

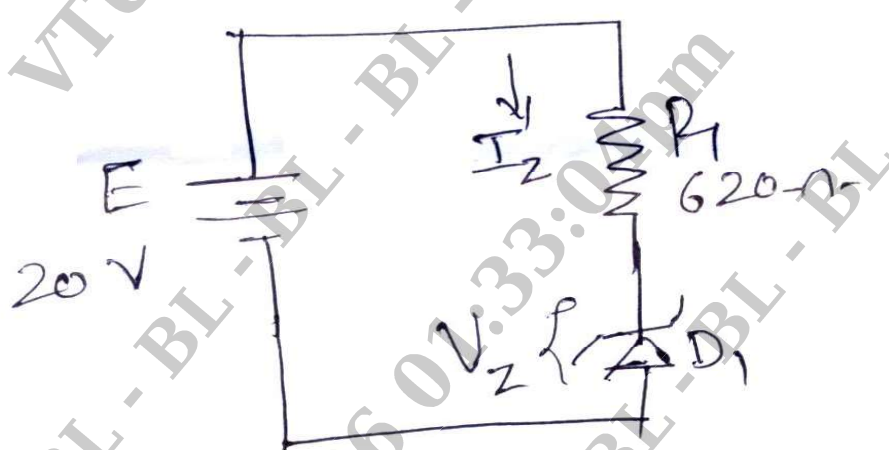
First/Second Semester B.E./B.Tech. Degree Examination, June / July 2026

Basic Electronics for EEE Stream

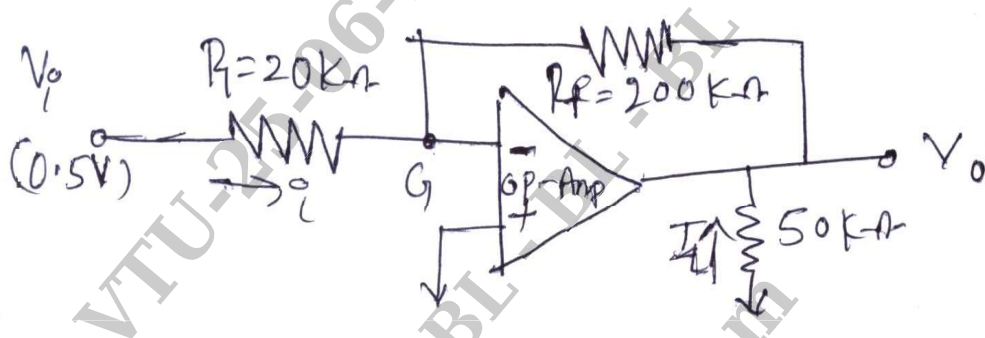
Time: 3 hrs.

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.	With a neat sketch of VI characteristics of PN junction diode, explain forward and reverse characteristics of it.	07	L2	CO1
	b.	Determine the peak output voltage and current for the bridge rectifier having $V_i = 30V$ $R_L = 300 \Omega$ and the diode having voltage of $V_F = 0.7 V$.	06	L2	CO1
	c.	Explain Zener diode voltage Regulator with and without load.	07	L2	CO1
OR					
Q.2	a.	Discuss the different types of junction breakdown that can occur in a reverse biased diode and briefly explain its operation.	06	L2	CO1
	b.	The Zener diode circuit shown in figure Q2(b) , has $E = 20 V$ $R_1 = 620 \Omega$ and zener diode $V_Z = 7.5 V$ calculate the diode current and power dissipation.	06	L3	CO1
 Fig.Q 2 (b)					
	c.	Describe the working of full wave rectifier, with a neat circuit diagram and necessary waveforms.	08	L2	CO1
Module – 2					
Q.3	a.	Explain the output characteristics of a transistor in common Emitter configuration.	06	L2	CO2
	b.	With a neat diagram, explain the construction working and characteristics of N – channel JFET.	08	L2	CO2
	c.	Calculate I_C & I_E for a transistor that has $\alpha_{dc} = 0.98$ and $I_B = 100 \mu A$. Also determine the value of β_{dc} for the transistor.	06	L3	CO2
OR					
Q.4	a.	Explain the enhancement type MOSFET along with the drain characteristics.	08	L2	CO3
	b.	Discuss the common Emitter input and output characteristics.	06	L2	CO3
	c.	Draw the DC Load line for transistor and identify Q points.	06	L2	CO3

Module – 3

Q.5	a.	Define the terms with respect to Op – Amp i) Slew rate ii) CMRR iii)SVRR iv) Common mode gain A_{cm} v) Virtual ground vi) Offset voltage vii) Bandwidth	07	L2	CO2
	b.	An inverting Amplifier shown in fig.Q.5 (b) below has a load resistor of $50\text{ K}\Omega$ connected to its outputs. If the input voltage is 0.5 V , find the load current, output voltage and input currents.  Fig.Q 5 (b)	06	L3	CO2
	c.	Explain the operation of an Op-Amp as inverting Amplifier with neat diagram and waveforms.	07	L2	CO2
OR					
Q.6	a.	Explain how Op-Amp can be used as : i) Integrator ii) Voltage follower.	08	L2	CO2
	b.	What is an Op-Amp? List the characteristics of an ideal Op – Amp.	06	L2	CO2
	c.	With a neat block diagram explain the Operational Amplifier.	06	L2	CO2
Module – 4					
Q.7	a.	State and prove DC - Morgan's theorem using suitable Truth table.	04	L2	CO4
	b.	i) Perform the following using 1's complement a) $1111 - 1011$ b) $110011 - 100101$ ii) Perform the following using 2's complement a) $10111 - 10011$ b) $1101 - 1001$	08	L3	CO4
	c.	Design full circuit, write expression for sum and carry with suitable truth table.	08	L2	CO4

OR

Q.8	a.	Perform the following operations. i) $(ABCD)_{16} = (\quad)_2 = (\quad)_8$ ii) $(IC00)_{16} = (\quad)_8$ iii) $(532.65)_{10} = (\quad)_{16} = (\quad)_2$ iv) $(B4D)_{16} = (\quad)_2$ v) $(7AF4)_{16} = (\quad)_2$ vi) $(11010.01101)_2 = (\quad)_{16}$	08	L3	CO4
	b.	Simplify the following using Boolean Algebra. i) $Y = \overline{A}\overline{B}\overline{C} + \overline{A}B\overline{C} + A\overline{B}\overline{C}$ ii) $Y = \overline{A}\overline{B}\overline{C} + \overline{A}B\overline{C} + A\overline{B}\overline{C} + A\overline{B}C$ iii) $Y = (A + B)(A + \overline{B})(\overline{A} + B)$ iv) $Y = A \oplus B \oplus C$	08	L3	CO4
	c.	Write the symbol and truth table of the following gates : i) AND ii) NOR iii) XOR iv) NAND	04	L2	CO4
Module – 5					
Q.9	a.	What is modulation? Explain the need for modulation.	06	L2	CO5
	b.	Explain the working of Linear Variable Differential Transducer (LVDT).	08	L2	CO5
	c.	Write a note on Piezoelectric Transducer.	06	L2	CO5
OR					
Q.10	a.	Explain the various blocks involved in an electrical communication system.	06	L2	CO5
	b.	Explain the working of the Potentiometric Resistive Transducer.	08	L2	CO5
	c.	Differentiate between AM and FM.	06	L2	CO5

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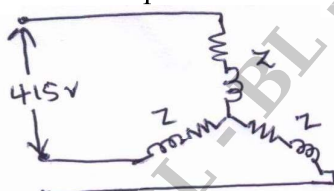
First/Second Semester B.E./B.Tech. Degree Examination, June/July 2026 Elements of Electrical Engineering

