO1
		OR			
Q.4	a.	Explain the robotic arms for prosthetics.	07	L3	CO1
	b.	Explain heart as a pump system.	07	L3	CO1
	c.	Write a short note on engineering solutions for Parkinson's disease.	06	L2	CO1
		Module – 3			
Q.5	a.	Explain the lungs as a purification system.	07	L3	CO2
	b.	Explain the kidney as filtration system.	07	L3	CO2
	c.	Write a short note on spirometry and ventilator.	06	L2	CO2
		OR			
Q.6	a.	Explain muscular and skeletal system as scaffolds.	07	L3	CO2
	b.	Explain bio-engineering solutions for muscular dystrophy and osteoporosis.	07	L3	CO2
	c.	Write a short note on Chronic Obstructive Pulmonary Disease (COPD).	06	L2	CO2
		Module – 4			
Q.7	a.	Explain the terms Echolocation Ultrasonography and Sonars.	07	L3	CO3
	b.	Explain the process of Photosynthesis and Photovoltaic cells.	07	L3	CO3
	c.	Write a short note on Bionic leaf, GPS, Bird flight and aircraft.	06	L2	CO3
		OR			
Q.8	a.	Explain the terms Lotus leaf effect, Plant Burrs and Super hydrophobic and self-cleaning surfaces.	07	L3	CO3
	b.	Explain the terms Spark skin and Swimsuits, Bullet train using biological concepts.	07	L3	CO3
	c.	Write a short note on Hemoglobin – Based Oxygen Carriers (HBOC's) and Perfluorocarbons (PFC).	06	L2	CO3
		Module – 5			
Q.9	a.	Explain the DNA Organic and Biocomputing.	07	L3	CO4
	b.	Explain the Bioimaging and Artificial intelligence for Disease Diagnosis.	07	L3	CO4
	c.	Write a short note on Self healing Bioconcrete.	06	L2	CO4
		OR			
Q.10	a.	Explain the			

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CBCS SCHEME

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18ES51

Fifth Semester B.E. Degree Examination, June/July 2023
Technology Innovation Management and Entrepreneurship

Time: 3 hrs.   Max. Marks: 100

Note: *Answer any FIVE full questions, choosing ONE full question from each module.*

Module-1

1 a. List and explain four basic functions of management.   (10 Marks)
   b. List and explain managerial skills with the help of skill-mix diagram.   (10 Marks)

OR

2 a. List and explain any five important characteristics of objectives in planning. (10 Marks)
   b. Explain programmed and non-programmed decisions.   (10 Marks)

Module-2

3 a. Explain the characteristics and typology of organizations.   (10 Marks)
   b. List and explain the sources of recruitment.   (10 Marks)

OR

4 a. List and explain the requirements of effective direction.   (10 Marks)
   b. Explain five managerial styles using managerial grid chart.   (10 Marks)

Module-3

5 a. Explain the social responsibilities of business towards employees and workers. (10 Marks)
   b. Explain the corporate governance in India.   (10 Marks)

OR

6 a. List and explain different types of entrepreneurs.   (10 Marks)
   b. Explain theory of achievement motivation and withdrawal of status respect models for
      entrepreneurial development.   (10 Marks)

Module-4

7 a. List and explain the stages of development of a family business.   (10 Marks)
   b. List and explain the characteristics of a family-owned business in India. (10 Marks)

OR

8 a. Explain brainstorming and survey method to generate business ideas.   (10 Marks)
   b. List and explain what changes leads to the creation of opportunities.   (10 Marks)

Module-5

9 a. Explain executive summary and management summary in business plans.   (10 Marks)
   b. Explain equity financing as a fund for project financing.   (10 Marks)

OR

10 a. List and explain preliminary activities involved in selection of a project. (10 Marks)
   b. Explain the need for network techniques.   (10 Marks)

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18EC52

Fifth Semester B.E. Degree Examination, June/July 2023
Digital Signal Processing

Time: 3 hrs.   Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1 a. Explain the frequency domain sampling of discrete time signals and obtain the DFT and IDFT expressions. **(10 Marks)**

   b. Given that sequence $x(n) = \{2, 3, -1, -2\}$. Obtain the sequences i) $x((-n))_4$, ii) $x((n-2))_4$ and iii) $x((2-n))_4$. Represent the data points on a circle and show the circular shift. **(06 Marks)**

   c. Given the sequence $x(n) = \{4, 3, 2, 1\}$, find $y(n)$ if $y(k) = x((k-3))_4$. **(04 Marks)**

OR

2 a. Illustrate how the DFT and IDFT can be viewed as a linear transformation on sequences $x(n)$ and $x(k)$ respectively. **(06 Marks)**

   b. Determine the 4-point circular convolution of the sequences.

   $$x_1(n) = \cos\left(\frac{2\pi n}{N}\right) \text{ and } x_2(n) = \sin\left(\frac{2\pi n}{N}\right); 0 \le n \le 3 \text{ using the time domain formula. Verify}$$

   the result using frequency domain approach using DFT and IDFT. **(08 Marks)**

   c. Compute the 4-point DFT of the sequence $x(n) = \{1, 2, 3, 4\}$. Using time shift property find the DFT $y(k)$, if $y(n) = x((n-3))_4$. **(06 Marks)**

Module-2

3 a. Write the computational methodology for overlap-save method of linear filtering. **(07 Marks)**

   b. Compute the 8-point DFT of the sequence $x(n) = \{1, -1, 0, 0, 1, -1, 0, 0\}$ using DIF-FFT algorithm. **(08 Marks)**

   c. Find the number of complex multiplications and complex additions required to compute 1024 point DFT using.
   i) Direct formula
   ii) FFT algorithm
   What is the speed improvement factor? **(05 Marks)**

OR

4 a. Develop radix-2 decimation in frequency FFT algorithm. **(07 Marks)**

   b. Using overlap-add method, compute the output of an filter with impulse response $h(n) = \{1, -2, 3\}$ and input $x(n) = \{1, 0, 2, 0, -1, -2, 3, -3, 1, 2\}$ use 8-point circular convolution. **(08 Marks)**

   c. Given $x(k) = \{0, j4, 0, -j4\}$, find $x(n)$ using radix-2 DIT-FFT algorithm. **(05 Marks)**

Module-3

5 a. For a symmetric FIR filter of length 'M', show that the system function $H(z) = z^{-(M-1)} H(z^{-1})$. **(06 Marks)**

   b. A low pass filter is to be designed with the desired frequency response.

   $$H_d(w) = \begin{cases} e^{-j3w}, & |w| < \frac{3\pi}{4} \\ 0, & \frac{3\pi}{4} \le |w| \le \pi \end{cases}$$

   Determine the filter coefficients $h(n)$ if Hamming window is used. **(08 Marks)**

1 of 2

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c. Realize the FIR filter for the following impulse responses:

i) $h(n) = \delta(n) + \frac{1}{4}\delta(n-1) - \frac{1}{8}\delta(n-2) - \frac{1}{8}\delta(n-3) + \frac{1}{4}\delta(n-4) + \delta(n-5)$.

ii) $h(n) = \left(\frac{1}{2}\right)^n [u(n) - u(n-4)]$.