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.	State and explain Kirchhoff's Laws.	8	L2	CO1
	b.	A resistance R is connected in series with a parallel circuit consisting of two resistors of $20\ \Omega$ and $48\ \Omega$. Total power dissipated in the circuit is 1000 W and the applied voltage is 250 V. Calculate R.	6	L3	CO3
	c.	Derive an expression for co-efficient of coupling between the two coils.	6	L3	CO1
OR					
Q.2	a.	State Ohm's law and mention its limitations.	8	L2	CO1
	b.	A solenoid consists of 2000 turns of wire wound on a length of 70 cm. A search coil of 500 turns having a mean area of 30 cm^2 is placed centrally inside the solenoid. Assuming $K = 1$, calculate (i) the mutual inductance, (ii) the emf induced in the search coil if the solenoid uniformly changes at a rate of 260 A/s.	6	L3	CO3
	c.	State and explain Faraday's laws of Electromagnetic induction.	6	L2	CO1
Module – 2					
Q.3	a.	Define the following and write the expressions: (i) Average value (ii) RMS value (iii) Form factor (iv) Peak factor	8	L1	CO2
	b.	Show that the power consumed in a pure inductive circuit is zero with the help of voltage current and power waveforms.	6	L3	CO2
	c.	A circuit consists of a resistance of $20\ \Omega$, an inductance of 0.05 H connected in series. A supply of 230 V at 50 Hz is applied across the circuit. Find the current, power factor and power consumed by the circuit. Draw the vector diagram.	6	L3	CO2
OR					
Q.4	a.	Derive an equation for the power consumed by an R-L series circuit. Draw the waveforms of voltage, current and power.	8	L3	CO2

	b.	In a parallel RLC circuit, when a line voltage of 250 V at 50 Hz is applied, the currents in the resistance, inductance and capacitance are 1.5 A, 2.5 A and 1.7 A respectively. Calculate the line current power factor of the circuit and power supplied.	6	L3	CO2
	c.	Define Power Factor. Draw the vector diagram showing the power factor angle for different loading conditions.	6	L2	CO2
Module – 3					
Q.5	a.	What are the advantages of three phase systems over single phase systems?	6	L2	CO2
	b.	In a three phase delta connection, find the relation between line and phase values of currents and voltages. Also derive the equation for three phase power.	8	L3	CO2
	c.	When three balanced impedances are connected in star, across a 3 phase, 415 V, 50 Hz supply, the line current drawn is 20 A, at a lagging p.f of 0.4. Determine the parameters of the impedance in each phase. 	6	L3	CO2
Fig. Q5 (c)					
OR					
Q.6	a.	Explain the effect of power factor on two wattmeter readings connected to measure 3 phase power.	8	L2	CO2
	b.	What is phase sequence? Write its significance.	6	L2	CO2
	c.	Two wattmeters connected to measure the power in a 3 phase circuit read 5 kW and 1 kW, the latter being read after reversing the potential coil ends. Calculate the power, power factor, total volt-amperes and reactive volt-amperes.	6	L3	CO2
Module – 4					
Q.7	a.	With a neat circuit diagram and truth table explain two way control of lamp.	6	L2	CO5
	b.	Explain the various factors that are required to be considered in selecting the type of wiring for domestic wiring.	6	L2	CO5
	c.	With a neat diagram, explain Whetstone's bridge.	8	L2	CO4
OR					
Q.8	a.	With a neat diagram, explain working principle of schering bridge for the measurement of capacitance.	6	L2	CO4
	b.	List the advantages and disadvantages of wooden casing and capping.	6	L2	CO5
	c.	With a neat diagram, explain working of a Megger.	8	L2	CO4

Module – 5					
Q.9	a.	What is an Electric Shock? What are the precautions to be taken to prevent shocks from occurring?	6	L2	CO5
	b.	With a neat schematic diagram, explain the operation of RCCB.	8	L2	CO5
	c.	What is Tarrif? Explain two-part tariff.	6	L2	CO5
OR					
Q.10	a.	What is Earthing? With a neat diagram, explain plate earthing.	7	L2	CO5
	b.	Write short note on : (i) Miniature circuit breaker (ii) Fuse	8	L2	CO5
	c.	Calculate the total electricity bill of a load of 3 kW, if the tariff of electric supply company is as follows: (i) 0 – 50 units = 4.1 Rs./unit (ii) 50 – 100 units = Rs.5.55 per unit (iii) 100 – 200 units = Rs.7.1 per unit Total number of units consumed = 120 units, Fixed cost up to 1 kW = Rs.85 > 1 kW = Rs.95	5	L3	CO5

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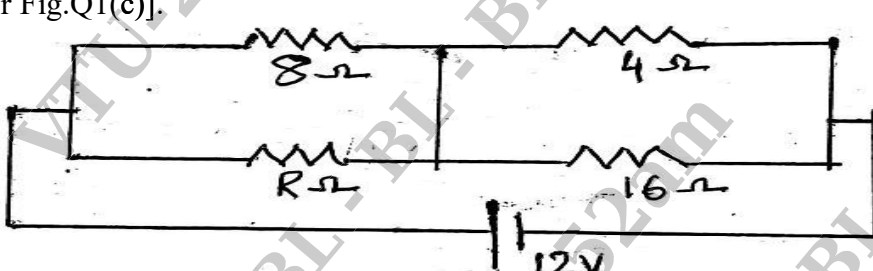
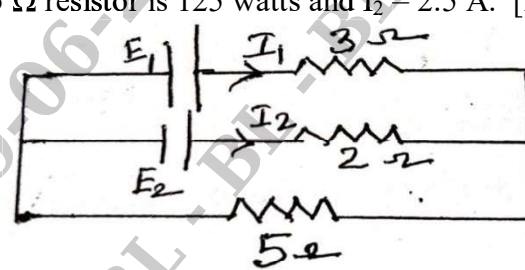
First/Second Semester B.E./B.Tech. Degree Examination, June/July 2026

Basics of Electrical Engineering

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.*
 3. *VTU Formula Hand Book is permitted.*

Module – 1			M	L	C
Q.1	a.	Define Absolute permittivity and relative permittivity. Mention the limitations of Ohm's law	06	L1	CO1
	b.	State and explain Kirchoff's laws as applied to DC circuit. Are these laws applicable to AC circuits?	06	L1	CO1
	c.	In the network shown find the value of R and the current flowing through it. [Refer Fig.Q1(c)].	08	L2	CO1
 Fig.Q1(c)					
OR					
Q.2	a.	State Coulomb's law and mention the factors affecting the capacitance of a parallel plate capacitor.	06	L2	CO1
	b.	Derive an expression for the energy stored in an electrostatic field.	06	L1	CO1
	c.	In the network shown find the values of E_1 and E_2 such that the power dissipated in the 5Ω resistor is 125 watts and $I_2 = 2.5\text{ A}$. [Refer Fig.Q2(c)]	08	L2	CO1
 Fig.Q2(c)					
Module – 2					
Q.3	a.	State Fleming's right hand rule and Fleming's left hand rule. Mention their applications.	06	L2	CO2
	b.	Define self-inductance and mutual inductance. Mention their units. Also deduce the relationship between selfinductance, mutual inductance and coefficient of coupling.	06	L1	CO2

Q.3	c.	A wire of length 50 cms moves at right angles to its length at 50 m/s in a uniform field of density 1 wb/m ² determine the emf induced in the conductor when the direction of motion is (i) perpendicular to the field (ii) inclined at 30° to the direction of the field. (iii) parallel to the field.	08	L3	CO2
OR					
Q.4	a.	Define Statically induced emf and Dynamically induced emf. Also state Lenz's law.	06	L1	CO2
	b.	Derive an expression for the energy stored in a magnetic field.	08	L1	CO2
	c.	An air cored coil has 1000 turns with an inductance of 0.12H. two hundred turns are removed from the coil and a steel core is placed around the coil. Determine the new value of the inductance. Assume μ_r of steel as 75.	06	L1	CO3
Module – 3					
Q.5	a.	Define RMS value, Average value, Form factor and Peak factor of a sinusoidal wave.	04	L2	CO3
	b.	Show that the power in a series R- L circuit is $V I \cos \phi$ and draw the waveforms of voltage, current and power.	08	L3	CO3
	c.	An emf whose instantaneous value is $100 \sin(314t - \pi/4)$ is applied to a circuit and the current flowing through it is $20 \sin(314t - 1.5708)$, find the values of the circuit elements.	08	L3	CO3
OR					
Q.6	a.	Derive an expression for the power in a pure capacitor energized from AC voltage. Draw the waveforms of voltage, current and power.	08	L2	CO3
	b.	A current of 10 A flows in a circuit with a 30° lag when the applied voltage is 100V. Find (i) Resistance, reactance and Impedance (ii) Conductance, Susceptance and Admittance.	06	L2	CO3
	c.	A circuit consists of 20Ω resistance in series with an inductance of 0.05H. A supply of 230V, 50 Hz is given to the circuit. Calculate (i) current (ii) phase angle (iii) power factor (iv) real power (v) reactive power	06	L3	CO3
Module – 4					
Q.7	a.	What are the advantages of 3Ø system over 1Ø system?	06	L2	CO3
	b.	Deduce the relationship between phase and line values of voltages currents in 3Ø star connected system.	08	L3	CO3
	c.	Each of the two watt meters connected to measure the input power to a 3Ø circuit reads 20KW. What does each instrument read when the load power factor is 0.866 lag with the total power remaining unchanged.	06	L3	CO3