(06 Marks)

OR

6 a. Obtain the magnitude and phase response function of the rectangular window function
$$w(n) = \begin{cases} 1, & n = 0,1, \quad M-1 \\ 0, & \text{otherwise} \end{cases}$$
(06 Marks)

b. Obtain the filter coefficients h(n) for a high pass filter with the following desired frequency response,
$$H_d(w) = \begin{cases} 0, & |w| < \frac{\pi}{4} \\ e^{-j2w}, & \frac{\pi}{4} \le |w| \le \pi \end{cases}$$ use rectangular window function.
(08 Marks)

c. Given the FIR filter with the difference equation $y(n) = x(n) + 2x(n-1) + 3x(n-2) + 2x(n-3)$. Obtain the lattice realization.
(06 Marks)

Module-4

7 a. Obtain the mapping relation between s-plane and z-plane for the bilinear transformation. List the general mapping properties.
(08 Marks)

b. Given an analog filter with transfer function $H(s) = \frac{5}{s+5}$ convert it into the digital filter transfer function and obtain the difference equation when a sampling period T = 0.05 sec.
(06 Marks)

c. Realize the following digital filter using direct form-II $H(z) = \frac{0.5z^2 + z + 0.5}{z^2 + 0.5z + 0.4}$.
(06 Marks)

OR

8 a. List the analog low pass prototype transformations to different filter types and illustrate with the corresponding frequency responses.
(08 Marks)

b. Design a digital low pass Butterworth filter with the following specifications. 3dB attenuation at the passband frequency 1.5kHz, 10dB stopband attenuation at the frequency 3kHz and sampling frequency of 8000Hz. Draw the direct form-II structure.
(12 Marks)

Module-5

9 a. With a neat diagram, explain the Harvard architecture used in DS-processor. Draw the execution cycle.
(07 Marks)

b. Illustrate the operation of circular buffers for four data samples and show the equivalent FIFO structure.
(07 Marks)

c. Convert the following decimal numbers to the floating point numbers using 4 bit exponent and 12 bit mantissa. i) 0.64×2^{-2} ii) -0.64×2^5.
(06 Marks)

OR

10 a. With a neat diagram, explain the basic architecture of TMS320C54× family DS processor.
(12 Marks)

b. Perform the following:
i) Find the signed Q-15 representation of 0.16.
ii) Convert the Q-15 signed numbers to decimal
I. 0.100111110110010
II. 1.110101110000010

(08 Marks)

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CBCS SCHEME

USN

18EC53

Fifth Semester B.E. Degree Examination, June/July 2023
Principles of Communication Systems

Time: 3 hrs.

Max. Marks: 100

Note: *Answer any FIVE full questions, choosing ONE full question from each module.*

Module-1

1 a. Explain the generation of AM wave using switching modulator. **(08 Marks)**
   b. With neat block diagram, explain the working of Costas loop. **(06 Marks)**
   c. Using the message signal $m(t) = \dfrac{t}{1+t^2}$, obtain the expression for AM wave when the percentage modulation are : i) 50% ii) 100% iii) 125%. **(06 Marks)**

OR

2 a. Explain the generation of DSBSC wave using ring modulator. **(08 Marks)**
   b. Explain the concept of VSB transmission for analog and digital transmission. **(06 Marks)**
   c. An audio frequency signal $m(t) = 5 \sin 2\pi (10^3)t$ in used to amplitude modulate a carrier of $c(t) = 100 \sin 2\pi (10^6)t$. If modulation index $\mu = 0.4$, find :
   i) Side band frequencies
   ii) Amplitude of each side band
   iii) B.W.
   iv) Efficiency of AM wave. Draw the frequency spectrum. **(06 Marks)**

Module-2

3 a. Explain the direct method of generating for waves. **(08 Marks)**
   b. Write neat block diagram explain the operation of FM stereo system. **(08 Marks)**
   c. A FM wave is given by
   $S(t) = 10\cos [2\pi \times 10^6 + 0.2 \sin (2000\pi t)]$
   Find out :
   i) Carrier frequency
   ii) Modulating frequency
   iii) Power in the modulated signal
   iv) B.W using Carson's rule. **(04 Marks)**

OR

4 a. With a neat diagram explain FM demodulation using balanced slope detector. **(07 Marks)**
   b. What is angle modulation? Obtain the time domain expression for PM wave. **(07 Marks)**
   c. A sinusoidal modulating wave form of amplitude 5V and a frequency of 1KHz is applied to an FM generator that has a frequency sensitivity constant of 40Hz/V. Find :
   i) Frequency deviation   ii) Modulation index. **(06 Marks)**

Module-3

5 a. Obtain the expression for Noise equivalent band width. **(07 Marks)**
   b. Prove that FOM of AM receiver using envelope detector is $\dfrac{\mu^2}{2+\mu^2}$ **(07 Marks)**
   c. Explain the use of pre-emphasis and de-emphasis in an FM system. **(06 Marks)**

1 of 2

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OR

6 a. Prove that FOM as a DSBSC receiver in ONE. (08 Marks)
   b. Define :
      i) Shot Noise
      ii) Thermal Noise
      iii) White Noise. (06 Marks)
   c. Write neat block diagram explain the FM threshold reduction. (06 Marks)

Module-4

7 a. What are the advantages of digital signal transmission over analog signal transmission? (04 Marks)
   b. State and prove the sampling theorem for low pass signals. (08 Marks)
   c. A signal m(t) = 10 cos(20πt) cos(200πt) is sampled at the rate of 250 samples/second.
      i) Sketch the spectrum of sampled signal
      ii) Specify the cut off frequency for the ideal reconstruction filter so as to recover m(t) from $m_f(t)$
      iii) Specify the Nyquist rate for the signal m(t). (08 Marks)

OR

8 a. Explain the generation of PAM signals with neat block diagram. (08 Marks)
   b. With neat block diagram, explain the generation of PPM signal. (08 Marks)
   c. Write short notes on TDM with neat block diagram. (04 Marks)

Module-5

9 a. Prove that $(SNR)_{0dB}$ = 1.8 + 6n for an uniform quantizer. (08 Marks)
   b. With neat block diagram, explain the construction and regeneration of PCM signal. (08 Marks)
   c. Write a short note on VOCODER. (04 Marks)

OR

10 a. Explain the construction of Delta modulation signal and explain its disadvantages. (08 Marks)
   b. Explain how digitization of video and MPEG is achieved with relevant diagram. (07 Marks)
   c. To transmit a bit sequence 10011011. Draw the resulting wave form using :
      i) Unipolar signaling.
      ii) Polar signaling.
      iii) Rectangular RZ type.
      iv) Bipolar RZ.
      v) Manchester. (05 Marks)

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CBCS SCHEME

USN | | | | | | | | | | **18EC54**

Fifth Semester B.E. Degree Examination, June/July 2023
Information Theory and Coding

Time: 3 hrs.   Max. Marks: 100

Note: *Answer any FIVE full questions, choosing ONE full question from each module.*

Module-1

1 a. A DMS emits symbols from the source alphabet $S = \{S_1, S_2, S_3, S_4, S_5, S_6, S_7\}$ with $P = \{0.25, 0.25, 0.125, 0.125, 0.125, 0.0625, 0.0625\}$. Compute :
i) $H(s)$ ii) $H(s)_{max}$ iii) Information
Rate R if $r_s = 5$ symbols/sec.   **(06 Marks)**

b. The state diagram of the Markov source is shown below Q1(b)
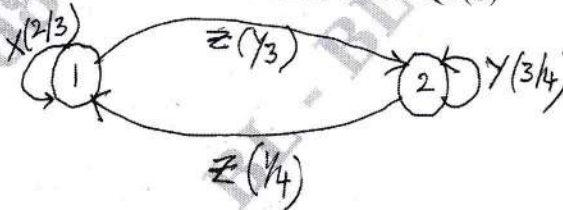
Fig Q1(b)

i)   Find the Entropy of the source
ii) Find the Message Entropy G_1, G_2
iii) Verify $G_1 \geq G_2 \geq H(s)$ **(10 Marks)**

c. A zero memory has a source alphabet $S = \{S_1, S_2, S_3\}$ with $P = \left\{\frac{1}{2}, \frac{1}{4}, \frac{1}{4}\right\}$. Construct the second order source and compute its entropy.   **(04 Marks)**