OR

Q.8	a.	Briefly explain the generation of 3 phase voltages.	05	L2	CO4
	b.	With the help of a neat circuit and vector diagrams show that only two watt meters are sufficient to measure the 3ϕ input power in a balanced star connected system.	08	L2	CO4
	c.	A 500V, 3 phase motor has an output of 37.3kw and operates at a power factor of 0.85 with an efficiency of 90%. Calculate the reading on each of the 2 watt meters connected to measure the input power.	07	L2	CO4

Module – 5

Q.9	a.	What is an electric shock? What are the precautions to be taken to prevent electric shock?	06	L2	CO5
	b.	Write short notes on Fuse and MCB.	06	L3	CO5
	c.	A consumer has a maximum demand of 300KW at 35% load factor. If the tariff is Rs 125/KW of maximum demand plus 15 paise/KWh, calculate the overall cost/KWh.	08	L2	CO5

OR

Q.10	a.	With a neat wiring diagram and truth table explain 2 way and 3 way control of lamps.	06	L2	CO5
	b.	What is Earthing? With a neat diagram explain pipe – earthing.	08	L2	CO5
	c.	In a residential building, the following loads are connected. (i) Six lamps of 40 W each, switched on for 5 hours. (ii) Two fans of 60 W each, switched on for 12 hours. (iii) One 1000 W heater switched on for 2 hours. and (iv) One refrigerator of 250W working for 10 hours a day. If the cost of energy is Rs 6.50/unit what is the total cost of energy in the month of April.	06	L2	CO5

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First/Second Semester B.E./B.Tech. Degree Examination, June/July 2026
**Physics of Electrical Engineering Materials (EEE stream-
only for EEE students)**

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.
3. VTU Formula Hand Book is permitted.*

Module – 1			M	L	C
Q.1	a.	Describe the different polarization mechanisms.	08	L2	CO1
	b.	Derive Clausius - Mossotti relation.	08	L2	CO1
	c.	The atomic weight and density of Sulphur are 32 and $2.08 \times 10^3 \text{ kg m}^{-3}$. The electronic polarizability of the atom is $3.28 \times 10^{-40} \text{ Fm}^{-2}$. If Sulphur solid has a cubic structure, calculate its dielectric constant.	04	L3	CO1
OR					
Q.2	a.	Explain Ferromagnetic Hysteresis using Domain theory,	08	L2	CO1
	b.	Explain the classification of magnetic materials.	08	L2	CO1
	c.	Given the Curie temperatures for Cobalt 1600 K and Iron 1200K, find the ratio of their magnetic susceptibilities at a temperature of 1800K.	04	L3	CO1
Module – 2					
Q.3	a.	Derive the expression for thermo emf in terms of T_1 and T_2 .	06	L2	CO2
	b.	Explain the construction and working thermoelectric coolers (TEC)	06	L2	CO2
	c.	Explain the application of thermoelectric materials in the exhaust of automobile.	04	L2	CO2
	d.	The thermo emf and the temperature of hot junction T satisfies the relation $e = aT + bT^2$ where $a = 4.1 \times 10^{-5} \text{ V/}^\circ\text{C}$ and $b = -4.1 \times 10^{-8} \text{ V/}^\circ\text{C}^2$. If the cold junction temperature is 0°C , find the neutral temperature.	04	L3	CO2
OR					
Q.4	a.	State the laws of thermoelectricity with necessary diagrams.	06	L2	CO2
	b.	Explain the construction and working of thermoelectric generators (TEG),	06	L2	CO2
	c.	Explain the application of thermoelectric materials in refrigerator.	04	L2	CO2
	d.	The junctions of a Ni – Cu thermocouple are at 0°C and 100°C . Calculate the Seeback emf if $a = 16.3 \times 10^{-6} \text{ V/}^\circ\text{C}$ and $b = -0.042 \times 10^{-6} \text{ V/}^\circ\text{C}^2$.	04	L3	CO2
1 of 2					

Module – 3

Q.5	a.	Derive an expression for electron concentration in intrinsic semiconductors.	08	L2	CO3
	b.	What is Fermi energy? Explain the variation of Fermi factor with temperature and energy.	08	L2	CO3
	c.	Calculate the probability of an electron occupying an energy level 0.02eV above Fermi level at 300K.	04	L3	CO3

OR

Q.6	a.	Explain Matheissen's rule. Derive the expression for Fermi level in intrinsic semiconductor.	08	L2	CO3
	b.	What is Hall effect? Derive the expression for the Hall voltage.	08	L2	CO3
	c.	The Fermi level for silver is 5.5eV. What is the energy for which probability of occupancy at 300K is 0.01.	04	L3	CO3

Module – 4

Q.7	a.	Derive the expression for critical current for a cylindrical wire using Ampere's law.	08	L2	CO4
	b.	What is Meissner effect? Explain the Type-I and Type-II superconductors.	08	L2	CO4
	c.	Superconducting tin has a critical temperature of 3.7 K at zero magnetic field and a critical field of 0.0306 T at 0K. Find the critical field at 2K.	04	L3	CO4

OR

Q.8	a.	Explain BCS Theory and mention its limitations.	08	L2	CO4
	b.	Explain with neat diagram i) DC Squid ii) MAGLEV vehicle	08	L2	CO4
	c.	Calculate the critical current which can flow through a long thin superconducting wire of aluminum of diameter 1 mm, the critical magnetic field for aluminum is 7.9×10^3 A/m.	04	L3	CO4

Module – 5

Q.9	a.	Explain the principle and applications of Magnetorheological (MR) materials.	07	L2	CO5
	b.	Elaborate on three types of electrical ceramics with neat diagrams and mention any two of their applications.	08	L2	CO5
	c.	Discuss the general characteristics and importance of rare earth elements in modern technology.	05	L2	CO5

OR

Q.10	a.	Write a note on electrostriction and piezoelectric effect and mention their applications.	07	L2	CO5
	b.	Discuss about Electrorheological (ER) materials, its principle and applications in detail.	08	L2	CO5
	c.	Explain the application of Electrorheological materials in ER Clutches.	05	L2	CO5

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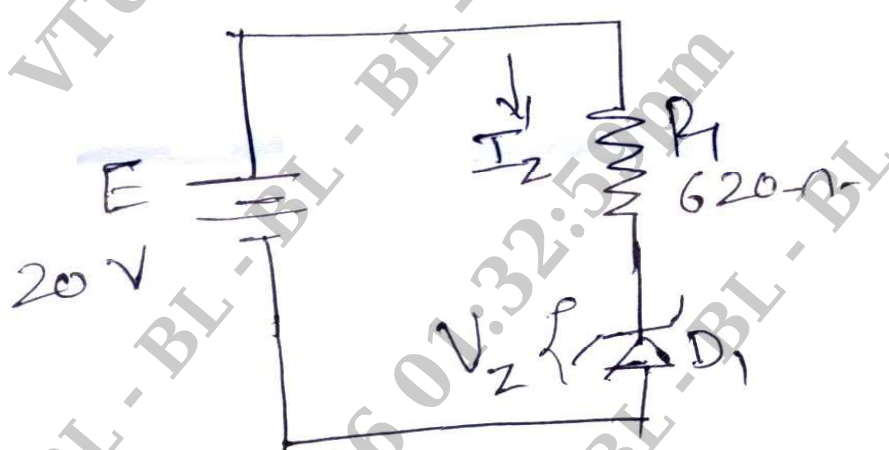
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Basic Electronics for EEE Stream