OR

2 a. Prove that the Entropy is maximum when the symbols are equiprobable.   **(06 Marks)**
b. Design a system to report heading of collection of 400 cars. The heading levels heading straight, turning left and turning right. The information is transmitted every second.
i)   On an average during a reporting interval 200 cars were heading straight, 100 were turning left and remaining were turning right.
ii) Out of 200 cars that reported heading straight, 100 were going straight during next reporting interval, 50 turning left and remaining were turning right in the next reporting interval.
iii) Out of 100 cars reported turning during signaling period, 50 continued turning and the remaining headed straight during the next reporting interval.
iv) The dynamics of the car did not allow them to turn left to right and vice versa
Find entropy of the state and source. Also, find Rate of informations.   **(10 Marks)**
c. Prove that entropy of the second order Binary source is $S^2 = 2H(s)$ bits/sy m   **(04 Marks)**

Module-2

3 a. Construct a Shannon Fano code for the following symbols :
$S = \{S_1, S_2, S_3, S_4, S_5, S_6\}$
$P = \{0.2, 0.4, 0.15, 0.15, 0.06, 0.04\}$
With code alphabet $X = \{0, 1\}$ and $X = \{0, 1, 2\}$. Find the efficiency of the code.   **(10 Marks)**

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b. A discrete memory less source has an alphabet of six symbols with probability statistics as given below :

Symbols	:	A	B	C	D	E	F
P	:	0.3	0.25	0.20	0.12	0.08	0.05

i) Construct the Huffman code by moving combined symbols as high as possible. Compute efficiency and variance

ii) Construct the Huffman trainary code by moving symbols combined as high as possible.

(10 Marks)

OR

4 a. Test whether the following code is a prefix code :

A	1			
B	0	1		
C	0	0	1	
D	0	0	0	1

(04 Marks)

b. Encode the symbols using Shannon encoding algorithm and compute the coding efficiency and variance for the following symbol set :

$X = \{x_1, x_2, x_3, x_4, x_5\}$

$P = \left\{ \dfrac{5}{16}, \dfrac{1}{4}, \dfrac{3}{16}, \dfrac{1}{8}, \dfrac{1}{8} \right\}$

(10 Marks)

c. A DMS has an alphabet

$S = \{s_1, s_2, s_3, s_4, s_5, s_6\}$

$P = \left\{ \dfrac{1}{12}, \dfrac{1}{8}, \dfrac{1}{12}, \dfrac{1}{8}, \dfrac{1}{3}, \dfrac{1}{4} \right\}$

Construct Huffman code for the code alphabet $X = \{0, 1, 2\}$. Compute coding efficiency.

(06 Marks)

Module-3

5 a. Compute Entropy function H(x), H(y) H(xy), H(x/y), H(y/x), Data transmission rate and channel capacity, given $\tau = 0.1$ sec/sym and

$$P(xy) = \begin{bmatrix} 0.15 & 0 & 0 & 0.15 \\ 0 & 0.2 & 0.15 & 0 \\ 0 & 0 & 0.1 & 0.05 \\ 0.1 & 0.1 & 0 & 0 \end{bmatrix}$$

(07 Marks)

b. Compute the channel capacity for the channel given below :

$$P(y/x) = \begin{bmatrix} 0.6 & 0.2 & 0.2 \\ 0.2 & 0.6 & 0.2 \\ 0.2 & 0.2 & 0.6 \end{bmatrix}. \text{ Given } r_s = 1000 \text{ sym/sec.}$$

(05 Marks)

c. Derive an expression for the channel capacity of a Binary Erasure channel.

(08 Marks)

OR
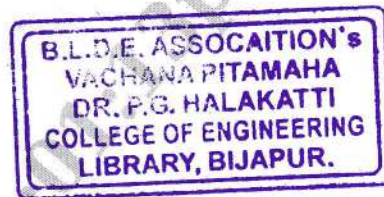
6 a. Prove that Mutual information is always positive.

(06 Marks)

b. Compute the channel capacity for the channel with $r_s = 1000$ sym/sec and

$$P(y/x) = \begin{bmatrix} 0.6 & 0.4 \\ 0.7 & 0.3 \end{bmatrix}$$

(06 Marks)

c. A Binary channel has the following characteristics :

$$P(y/x) = \begin{bmatrix} \frac{2}{3} & \frac{1}{3} \\ \frac{1}{3} & \frac{2}{3} \end{bmatrix} \quad P(x) = \begin{bmatrix} \frac{3}{4} & \frac{1}{4} \end{bmatrix}$$

Compute :
i)   Mutual information
ii) Channel capacity if $r_s = 100$ sym/sec. **(08 Marks)**

Module-4

7 a. For a (6, 3) Linear Block code, the check bits are related to the message bits as per the equations given below :
$C_4 = d_1 + d_2$; $C_5 = d_1 + d_2 + d_3$; $C_6 = d_2 + d_3$
   i)   Obtain the Generator Matrix G.
   ii) Find all possible code words.
   iii) Find H and H^T.
   iv) Computer syndrome if there is an error in the 3rd bit of a transmitted codeword [110 001] and show how it can be corrected. **(10 Marks)**

   b. For a (6, 3) cyclic code find the following :
   i) g(x)   ii) G in systematic form   iii) find all possible code words. **(06 Marks)**

   c. For a (7, 3) Hamming code with $g(x) = 1 + x + x^2 + x^4$, design a suitable encoder to generate systematic cyclic codes. **(04 Marks)**

OR

8 a. Prove that $C. H^T = 0$ there by show that $S = E. H^T$ **(06 Marks)**

   b. A (7, 4) cyclic code has the generator polynomial $g(x) = 1 + x + x^4$. Design a syndrome computation circuit and verify the circuit for the message polynomial $d(x) = 1 + x^3$. **(07 Marks)**

   c. For a (7, 4) Linear Block code the syndrome is given by
   $S_1 = r_1 + r_2 + r_3 + r_5$
   $S_2 = r_1 + r_2 + r_4 + r_6$
   $S_3 = r_1 + r_3 + r_4 + r_7$
   i) Find G and H matrix
   ii) Draw the Encoder and syndrome computation circuit. **(07 Marks)**

Module-5

9 a. Consider (3, 1, 2) convolutional encoder with g(1) = (110), g(2) = (101), g(3) = (111)
   i) Write the Encoder circuit.
   ii) Write the state transition table.
   iii) Write the state diagram.
   iv) Write the code tree. **(10 Marks)**

   b. For a (2, 1, 3) convolutional encoder with $g^1 = (1101)$, $g^2 = (1011)$
   i)   Find the constraint length.
   ii) Find the rate efficiency.
   iii) Find the codeword for the message sequence (11101) using matrix and frequency domain approach. **(10 Marks)**

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OR

10 a. Explain Viterbi Decoding algorithm with an example.   (08 Marks)
    b. For the State show below with $S_0 = 00$, $S_1 = 10$, $S_2 = 01$, $S_3 = 11$, draw the trellis diagram. For the input sequence $m = \{1\ 0\ 1\}$ trace the output.