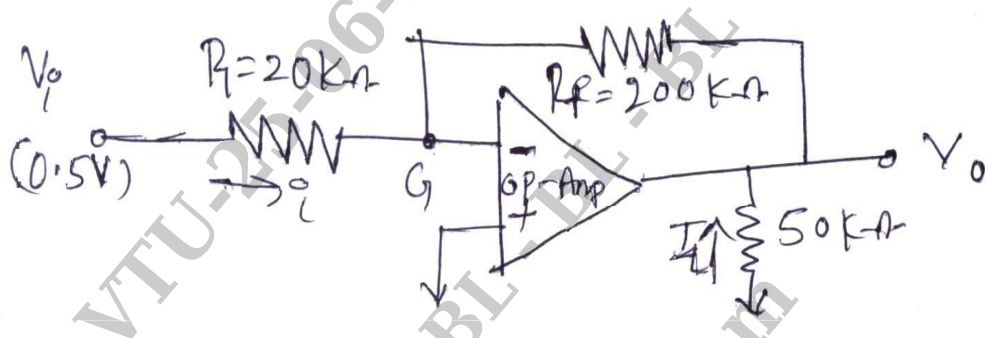
Time: 3 hrs.

Max. Marks: 100

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2. M : Marks , L: Bloom's level , C: Course outcomes.*

Module – 1			M	L	C
Q.1	a.	With a neat sketch of VI characteristics of PN junction diode, explain forward and reverse characteristics of it.	07	L2	CO1
	b.	Determine the peak output voltage and current for the bridge rectifier having $V_i = 30V$ $R_L = 300 \Omega$ and the diode having voltage of $V_F = 0.7 V$.	06	L2	CO1
	c.	Explain Zener diode voltage Regulator with and without load.	07	L2	CO1
OR					
Q.2	a.	Discuss the different types of junction breakdown that can occur in a reverse biased diode and briefly explain its operation.	06	L2	CO1
	b.	The Zener diode circuit shown in figure Q2(b) , has $E = 20 V$ $R_1 = 620 \Omega$ and zener diode $V_Z = 7.5 V$ calculate the diode current and power dissipation.	06	L3	CO1
 Fig.Q 2 (b)					
	c.	Describe the working of full wave rectifier, with a neat circuit diagram and necessary waveforms.	08	L2	CO1
Module – 2					
Q.3	a.	Explain the output characteristics of a transistor in common Emitter configuration.	06	L2	CO2
	b.	With a neat diagram, explain the construction working and characteristics of N – channel JFET.	08	L2	CO2
	c.	Calculate I_C & I_E for a transistor that has $\alpha_{dc} = 0.98$ and $I_B = 100 \mu A$. Also determine the value of β_{dc} for the transistor.	06	L3	CO2
OR					
Q.4	a.	Explain the enhancement type MOSFET along with the drain characteristics.	08	L2	CO3
	b.	Discuss the common Emitter input and output characteristics.	06	L2	CO3
	c.	Draw the DC Load line for transistor and identify Q points.	06	L2	CO3

Module – 3

Q.5	a.	Define the terms with respect to Op – Amp i) Slew rate ii) CMRR iii)SVRR iv) Common mode gain A_{cm} v) Virtual ground vi) Offset voltage vii) Bandwidth	07	L2	CO2
	b.	An inverting Amplifier shown in fig.Q.5 (b) below has a load resistor of $50\text{ K}\Omega$ connected to its outputs. If the input voltage is 0.5 V , find the load current, output voltage and input currents.  Fig.Q 5 (b)	06	L3	CO2
	c.	Explain the operation of an Op-Amp as inverting Amplifier with neat diagram and waveforms.	07	L2	CO2

OR

Q.6	a.	Explain how Op-Amp can be used as : i) Integrator ii) Voltage follower.	08	L2	CO2
	b.	What is an Op-Amp? List the characteristics of an ideal Op – Amp.	06	L2	CO2
	c.	With a neat block diagram explain the Operational Amplifier.	06	L2	CO2

Module – 4

Q.7	a.	State and prove DC - Morgan's theorem using suitable Truth table.	04	L2	CO4
	b.	i) Perform the following using 1's complement a) $1111 - 1011$ b) $110011 - 100101$ ii) Perform the following using 2's complement a) $10111 - 10011$ b) $1101 - 1001$	08	L3	CO4
	c.	Design full circuit, write expression for sum and carry with suitable truth table.	08	L2	CO4

OR

Q.8	a.	Perform the following operations. i) $(ABCD)_{16} = (\quad)_2 = (\quad)_8$ ii) $(IC00)_{16} = (\quad)_8$ iii) $(532.65)_{10} = (\quad)_{16} = (\quad)_2$ iv) $(B4D)_{16} = (\quad)_2$ v) $(7AF4)_{16} = (\quad)_2$ vi) $(11010.01101)_2 = (\quad)_{16}$	08	L3	CO4
	b.	Simplify the following using Boolean Algebra. i) $Y = \overline{A}\overline{B}\overline{C} + \overline{A}B\overline{C} + A\overline{B}\overline{C}$ ii) $Y = \overline{A}\overline{B}\overline{C} + \overline{A}B\overline{C} + A\overline{B}\overline{C} + A\overline{B}C$ iii) $Y = (A + B)(A + \overline{B})(\overline{A} + B)$ iv) $Y = A \oplus B \oplus C$	08	L3	CO4
	c.	Write the symbol and truth table of the following gates : i) AND ii) NOR iii) XOR iv) NAND	04	L2	CO4
Module – 5					
Q.9	a.	What is modulation? Explain the need for modulation.	06	L2	CO5
	b.	Explain the working of Linear Variable Differential Transducer (LVDT).	08	L2	CO5
	c.	Write a note on Piezoelectric Transducer.	06	L2	CO5
OR					
Q.10	a.	Explain the various blocks involved in an electrical communication system.	06	L2	CO5
	b.	Explain the working of the Potentiometric Resistive Transducer.	08	L2	CO5
	c.	Differentiate between AM and FM.	06	L2	CO5

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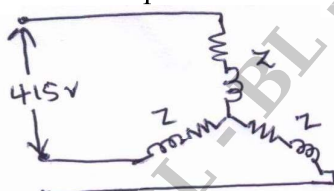
First/Second Semester B.E./B.Tech. Degree Examination, June/July 2026 Elements of Electrical Engineering

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.	State and explain Kirchhoff's Laws.	8	L2	CO1
	b.	A resistance R is connected in series with a parallel circuit consisting of two resistors of $20\ \Omega$ and $48\ \Omega$. Total power dissipated in the circuit is 1000 W and the applied voltage is 250 V. Calculate R.	6	L3	CO3
	c.	Derive an expression for co-efficient of coupling between the two coils.	6	L3	CO1
OR					
Q.2	a.	State Ohm's law and mention its limitations.	8	L2	CO1
	b.	A solenoid consists of 2000 turns of wire wound on a length of 70 cm. A search coil of 500 turns having a mean area of 30 cm^2 is placed centrally inside the solenoid. Assuming $K = 1$, calculate (i) the mutual inductance, (ii) the emf induced in the search coil if the solenoid uniformly changes at a rate of 260 A/s.	6	L3	CO3
	c.	State and explain Faraday's laws of Electromagnetic induction.	6	L2	CO1
Module – 2					
Q.3	a.	Define the following and write the expressions: (i) Average value (ii) RMS value (iii) Form factor (iv) Peak factor	8	L1	CO2
	b.	Show that the power consumed in a pure inductive circuit is zero with the help of voltage current and power waveforms.	6	L3	CO2
	c.	A circuit consists of a resistance of $20\ \Omega$, an inductance of 0.05 H connected in series. A supply of 230 V at 50 Hz is applied across the circuit. Find the current, power factor and power consumed by the circuit. Draw the vector diagram.	6	L3	CO2
OR					
Q.4	a.	Derive an equation for the power consumed by an R-L series circuit. Draw the waveforms of voltage, current and power.	8	L3	CO2

	b.	In a parallel RLC circuit, when a line voltage of 250 V at 50 Hz is applied, the currents in the resistance, inductance and capacitance are 1.5 A, 2.5 A and 1.7 A respectively. Calculate the line current power factor of the circuit and power supplied.	6	L3	CO2
	c.	Define Power Factor. Draw the vector diagram showing the power factor angle for different loading conditions.	6	L2	CO2
Module – 3					
Q.5	a.	What are the advantages of three phase systems over single phase systems?	6	L2	CO2
	b.	In a three phase delta connection, find the relation between line and phase values of currents and voltages. Also derive the equation for three phase power.	8	L3	CO2
	c.	When three balanced impedances are connected in star, across a 3 phase, 415 V, 50 Hz supply, the line current drawn is 20 A, at a lagging p.f of 0.4. Determine the parameters of the impedance in each phase. 	6	L3	CO2
Fig. Q5 (c)					
OR					
Q.6	a.	Explain the effect of power factor on two wattmeter readings connected to measure 3 phase power.	8	L2	CO2
	b.	What is phase sequence? Write its significance.	6	L2	CO2
	c.	Two wattmeters connected to measure the power in a 3 phase circuit read 5 kW and 1 kW, the latter being read after reversing the potential coil ends. Calculate the power, power factor, total volt-amperes and reactive volt-amperes.	6	L3	CO2
Module – 4					
Q.7	a.	With a neat circuit diagram and truth table explain two way control of lamp.	6	L2	CO5
	b.	Explain the various factors that are required to be considered in selecting the type of wiring for domestic wiring.	6	L2	CO5
	c.	With a neat diagram, explain Whetstone's bridge.	8	L2	CO4
OR					
Q.8	a.	With a neat diagram, explain working principle of schering bridge for the measurement of capacitance.	6	L2	CO4
	b.	List the advantages and disadvantages of wooden casing and capping.	6	L2	CO5
	c.	With a neat diagram, explain working of a Megger.	8	L2	CO4

Module – 5					
Q.9	a.	What is an Electric Shock? What are the precautions to be taken to prevent shocks from occurring?	6	L2	CO5
	b.	With a neat schematic diagram, explain the operation of RCCB.	8	L2	CO5
	c.	What is Tarrif? Explain two-part tariff.	6	L2	CO5
OR					
Q.10	a.	What is Earthing? With a neat diagram, explain plate earthing.	7	L2	CO5
	b.	Write short note on : (i) Miniature circuit breaker (ii) Fuse	8	L2	CO5
	c.	Calculate the total electricity bill of a load of 3 kW, if the tariff of electric supply company is as follows: (i) 0 – 50 units = 4.1 Rs./unit (ii) 50 – 100 units = Rs.5.55 per unit (iii) 100 – 200 units = Rs.7.1 per unit Total number of units consumed = 120 units, Fixed cost up to 1 kW = Rs.85 > 1 kW = Rs.95	5	L3	CO5

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CBCS SCHEME

USN

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BMATE301/BEE301

Third Semester B.E/B.Tech. Degree Examination, June/July 2026 Engineering Mathematics for EEE

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.
3. Use of VTU mathematics handbook, statistical table handbook is permitted.

Module – 1			M	L	C																						
1	a.	Solve : $(4D^4 - 8D^3 - 7D^2 + 11D + 6)y = 0$.	6	L3	CO1																						
	b.	Solve : $\frac{d^2y}{dx^2} - 4y = \cosh(2x - 1) + 3^x$.	7	L3	CO1																						
	c.	Solve : $x^2y'' - 3xy' + 4y = (1 + x)^2$.	7	L3	CO1																						
OR																											
2	a.	Solve : $(D^2 + 3D + 2)y = 4 \cos^2 x$.	6	L3	CO1																						
	b.	Solve : $(1 + x)^2y'' + (1 + x)y' + y = \sin 2 [\log (1 + x)]$.	7	L3	CO1																						
	c.	A voltage $E e^{-at}$ is applied at $t = 0$ to circuit of inductance L and resistance R . show that current at any time 't' is $\frac{E}{R - aL} \left[e^{-at} - e^{-\frac{Rt}{L}} \right]$ given that the current is initially zero when $t = 0$.	7	L3	CO1																						
Module – 2																											
3	a.	Fit a straight line $y = ax + b$ for the following data : <table border="1"><tr><td>x</td><td>1</td><td>3</td><td>4</td><td>6</td><td>8</td><td>9</td><td>11</td><td>14</td></tr><tr><td>y</td><td>1</td><td>2</td><td>4</td><td>4</td><td>5</td><td>7</td><td>8</td><td>9</td></tr></table>	x	1	3	4	6	8	9	11	14	y	1	2	4	4	5	7	8	9	6	L2	CO2				
x	1	3	4	6	8	9	11	14																			
y	1	2	4	4	5	7	8	9																			
	b.	Fit a second degree parabola to the following data : <table border="1"><tr><td>x</td><td>1</td><td>1.5</td><td>2</td><td>2.5</td><td>3</td><td>3.5</td><td>4</td></tr><tr><td>y</td><td>1.1</td><td>1.3</td><td>1.6</td><td>2</td><td>2.7</td><td>3.4</td><td>4.1</td></tr></table>	x	1	1.5	2	2.5	3	3.5	4	y	1.1	1.3	1.6	2	2.7	3.4	4.1	7	L2	CO2						
x	1	1.5	2	2.5	3	3.5	4																				
y	1.1	1.3	1.6	2	2.7	3.4	4.1																				
	c.	Ten students got the following percentage of marks in two subjects x and y compute their rank correlation coefficient. <table border="1"><tr><td>Marks in x</td><td>78</td><td>36</td><td>98</td><td>25</td><td>75</td><td>82</td><td>90</td><td>62</td><td>65</td><td>39</td></tr><tr><td>Marks in y</td><td>84</td><td>51</td><td>91</td><td>60</td><td>68</td><td>62</td><td>86</td><td>58</td><td>53</td><td>47</td></tr></table>	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	47	7	L3	CO2
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	47																	
1 of 3																											

OR

4	a.	In a partially destroyed lab record, only the lines of regression of y on x and x on y are available as $4x - 5y + 33 = 0$ and $20x - 9y = 107$ respectively calculate the coefficient of correlation between x and y.	6	L3	CO2																						
	b.	Obtain the lines of regression and hence find the coefficient of correlation for the data : <table><tr><td>x</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td></tr><tr><td>y</td><td>9</td><td>8</td><td>10</td><td>12</td><td>11</td><td>13</td><td>14</td></tr></table>	x	1	2	3	4	5	6	7	y	9	8	10	12	11	13	14	7	L3	CO2						
x	1	2	3	4	5	6	7																				
y	9	8	10	12	11	13	14																				
	c.	Compute the rank correlation coefficient for the following data : <table><tr><td>x</td><td>68</td><td>64</td><td>75</td><td>50</td><td>64</td><td>80</td><td>75</td><td>40</td><td>55</td><td>64</td></tr><tr><td>y</td><td>62</td><td>58</td><td>68</td><td>45</td><td>81</td><td>60</td><td>68</td><td>48</td><td>50</td><td>70</td></tr></table>	x	68	64	75	50	64	80	75	40	55	64	y	62	58	68	45	81	60	68	48	50	70	7	L3	CO2
x	68	64	75	50	64	80	75	40	55	64																	
y	62	58	68	45	81	60	68	48	50	70																	

Module – 3

5	a.	Obtain the Fourier series of $f(x) = \frac{\pi - x}{2}$ in $0 < x < 2\pi$. Hence deduce that $\frac{\pi}{4} = 1 - \frac{1}{3} + \frac{1}{5} - \frac{1}{7} + \dots$	6	L2	CO3																		
	b.	Find the Cosine half range series for $f(x) = x(\ell - x)$, $0 \leq x \leq \ell$.	7	L2	CO3																		
	c.	Obtain the Fourier series of y upto the second harmonics for the following data: <table border="1"><tr><td>x°</td><td>45</td><td>90</td><td>135</td><td>180</td><td>225</td><td>270</td><td>315</td><td>360</td></tr><tr><td>y</td><td>4.0</td><td>3.8</td><td>2.4</td><td>2.0</td><td>-1.5</td><td>0</td><td>2.8</td><td>3.4</td></tr></table>	x°	45	90	135	180	225	270	315	360	y	4.0	3.8	2.4	2.0	-1.5	0	2.8	3.4	7	L3	CO3
x°	45	90	135	180	225	270	315	360															
y	4.0	3.8	2.4	2.0	-1.5	0	2.8	3.4															