Fig Q10(b)   (06 Marks)

    c. Define the following distance properties of convolution codes
        i)   Minimum free distance
        ii) Column distance function
        iii) Minimum distance   (06 Marks)

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CBCS SCHEME

USN 2BL20EC097   18EC55

Fifth Semester B.E. Degree Examination, June/July 2023
Electromagnetic Waves

Time: 3 hrs.   Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1 a. Derive the expression for Electric Field due to line charge of infinite length. **(08 Marks)**

   b. Find the force on 100 μc charge at (0, 0, 3)m , if four like charges of 20 μc are located on the x and y axis at ±4m. **(06 Marks)**

   c. Determine Electric Field at origin due to charge at 6.44×10^{-9}C located at (4, 2, −3)m in Cartesian coordinate system. **(06 Marks)**

OR

2 a. A charge lies in the Z = −3m plane in the form of a square sheet defined by $-2 \leq x \leq 2$, $-2 \leq y \leq 2$ m with $\rho_s = 2(x^2 + y^2 + 9)^{3/2}$ nc. Find Electric field at origin. **(07 Marks)**

   b. Three negative charges $Q_1 = -1$ μC , $Q_2 = -2$ μC , $Q_3 = -3$ μC are placed at the corners of an equilateral triangle. If length of each side is 1m, find magnitude and direction of EF at a point bisecting line between the charge Q_2 and Q_3. **(08 Marks)**

   c. Derive the expression for Electric field intensity due to several point charges. **(05 Marks)**

Module-2

3 a. A charge Q is uniformly distributed in a square ring of side *l*. Find E and V at centre of the ring. **(08 Marks)**

   b. Determine work done in carrying a charge of − 2C from (2, 1, −1) to (8, 2, −1) in Electric field $E = y\hat{a}_x + x\hat{a}_y$ considering the path along parabola $x = 2y^2$. **(05 Marks)**

   c. State and prove Gauss divergence theorem. **(07 Marks)**

OR

4 a. A point charge Q = 90 μC is located at origin and these are two uniformly surface charge density distribution − 8 μC/m² at r = 1m and 4.5 μC/m² at r = 2. Find $\overline{D}$ everywhere. **(08 Marks)**

   b. Given D = 5r $\hat{a}_r$ C/m². Determine whether divergence theorem holds good for shell region enclosed by spherical surface at r = a and r = b(b > a) centred at origin. **(07 Marks)**

   c. Find the potential and volume charge density at P(0.5, 1.5, 1)m in free space given $V = 2x^2 - y^2 - z^2$. **(05 Marks)**

Module-3

5 a. Let $V = A \ln\left[\dfrac{B(1-\cos\theta)}{1+\cos\theta}\right]$

   i) Show that V satisfies Laplace equation in spherical coordinates.

   ii) Find A and B, so that V = 100 V and E = 500 at r = 5cm, θ = 90, φ = 60°. **(08 Marks)**

   b. State and explain strokes theorem. **(04 Marks)**

   c. Determine whether or not the following potential satisfy Laplace equation :

   i) $V = r \cos \phi + z$ ii) $V = x^2 - y^2 + z^2$ **(08 Marks)**
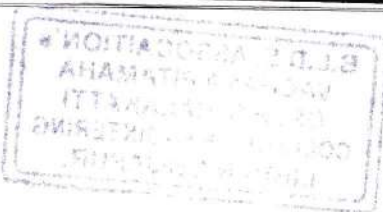
OR

6 a. Find the magnetic field intensity at P for the Fig.Q6(a).
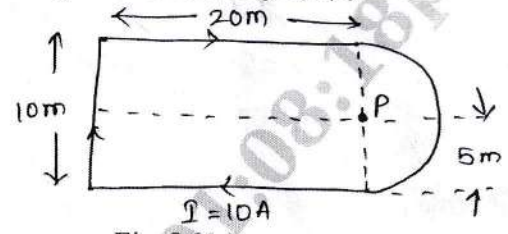
Fig.Q6(a)   **(08 Marks)**

b. There exist a potential of V = –2.5V on the conductor of 0.02m and V = 15V at r = 0.35m. Determine E and D by solving Laplace equation in spherical coordinates. **(07 Marks)**

c. If the magnetic field intensity in region H = $(3y – 2)\hat{a}_z + 2x\hat{a}_y$. Find current density.

(05 Marks)

Module-4

7 a. For region1, $\mu_1 = 4\mu$ H/m and for region2, $\mu_2 = 6\mu$ H/m. The regions are separated by Z = 0 plane. The surface current density at the boundary is K = $100\,\hat{a}_x$ A/m. Find B_2 if $B_1 = 2\hat{a}_x – 3\hat{a}_y + \hat{a}_z$ mT for Z = 0. **(08 Marks)**

b. A circular conducting loop of radius 40cm lies in xy plane and has a resistance of 20Ω. If magnetic flux density is B = 0.2 cos $(500t)\hat{a}_x$ + 0.75sin(400t)$\hat{a}_y$ +1.2cos(314t)$\hat{a}_z$. Find induced current in Loop. **(07 Marks)**

c. Explain Lorentz force equation. **(05 Marks)**

OR

8 a. A conductor of length 2.5m in Z = 0 and x = 4m carries a current of 12A in $–\hat{a}_y$ direction. Calculate uniform flux density in region, if force on the conductor is 12×10^{-2} N in direction by $\left[\dfrac{-\hat{a}_x + \hat{a}_z}{\sqrt{2}}\right]$ **(07 Marks)**

b. Explain Magnetization and Permeability. **(07 Marks)**

c. Explain force between differential current elements with equation. **(06 Marks)**

Module-5

9 a. Given H = $H_m\, e^{j(wt + \beta z)}\, \hat{a}_x$ A/m in free space. Find E. **(07 Marks)**

b. Derive the wave equation for vector E and H field in conducting medium. **(08 Marks)**

c. Prove that $\nabla \times \vec{E} = -\dfrac{\partial\vec{B}}{\partial t}$. **(05 Marks)**

OR

10 a. Discuss the propagation of uniform plane wave in good conductor and explain skin depth. **(08 Marks)**

b. Determine α, β, γ, v, λ, η for damp soil at frequency of 1 MHz given that $\varepsilon_r = 12$, $\mu_r = 1$, and $\sigma = 20$m $\mho$/m. **(05 Marks)**

c. Find the Amplitude of displacement current density in free space within large power distribution
$$H = 10^6 \cos(377t + 1.256\times10^{-6}z)\hat{a}_y$$ **(07 Marks)**

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CBCS SCHEME

18CIV59
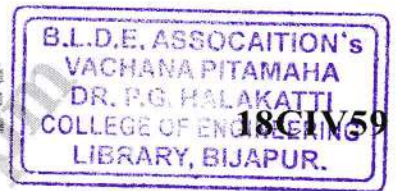
USN

Fifth Semester B.E Degree Examination, June/July 2023
Environmental Studies
(COMMON TO ALL BRANCHES)

Time: 2 hrs.]   [Max. Marks: 100

INSTRUCTIONS TO THE CANDIDATES

1. Answer all the hundred questions, each question carries one mark.

2. Use only **Black ball point pen** for writing / darkening the circles.

3. For each question, after selecting your answer, darken the appropriate circle corresponding to the same question number on the OMR sheet.