OR

6	a.	Obtain the Fourier series to represent $f(x) = x - x^2$ in $-1 < x < 1$.	6	L2	CO3														
	b.	Obtain the sine half range series of $f(x) = \begin{cases} \frac{1}{4} - x & \text{in } 0 < x < \frac{1}{2} \\ x - \frac{3}{4} & \text{in } \frac{1}{2} < x < 1 \end{cases}$.	7	L3	CO3														
	c.	Express y as a Fourier series upto the third harmonics given the following values : <table border="1"><tr><td>x</td><td>0</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td></tr><tr><td>y</td><td>4</td><td>8</td><td>15</td><td>7</td><td>6</td><td>2</td></tr></table>	x	0	1	2	3	4	5	y	4	8	15	7	6	2	7	L3	CO3
x	0	1	2	3	4	5													
y	4	8	15	7	6	2													

Module – 4

7	a.	Find the Fourier transform of $f(x) = e^{- x }$.	6	L3	CO4
	b.	If $f(x) = \begin{cases} 1 - x^2, & x < 1 \\ 0, & x \geq 1 \end{cases}$ Find the Fourier transform of f(x) and hence find the value of $\int_0^\infty \frac{x \cos x - \sin x}{x^3} dx$.	7	L3	CO4
	c.	Find the Z-transform of $\sin(3n + 5)$.	7	L3	CO4

OR

8	a.	Find the Fourier sine and cosine transforms of $f(x) = e^{-\alpha x}$, $\alpha > 0$.	6	L2	CO4
	b.	Find the inverse Z-transform of $\frac{z}{(z-1)(z-2)}$.	7	L3	CO4
	c.	Solve by using Z-transform $y_{n+2} - 4y_n = 0$, given that $y_0 = 0$, $y_1 = 2$.	7	L3	CO4

Module – 5

9	a.	A random variable X has the following probability function for various values of x <table><tr><td>x</td><td>0</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td></tr><tr><td>P(x)</td><td>0</td><td>K</td><td>2K</td><td>2K</td><td>3K</td><td>K²</td><td>2K²</td><td>7K² + k</td></tr></table> Find K, evaluate P(x < 6), P(x ≥ 6).	x	0	1	2	3	4	5	6	7	P(x)	0	K	2K	2K	3K	K ²	2K ²	7K ² + k	6	L3	CO5
x	0	1	2	3	4	5	6	7															
P(x)	0	K	2K	2K	3K	K ²	2K ²	7K ² + k															
	b.	Derive mean and standard deviation of the binomial distribution.	7	L3	CO5																		
	c.	In a certain factory turning out razor blades there is a small probability of 1/500 for any blade to be defective the blades are supplied in packets of 10. Use Poisson distribution to calculate the approximate number of packets containing : i) No defective ii) One defective iii) Two defective blades in a consignment of 10000 packets.	7	L3	CO5																		

OR

10	a.	If x is normally distributed with mean 12 and S.D. 4, find the following : i) $P(x \geq 20)$ ii) $P(x \leq 20)$.	6	L3	CO5														
	b.	In a sample of 500 men it was found that 60% of them had over weight. What can be infer about the proportion of people having over weight in the population.	7	L3	CO5														
	c.	A dice is thrown 264 times and the number appearing on the face (x) follows frequency distribution : <table border="1"><tr><td>x</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td></tr><tr><td>y</td><td>40</td><td>32</td><td>28</td><td>58</td><td>54</td><td>60</td></tr></table> Calculate the value of ψ^2 (Chi square).	x	1	2	3	4	5	6	y	40	32	28	58	54	60	7	L3	CO5
x	1	2	3	4	5	6													
y	40	32	28	58	54	60													

CBCS SCHEME

USN

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BEE302

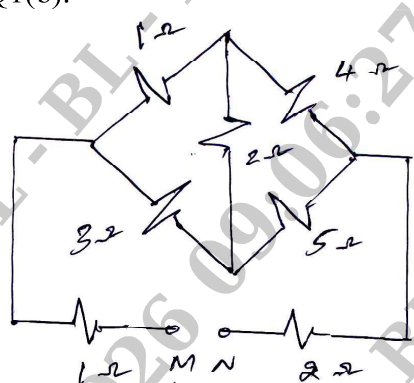
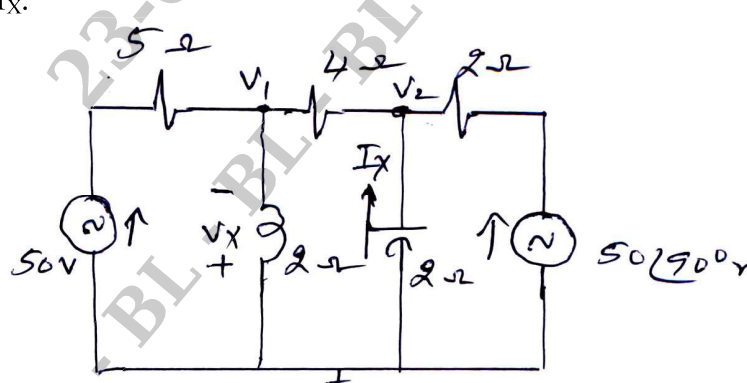
Third Semester B.E./B.Tech. Degree Examination, June/July 2026

Electric Circuit Analysis

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.	Define following : i) Linear and Bilateral network ii) Planner and Active network iii) Independent Energy Source.		5	L1	CO1
	b.	Solve for resistance between M and N using source transformation of the circuit shown in Fig.Q1(b).	 Fig.Q1(b)	5	L3	CO1
	c.	Develop node equations of the network shown in Fig.Q1(c) and find V_X and I_X .	 Fig.Q1(c)	10	L3	CO1

OR

Q.2	a.	Show how to convert Delta to star using Delta-star transformation.	4	L2	CO1
	b.	Solve for the potential difference between M and N using source transformation of the circuit shown in Fig.Q2(b).	4	L3	CO1
	c.	Apply Mesh current analysis to find the output of dependent current source shown in Fig.Q2(c).	8	L3	CO1
	d.	Develop the dual network of shown in Fig.Q2(d).	4	L3	CO1

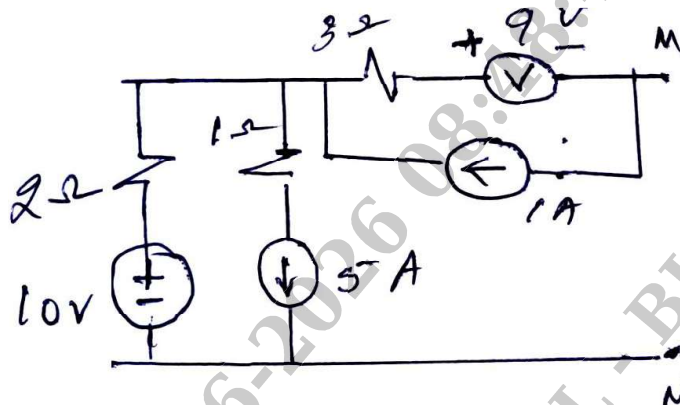


Fig.Q2(b)

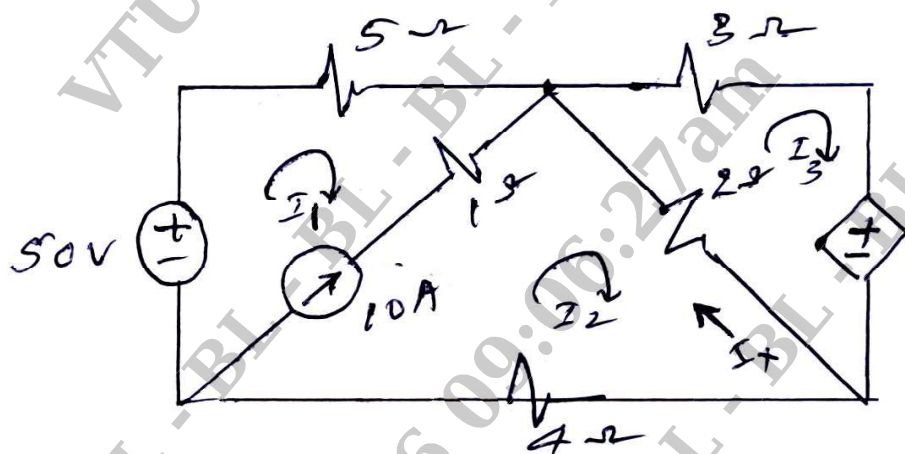


Fig.Q2(c)

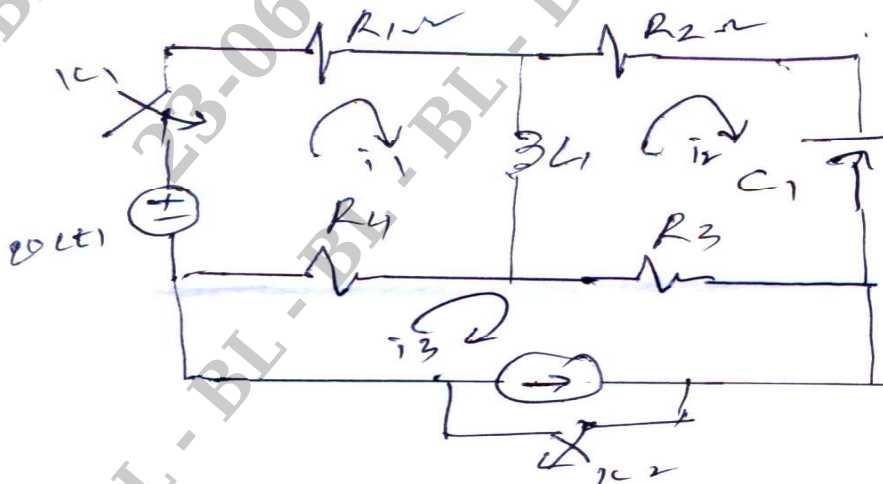
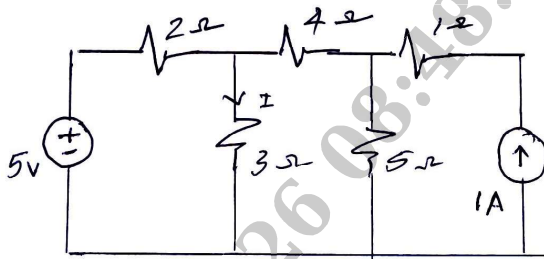
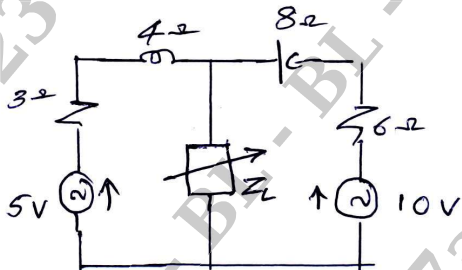
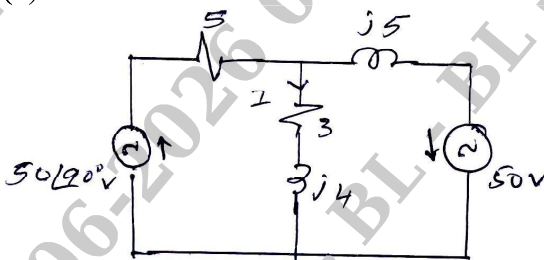
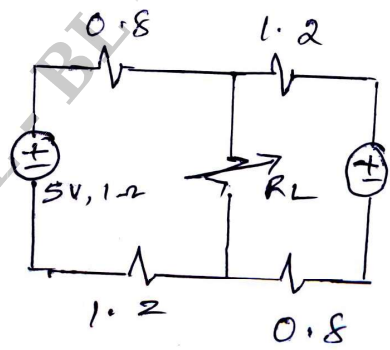


Fig.Q2(d)

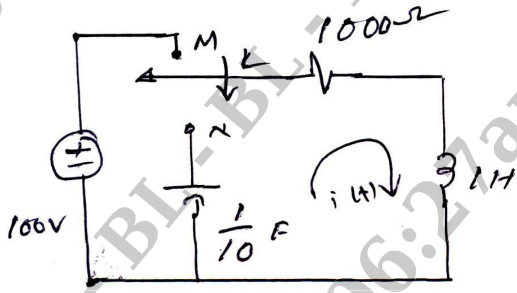
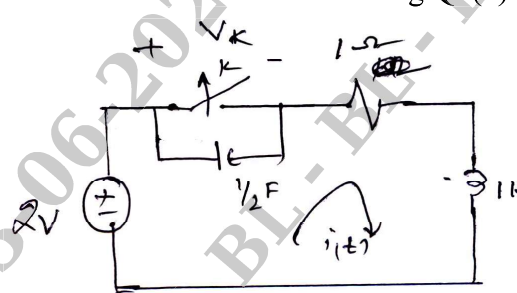
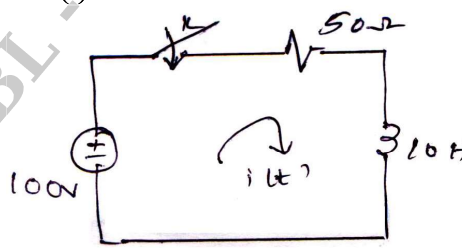
Module – 2

Q.3	a.	State and explain the super position theorem.	5	L2	CO2
	b.	Apply Norton's theorem, to find current in $3\ \Omega$ of the network shown in Fig.Q3(b).  Fig.Q3(b)	7	L3	CO2
	c.	For the network shown in Fig.Q3(c), obtain the condition for maximum power when load impedance consisting of variable resistance and reactance. Also, find maximum power.  Fig.Q3(c)	8	L3	CO2
OR					
Q.4	a.	State and explain Thevenin's theorem.	5	L2	CO2
	b.	Apply super position theorem, to find current in $(3 + j4)\Omega$ of the network shown in Fig.Q4(b).  Fig.Q4(b)	8	L3	CO2
	c.	For the network shown in Fig.Q4(c) obtain the condition for maximum power. Also, find the maximum power.  Fig.Q4(c)	7	L3	CO2

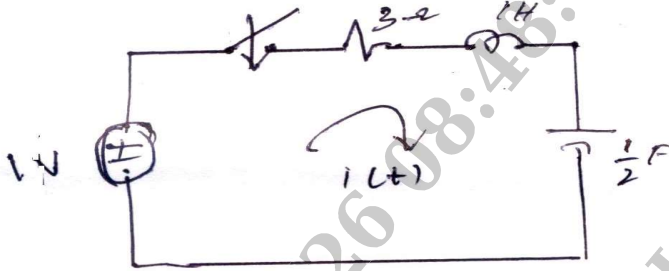
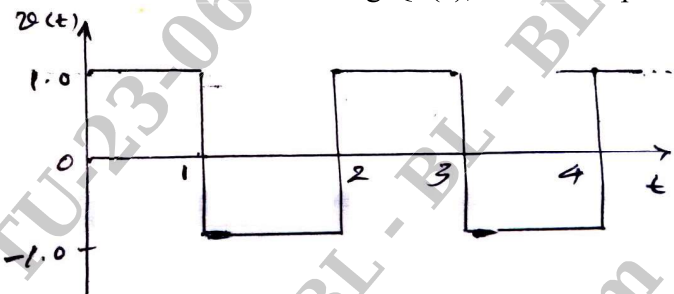
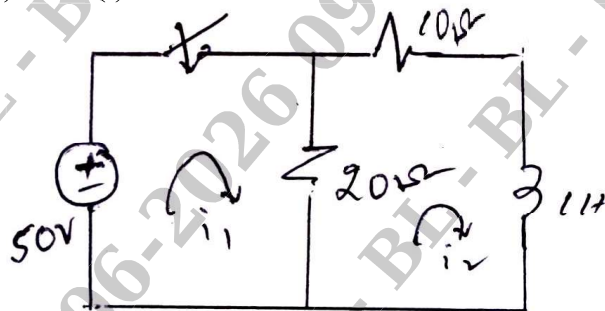
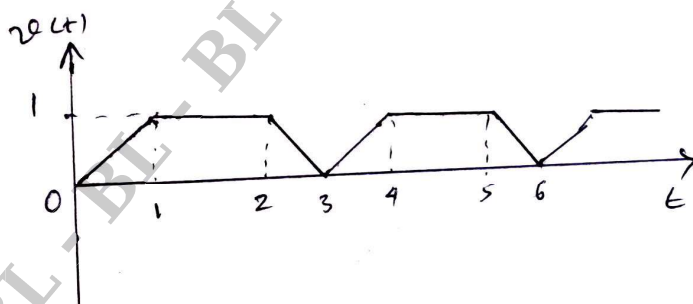
Module – 3