4. Darkening two circles for the same question makes the answer invalid.

5. **Damaging/overwriting, using whiteners** on the **OMR** sheets are strictly prohibited.

---

1. How many parts are there in the forest ecosystem?
   a) One   b) Two   c) Three   d) Four

2. On which factor forest type is mainly dependent
   a) Abiotic   b) Size of forest
   c) Shape of Trees   d) Production from the trees

3. The forest cover in India has recently increased due to
   a) Increase in natural forest growth
   b) Increase in net sown area
   c) Plantation by different agencies
   d) None of the above

4. What is not entirely correct about desert?
   a) It is dry and hot   b) Waterless
   c) Without shelter   d) All of these

5. Who have learnt to live under very hot and dry conditions
   a) People   b) Plants   c) Animals   d) All of these

6. The term wet land implies
   a) Land covers by rain water only
   b) Slow moving water covered wet ground
   c) Water logged wet ground
   d) Fast moving water covered wet ground

7. World Wetland day celebrated every year on _____ February
   a) 2nd   b) 3rd   c) 4th   d) 15th

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8. World's most saltiest sea is
   a) Mediterranean Sea   b) Dead Sea   c) Callibben Sea   d) Black Sea

9. Atmosphere contains 79 percent Nitrogen and 21 percent Oxygen by
   a) Volume   b) Weight   c) Density   d) All of these

10. In complex ecosystem the degree of species diversity is
    a) Poor   b) High   c) Medium   d) None

11. The organisms who directly feed on producers are called
    a) Herbivores   b) Carnivores   c) Decomposers   d) Sprophytes

12. Abiotic component includes
    a) Soil   b) Water   c) Temperature   d) All of these

13. Which of the following is the climatic factor
    a) Pressure   b) Humidity   c) Temperature   d) All of these

14. The basic requirements of human beings are provided by
    a) Industrialization   b) Agriculture   c) Nature   d) Urbonization

15. Which atmospheric sphere is closest to the earth surface?
    a) Troposphere   b) Stratosphere   c) Mesosphere   d) Exosphere

16. A food web consists of
    a) A portion of a food chain
    b) An organism position in a food chain
    c) Interlocking food chains
    d) A set of similar consumers

17. The pyramid of energy is
    a) Always upright
    b) Always inverted
    c) Both uplight and inverted
    d) None of these

18. Which is the most stable ecosystem
    a) Mountain   b) Desert   c) Forest   d) Ocean

19. 'Earth Day' is held every year on
    a) June 5th   b) November 23rd   c) April 22nd   d) Jan 10th

20. Which of the following is absorbed by green plants from the atmosphere?
    a) Carbon dioxide   b) Water   c) Nutrients   d) All of these

21. The most commonly used chemicals in the artificial cloud seeding
    a) Silver iodide   b) Sodium chloride   c) Dry ice   d) All of these

22. Bhopal disaster is a kind of _____
    a) Natural disaster   b) Manmade disaster   c) None of (a) & (b)   d) Other

23. National disaster management is headed by
    a) Prime minister
    b) President of India
    c) Governor of states
    d) Chief minister of states.

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24. Disaster management includes
   a) Mitigation   b) Reconstruction   c) Rehabilitation   d) All of these

25. Floods can be prevented by _____
   a) Attorestation   b) Cutting the forest
   c) Tilling the land   d) Removing the top soil

26. Which of the following is not a type of primary source
   a) Crude oil   b) Coal   c) Hydrogen energy   d) Sunlight

27. Which of these energy resources are widely used in industries?
   a) Coal and Gasoline   b) Wood   c) Biogas   d) Crop residue

28. What does OTEC stands for?
   a) Ocean thermal energy cultivation
   b) Ocean thermal energy conversion
   c) Ocean techno energy conversation
   d) Ocean thermal energy consumption

29. What is the basic requirement for hydro electric power station?
   a) Reservoir   b) Turbine   c) Power house   d) Penstock

30. Photovoltaic cell converts solar energy into
   a) Heat energy   b) Electrical energy   c) Mechanical energy   d) Chemical energy

31. Which of the following is non-renewable resource?
   a) Coal   b) Forests   c) Water   d) Wildlife

32. Both power and manure is provided by :
   a) Nuclear plants   b) Thermal plants   c) Biogas plants   d) Hydroelectric plant

33. At what range of speed is the electricity from the wind turbine is generated
   a) 100 – 125 Mph   b) 450 – 600 Mph   c) 200 – 250 Mph   d) 30 – 35 Mph

34. What is used to turn wind energy into electrical energy
   a) Turbine   b) Generator   c) Yaw motor   d) Blades

35. What type of energy is wind energy?
   a) Renewable   b) Non-Renewable   c) Conventional   d) Commercial

36. How is OTEC caused?
   a) By wind energy   b) By geothermal energy
   c) By solar energy   d) By gravitational force

37. Series of parallel combination of the solar cell is known as _____
   a) Solar array   b) Solar light   c) Solar sight   d) Solar eye

38. Materials used for making solar cell is _____
   a) Silicon   b) Carbon   c) Sodium   d) Magnesium

39. Quarries are generally
   a) Open pits   b) Surface coal mines
   c) Underground mines   d) Explosive mines

3 of 8

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40. When the minerals are located to deep in the ground, the method used for mining is
    a) Open pit method   b) Quarries   c) Surface mining   d) Sub surface mining

41. Major pollution causing agent is
    a) Man
    c) Hydrocarbon gases
    b) Animals
    d) None of these

42. The result of ozone hole is
    a) Acid rain   b) UV radiations   c) Global warming   d) Green house effect

43. Which of the following causes out break of jaundice
    a) Air pollution   b) Water pollution   c) Thermal pollution   d) Soil pollution

44. Minamata disease caused by pollution of water by
    a) Mercury
    c) Tin
    b) Lead
    d) Methyl ISD Cyanate

45. Noise is measured using sound meter and the unit is
    a) Hertz   b) Decibel   c) Joule   d) Sound

46. Air pollution causes
    a) Global warming
    c) Soil erosion
    b) Respiratory problems
    d) None of these

47. Intake of lead may primarily cause damage of the ____
    a) Brain   b) Liver   c) Lung   d) Kidney

48. According to WHO maximum permissible level of chlorides in drinking water is ____
    a) 100 mg/L   b) 600mg/L   c) 800mg/L   d) 200mg/L

49. The main source of water pollution is ____
    a) Sewage water
    c) Acid rain
    b) Industrial pollutants
    d) None of these

50. What is the health effects of excess fluoride in drinking water
    a) Fluoros's   b) Toothaches   c) Lung disease   d) Brain problem

51. Bacteria and micro organisms present in water will cause ____ in human and animals
    a) Indigestion   b) Intestinal tract c) Brain tumor   d) Cancer

52. Why it is difficult to recycle plastics?
    a) It is very hard
    b) It comes in different sizes
    c) It is adhesive
    d) It contains different types of polymer resins

53. The disposable wastes contain
    a) Solids   b) Slurries   c) Liquids   d) All of these

54. Identify the following ones which can be recycled many times
    a) Plastic   b) Wood   c) Aluminum   d) Organic materials

55. Noise pollution limits at residential area
    a) 80 dB   b) 45 dB   c) 90dB   d) 120dB

4 of 8

83

56. Which of the following make e-waste hazardous in nature
    a) Glass
    b) Plastic
    c) Lead
    d) Iron

57. What is the hazardous pollutant released form LED's?
    a) Barium
    b) Arsenic
    c) Cobalt
    d) Cadmium

58. What is the hazardous pollutant released form batteries?
    a) Arsenic
    b) Cadmium
    c) Copper
    d) Cobalt

59. What proportion of health care waste is hazardous waste
    a) 25%
    b) 15%
    c) 50%
    d) 80%

60. What is the hazardous waste released from telephones
    a) Barium
    b) Copper
    c) Lithium
    d) Lead

61. Which of the following contains most water
    a) Atmosphere
    b) Biosphere
    c) Ground water
    d) Lakes and Rivers

62. Hard water contains large amount of _____
    a) Lead
    b) Sodium
    c) Calcium
    d) Silicon

63. Water that is good enough to drink is called _____
    a) Potable water
    b) Ground water
    c) Surface water
    d) Artesian water

64. The pH value of acid rain water is
    a) 5.7
    b) 7.0
    c) 8.5
    d) 7.5

65. The primary cause of acid rain around the world is _____
    a) CFC
    b) SO_2
    c) CO
    d) O_3

66. Acid rain can be controlled by
    a) Reducing SO_2 and NO_2 emissions
    b) Reducing oxygen emissions
    c) Increasing number of lakes
    d) Increasing the forest cover

67. The effect of acid rain
    a) Reduces soil fertility
    b) Increases atmospheric temperature
    c) Causing respiratory problem
    d) Skin cancer

68. Major compound responsible for the destruction of stratospheric ozone layer is
    a) Oxygen
    b) CFC
    c) CO_2
    d) Methane

69. Ozone layer thickness is measured in
    a) PPM
    b) PPB
    c) Decibles
    d) Dobson units

70. Normal average thickness of stratospheric ozone layer across the globe is around
    a) 5 PPM
    b) 300 DU
    c) 400 DU
    d) 500 DU

71. Chloro Fluro Carbon's (CFC) are
    a) Non-toxic
    b) Non – Flammable
    c) Non Carcinogenic
    d) All of these

84

72. Breathing radon over time causes
    a) Lung cancer   b) Oral cancer   c) Skin cancer   d) All of these

73. Radon gas is
    a) Inert   b) Colorless   c) Odorless   d) All of these

74. Ozone depletion causes
    a) Snow blindness   b) Photochemical smog
    c) Acid rain   d) Vomiting

75. World ozone day is observed on
    a) November 16   b) October 16   c) Jan 16   d) September 16

76. A great way to reduce acid rain is
    a) Use of solar power
    b) Use of wind power
    c) User of hydropower
    d) All of these

77. Ozone layer was first discovered over
    a) Arctic
    c) Tropical Region
    b) Antarctical
    d) Africa

78. Animal husbandry results in
    a) Global warming
    c) Ozone depletion
    b) Acid rain
    d) None of these

79. Formation of ozone layer is explained by
    a) Rosenmund reaction
    b) Henderson's reaction
    c) Chapman's reaction
    d) Perkin's reaction

80. The main cause of acid rain is
    a) Soil pollution   b) Water pollution   c) Air pollution   d) All of these

81. Remote sensing technique makes use of properties of _____
    a) Electric waves   b) Sound waves
    c) Electromagnetic waves   d) Wind waves

82. The attitude distance of a geostationary satellite from earth is about
    a) 26,000 km   b) 30,000 km   c) 36000 km   d) 44000 km

83. The changes in the reflectivity/emissivity with time is called
    a) Spectral variation
    c) Temporal variation
    b) Spatial variation
    d) None of these

84. Which one of the following helps to find objects on the earth surface
    a) Atmospheric window
    c) Radiometric error
    b) Signature
    d) None of these

85. Orbital radius of GPS satellites is approximately
    a) 15000km   b) 26600km   c) 18400km   d) 36100km

86. GIS stands for
a) Geographic Information System
b) Generic Information System
c) Geological Information System
d) Geographic Information Sharing

87. GIS deals with what kind and data
a) Numeric data   b) Binary data   c) Spatial data   d) Complex data

88. Among the following _____ is example of hardware
a) Arc GIS   b) Auto CAD   c) Digitization   d) Mouse

89. Among the following which do not come under components of GIS?
a) Hardware   b) Software   c) Compiler   d) Data

90. The relation between velocity, wave length and frequency is
a) $\lambda = cf$ b) $\lambda = c/f$ c) $\lambda = c^2 f$ d) $\lambda = cf^2$

91. A short – term EIA (Environmental Impact Assessment) has a time period of
a) 2 – 5 years   b) 10 – 15 years   c) 5 – 10 years   d) 5 – 7 years

92. EIA commenced in the year
a) 1960's   b) 1890's   c) 1880's   d) 1950's

93. How many strategies are there in EIA
a) 5   b) 3   c) 2   d) 4

94. Which is the first Country to pass the Amendment in the Parliament to safeguard the environment?
a) India   b) Brazil   c) China   d) Denmark

95. ISO 14000 standards are for the
a) Quality Management System
b) Environmental Management System
c) Administration
d) Supply Chain

96. Who among the following is the most celebrated environmental activist in contemporary India?
a) Anna Hazare
b) Medha Patkar
c) Vasundhara Raje
d) Arvind Kejrival

97. What is the full form of NGO?
a) Non – Governmental Organization
b) No Governance Organization
c) Non-Governance Organization
d) Null Governmental Organization
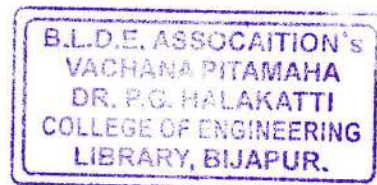
98. When did Green peace founded
   a) 1965   b) 1967   c) 1968   d) 1971

99. When did Wild Protection Act included in the Constitution of India.
   a) 1980   b) 1972   c) 1920   d) 1992

100. When did World Nature Organization (WNO) be established?
   a) 2000   b) 2001   c) 2010   d) 2014

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CBCS SCHEME

18EC61

USN

Sixth Semester B.E. Degree Examination, June/July 2023
Digital Communication

Time: 3 hrs.   Max. Marks: 100

Note: *Answer any FIVE full questions, choosing ONE full question from each module.*

Module-1

1 a. Determine the Hibert transform of rectangular pulse :

$$rect(t) = \begin{cases} 1 & -\dfrac{1}{2} \le t \le \dfrac{1}{2} \\ 0, & \text{otherwise} \end{cases}$$

(04 Marks)

   b. Express band pass signal S(t) in canonical form. Also derive the schemes for obtaining in phase and quadrature components of the band pass signal S(t) and vice-versa. **(08 Marks)**

   c. Explain with necessary equations, the time–domain procedure for computational analysis of a band pass system driven by a band pass signal. **(08 Marks)**

OR

2 a. Consider a real base band signal m(t) = 4 cos(2t) – 6 sin (3t) and a carrier signal c(t) = cos(100t). Determine a band pass signal s(t), analytic signal $s_t(t)$ and complex envelope $\tilde{s}(t)$. **(08 Marks)**

   b. Draw the power spectra of :
      i) NRZ polar signal
      ii) Manchester signal. **(04 Marks)**

   c. Illustrate HDB3, B8ZS and B3ZS signaling schemes and mention its applications. **(08 Marks)**

Module-2

3 a. Obtain the maximum likelihood decision rule for the signal detection problem. **(10 Marks)**

   b. Derive the expressions for mean and variance of the correlator outputs. Also show that the correlator outputs are statistically independent. **(10 Marks)**

OR

4 a. Using the Gram-Schmidt orthogonalization procedure, find a set of orthonormal basis functions to represent the three signals $S_1(t)$, $S_2(t)$ and $S_3(t)$ shown in Fig.Q4(a). Also express each of these signals interms of the set of basis functions.
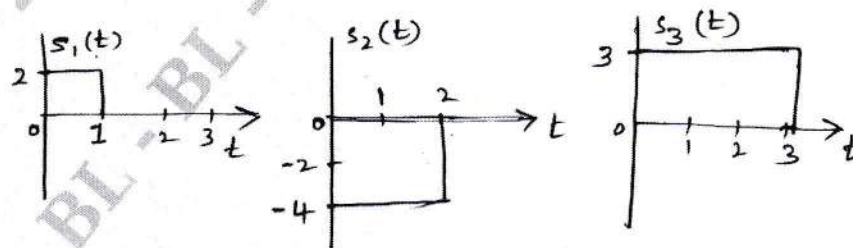

Fig. Q4 **(10 Marks)**

   b. With a neat diagram, explain the correlation receiver. **(10 Marks)**

Module-3

5 a. With necessary expressions and block diagrams, explain the generation and coherent detection of QPSK signals. Also mention the shortcomings of QPSK and solution for the same. **(10 Marks)**

 b. Define bandwidth efficiency. Tabulate and comment on the bandwidth efficiency of M-ary PSK signals for different values of M. **(04 Marks)**

 c. What is the advantage of M-ary QAM over M-ary PSK system? Obtain the constellation of QAM for M = 4 and draw signal space diagram. **(06 Marks)**

OR

6 a. Derive an expression for probability of error of BFSK technique. Also draw the black diagrams of BFSK transmitter and coherent BFSK receiver. **(10 Marks)**

 b. With a neat block diagram, explain the generation and optimum detection of DPSK signals. **(10 Marks)**

Module-4

7 a. With a neat block diagram, explain the digital PAM transmission through band limited base band channels. Also obtain an expression for inter symbol interference. **(10 Marks)**

 b. Explain the need for precoder in a duobinary signaling. Consider a binary sequence 111010010001101 is given as an input to the pre coder whose output is used to modulate a duobinary transmitting filter. Obtain the pre coded sequence, transmitted amplitude levels, the received signal levels and the decoded sequence. **(08 Marks)**

 c. State the Nyquist condition for zero ISI. **(02 Marks)**

OR

8 a. What is a zero forcing equalizer? With a neat block diagram, explain the operation of linear transversal filter. **(08 Marks)**

 b. Explain the design of band limited signals with controlled ISI. **(08 Marks)**

 c. Write a note on eye diagram. **(04 Marks)**

Module-5

9 a. With a neat diagram, explain the model of a spread spectrum digital communication system. **(08 Marks)**

 b. Explain the generation and demodulation of direct sequence spread spectrum signals with necessary equations and block diagram. **(08 Marks)**

 c. A direct sequence spread – spectrum signal is designed so that the power ratio PR/PN at the intended receiver is 10^{-2}. If the desired $E_b/N_0 = 10$ for acceptable performance, determine the maximum value of the processing gain. **(04 Marks)**

OR

10 a. With a neat bock diagram, explain the frequency hopped spread spectrum. **(06 Marks)**

 b. With a neat diagram, explain the IS – 95 reverse link. **(10 Marks)**

 c. Write a note on law detectability signal transmission as an application of DSSS. **(04 Marks)**

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CBCS SCHEME

18EC62

USN [ ][ ][ ][ ][ ][ ][ ][ ][ ][ ]

Sixth Semester B.E. Degree Examination, June/July 2023
Embedded Systems

Time: 3 hrs.   Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1. a. List the different registers of ARM CORTEX-M3 and mention their use. Explain the use of link register with an illustration. **(08 Marks)**
   b. Explain Program Status Register (PSR) configuration. Illustrate how to access different subdivisions of PSR. **(06 Marks)**
   c. Explain exceptions and interrupts of ARM CORTEX-M3. **(06 Marks)**

OR

2. a. Explain the operation modes of CORTEX-M3 with a block diagram. **(08 Marks)**
   b. Explain CORTEX-M3 stack implementation for push and pop operations. **(06 Marks)**
   c. Explain reset sequence of CORTEX-M3 why LSB of reset vector address is set to 1. **(06 Marks)**

Module-2

3. a. Explain following instruction of ARM CORTEX-M3 with suitable illustration:
      (i) BIC   (ii) SBFX   (iii) REVSH   (iv) LDRH **(08 Marks)**
   b. Write an assembly language program to find sum of all even numbers in a given array of 10 numbers. **(06 Marks)**
   c. Explain conditional execution using IT instructions with an example. **(06 Marks)**

OR

4. a. Explain all shift and rotate instructions of CORTEX-M3 with illustration. How rotate left operation can be implemented? **(10 Marks)**
   b. Write an assembly language program to determine the parity of a 32 bit number. If even parity store 00h in a memory location otherwise store FFh in the location. **(06 Marks)**
   c. Assume R0 = 0X12345678, R1 =0XFEDCBA12. Write the result after executing following instructions:
      (i)   BFC.W   R0, #8, #16
      (ii)   UBFX.W   R0, R1, #4, #8
      (iii)   BFI.W   R1, R0, #8, #16
      (iv)   REVSH   R1, R0 **(04 Marks)**

Module-3

5. a. Explain Big Endian and little Endian operation and give examples. **(06 Marks)**
   b. With a diagram, explain SRAM cell implementation and its working. Give comparison between SRAM and DRAM cells. **(08 Marks)**
   c. Explain the sequence of operation for communicating with an I2C slave device. **(06 Marks)**

OR

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6 a. Give comparison between RISC and CISC. **(06 Marks)**

b. With a circuit diagram, explain how input and output circuits of a processor can be isolated. **(06 Marks)**

c. Explain SPI Bus interfacing and sequence of operation for communicating with a SPI device. **(08 Marks)**

Module-4

7 a. Explain characteristics of an embedded system with examples for each. **(06 Marks)**

b. Explain state machine model (FSM) by considering automatic seat belt warning system. **(08 Marks)**

c. Discuss advantages and drawbacks of super loop based firmware design approach. **(06 Marks)**

OR

8 a. Explain any six nonoperational quality attributes. Explain product life cycle curve. **(10 Marks)**

b. Design an automatic tea/coffee vending machine based on FSM model for the following requirement:

The tea/coffee vending is initiated by user inserting a 5 rupees coin. After inserting coin, the user can either select 'Coffee' or 'Tea' or press 'Cancel' the order and take back the coin. **(06 Marks)**

c. Explain the assembly language to machine language conversion process with block diagram. **(04 Marks)**

Module-5

9 a. Explain monolithic and micro kernels with suitable example for each. **(06 Marks)**

b. Explain task, process and threads. **(08 Marks)**

c. Three processes with process IDs P1, P2, P3 with estimated completion time 10, 5, 7 ms respectively enter the ready queue together in order P1, P2, P3. Calculate waiting time and turn around time for each process and average waiting time and TAT. (Assume there is no I/O waiting for the processes) **(06 Marks)**

OR

10 a. Explain different conditions that favour deadlock. Explain techniques to detect and prevent deadlock. **(08 Marks)**

b. With a block diagram, explain the concept of counting semaphore. Give real world example. **(08 Marks)**

c. Explain the advantages of simulation based debugging. **(04 Marks)**

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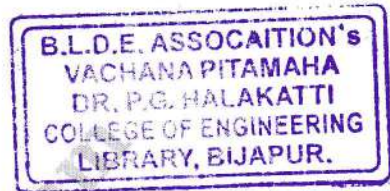
CBCS SCHEME

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18EC646

Sixth Semester B.E. Degree Examination, June/July 2023
Python Application Programming

Time: 3 hrs.

Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1. a. Explain the concept of type conversion functions and math functions in python with examples. **(10 Marks)**
   b. Write a program which prompts the user for a Celsius temperature, convert the temperature to Fahrenheit, and print out the converted temperature. **(05 Marks)**
   c. List any five features of python programming language. **(05 Marks)**

OR

2. a. List and give syntax of all python supported conditional statements. Write a python program to check whether given number is positive or negative or zero. **(10 Marks)**
   b. Explain the rules of precedence used by python to evaluate an expression. **(05 Marks)**
   c. Write a program to prompt for a score between 0.0 and 1.0. If the score is out of range, print an error message. If the score is between 0.0 and 1.0, print a grade using the following table:

Score	>= 0.9	>= 0.8	>= 0.7	>= 0.6	< 0.6
Grade	A	B	C	D	F

(05 Marks)

Module-2

3. a. Write a python code which repeatedly reads numbers until the user enters "done". Once "done" is entered, print out the total, count, and average of the numbers. If the user enters anything other than a number, detect their mistakes using try and except and print an error message and skip to the next number. **(10 Marks)**
   b. List and explain with example any five built in string manipulation functions supported by python. **(10 Marks)**

OR

4. a. Define a string. How it can be traversal through using looping statement? **(06 Marks)**
   b. Explain file open, file close, file read and file write concepts in python with examples. **(08 Marks)**
   c. Write a program to read through a file and print the contents of the file (line by line) all in upper case. **(06 Marks)**

Module-3

5. a. What is dictionary? Write a python program that accepts a sentence and build dictionary with LETTER, DIGIT, UPPER CASE, LOWER CASE as key value and their count in the sentences as values.
   Example: Sentence = 'VTU@123.e-Learning'
   d = {"LETTER" :12, "DIGITS" : 3, "UPPER CASE" : 4, "LOWER CASE" :8} **(10 Marks)**

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b. Compare and contrast tuples with lists. Explain the following operations in tuples:
   (i) Sum of two tuples
   (ii) Slicing operators
   (iii) Comparison of two tuples
   (iv) Assignments to variables

(10 Marks)

OR

6 a. Describe any two list operations and list methods. Write a python program to accept 'n' numbers from user, find sum of all even numbers and product of all odd numbers in entered list. **(10 Marks)**

b. Illustrate the use of regular expressions for:
   (i) Extracting data
   (ii) Character matching
   (iii) Combining searching and extracting

(10 Marks)

Module-4

7 a. What is class? How to define a class in python? **(05 Marks)**

b. Write a definition for a class named circle with attributes center and radius, where center is a point object and radius is a number. Instantiate a circle object that represents a circle with its center at (150, 100) and radius 75. Write a function named point_in_circle that takes a circle and a point and returns True if the point lies in or on the boundary of the circle. **(10 Marks)**

c. Distinguish between pure functions and modifiers with example. **(05 Marks)**

OR

8 a. Illustrate how _init_ method is invoked when an object is initiated. **(05 Marks)**

b. What does the keyword self in python mean? Explain with example. **(05 Marks)**

c. What is operator overloading and type-based dispatch? Write a python code to add or increment the time based on the type of second parameter. If the second parameter is time then perform addition. If it is integer then perform increment operation. **(10 Marks)**

Module-5

9 a. What is socket? Explain how socket connection can be established to the internet using python code over the TCP/IP connection and the http protocol to get the web content. **(08 Marks)**

b. Write a note on XML. Write a python program to retrieve a node present in XML. **(08 Marks)**

c. What is service-oriented architecture? List the advantages of the same. **(04 Marks)**

OR

10 a. Brief on structured query language, with suitable python program explain functions involved in creation of database table in python. **(08 Marks)**

b. Demonstrate with the python program:
   (i) How to retrieve an image over HTTP?
   (ii) How to retrieve web pages with Urllib?

(08 Marks)

c. Compare and contrast the Java Script object notation and extensible markup language (JSON and XML). **(04 Marks)**

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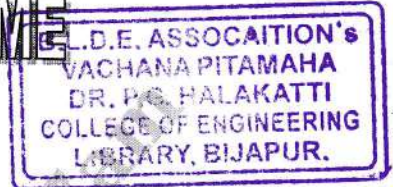
USN | | | | | | | | | | **18EC655**

Sixth Semester B.E. Degree Examination, June/July 2023
Basic VLSI Design

Time: 3 hrs.

Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1 a. Explain I.V characteristics of nMOS transistor. Derive the equation for I_{DS} in linear region.
(10 Marks)
   b. Explain with neat sketches the fabrication of P-well CMOS inverter. (10 Marks)

OR

2 a. Derive the CMOS inverter DC characteristics and show all operating regions. (10 Marks)
   b. With neat sketches discuss the nMOS fabrication process steps. (10 Marks)

Module-2

3 a. Explain, with neat sketches the latch up in CMOS process. (08 Marks)
   b. Show that $\dfrac{Z_{pu}}{Z_{pd}}$ for nMOS inverter driven by another nMOS inverter is 4:1. (12 Marks)

OR

4 a. Derive an equation for rise time and fall time with respect to CMOS inverter. (10 Marks)
   b. With a neat diagram, obtain an expression for sheet resistance and apply sheet resistance concept to MOS transistor. (10 Marks)

Module-3

5 a. What are the MOS layers and explain briefly. (04 Marks)
   b. Discuss the CMOS design style with a diagram. (06 Marks)
   c. With a neat diagram, explain λ based design rules. (10 Marks)

OR

6 a. Define Scaling. Explain the scaling factors for device parameters. (10 Marks)
   b. Draw stick diagram and layout for the following using CMOS logic:
   i)   Two input NAND gate
   ii)   Two input NOR gate
   iii) $\overline{X} = A + BC$
(10 Marks)

Module-4

7 a. Briefly explain architectural issues to be considered in the design of VLSI sub system.
(06 Marks)
   b. Explain switch logic implementation of CMOS 5 way selector with neat circuit diagram.
(06 Marks)
   c. Explain Dynamic CMOS logic. (08 Marks)

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OR

8 a. Explain the design method for the implementation of a parity generator.
  b. With layout diagram, explain the implementation of four way multiplexer.

(10 Marks)
(10 Marks)

Module-5

9 a. Explain Two-phase clocking with help of circuits and waveforms.
  b. Explain the construction of Four-bit shift registers using nMOS and CMOS.

(10 Marks)
(10 Marks)

OR

10 a. Briefly explain the optimization approach for CMOS inverter.
   b. Explain the following aspects of design tools:
      i)   Graphical entry layout
      ii)   Design verification
      iii) Design Rule Checkers (DRC).

(10 Marks)

(10 Marks)

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