Q.5	a.	Show that the resonant frequency is geometric mean of cut off frequencies.	5	L2	CO3
	b.	A 50Ω resistance is connected in series with an inductor having an internal resistance and a capacitor which is supplied by 100 Volts and a variable frequency. At a frequency of 200 Hz, the current is maximum of 0.7A and voltage drop across the capacitor is 200V. Determine internal resistance, inductance capacitance of the network. Also find BW and Quality factor.	7	L3	CO3
	c.	A coil of 25Ω resistance has an inductance of 0.2H and is connected in parallel with capacitance of $100\ \mu\text{F}$. which is supplied by 100 V variable frequency. At resonance, determine resonant frequency, dynamic resistance bandwidth of Quality factor and current in each branch.	8	L3	CO3

OR

Q.6	a.	For the network shown in Fig.Q6(a), switch is changed from M to N at $t = 0$, after having reached steady condition. Determine current $i(t)$ and its first and second derivation at $t = 0^+$.	7	L3	CO3
		 Fig.Q6(a)			
	b.	Solve for voltage drop across the switch $V_K(+)$ and its first and second derivation at $t = 0^+$. The switch K is opened at $t = 0$, after reaching the steady state condition of the network shown in Fig.Q6(b).	7	L3	CO3
		 Fig.Q6(b)			
	c.	Apply transient analysis of the network shown in Fig.Q6(c) to write the expression for current $i(t)$ for $t \geq 0$.	6	L3	CO3
		 Fig.Q6(c)			

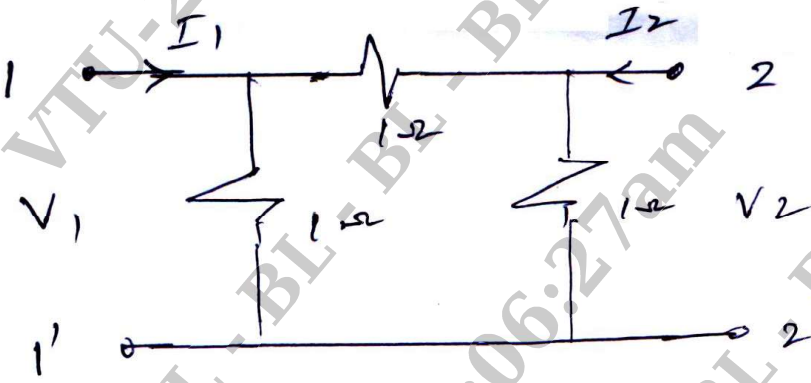
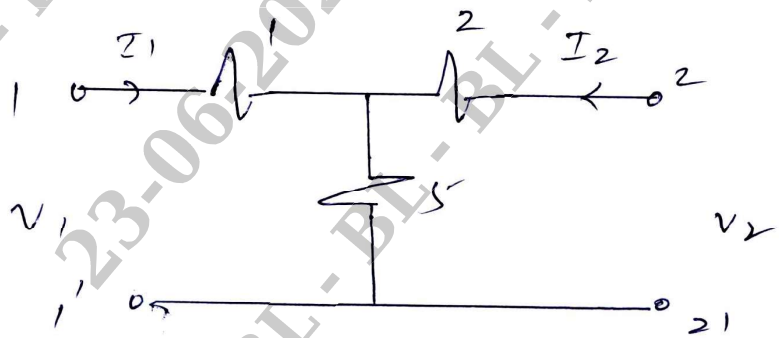
Module – 4

Q.7	a.	State and prove Initial Value Theorem.	5	L2	CO4
	b.	For the network shown in Fig.Q7(b) obtain the expression for current $i(t)$ for $t \geq 0$.  Fig.Q7(b)	7	L3	CO4
	c.	For the periodic wave form shown in Fig.Q7(c), find the Laplace transform.  Fig.Q7(c)	8	L3	CO4
OR					
Q.8	a.	State and Prove Final Value Theorem.	5	L2	CO4
	b.	For the network shown, draw the transformed network and find expression for current $i_1(t)$ and $i_2(t)$ for $t \geq 0$.  Fig.Q8(b)	7	L3	CO4
	c.	Determine the Laplace transform of periodic waveform shown in Fig.Q8(c).  Fig.Q8(c)	8	L3	CO4

Module – 5

Q.9	a.	A 3-phase, 3-wire 240V, ACB system supplies a Delta connected load in which $Z_{AB} = 25\angle 90^\circ$, $Z_{BL} = 15\angle 30^\circ$, and $Z_{CA} = 20\Omega$. Find the line currents and total power.	10	L3	CO5
	b.	Solve for line currents, neutral current and total power of 3-phase, 4 wire 208 volt, ABC system supplies star connected load. The load impedance are $Z_A = 10\Omega$, $Z_B = 15\angle 30^\circ$ and $Z_C = 10\angle -30^\circ\Omega$.	10	L3	CO5

OR

Q.10	a.	Explain Impedance and Admittance Parameters.	6	L2	CO5
	b.	Solve for admittance parameter for the network shown in Fig.Q10(b). 	8	L3	CO5
	c.	For the network shown in Fig.Q10(c), obtain the transmission parameter. 	6	L3	CO5

Third Semester B.E./B.Tech. Degree Examination, June/July 2026

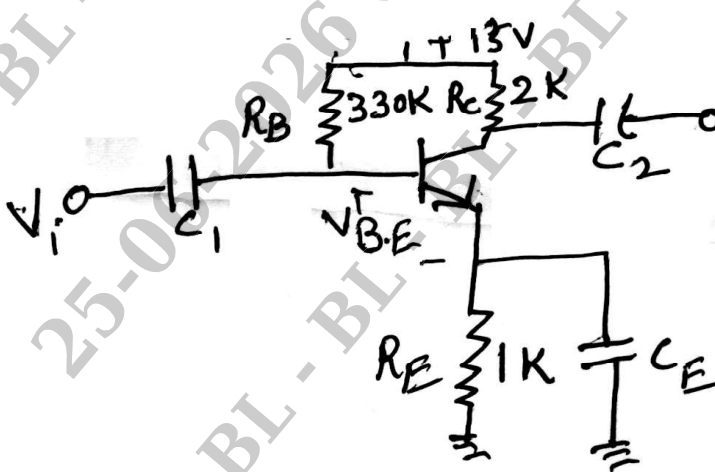
Analog Electronic Circuits

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.	Draw the circuits and explain the operation of i) Positive clamper ii) Series clippers.	8	L2	CO1
	b.	Design a voltage divider bias circuit for the following specifications collector supply voltage = $V_{CC} = 15$ Volts, Collector current $I_C = 5$ mA, V_E is 10% V_{CC} collector emitter voltage = $V_{CE} = 7$ Volts, $\beta = 150$, $V_{BE} = 0.7$ V.	8	L3	CO1
	c.	Write a note on Transistor Switching Circuits.	4	L2	CO1
OR					
Q.2	a.	Obtain expression for $S^{I_{CO}}$, $S^{I_{BE}}$, S^{β} for voltage divider bias.	10	L2	CO1
	b.	For the circuit shown in Fig Q2(b) determine I_C , V_E and I_B , V_{CE} , V_C , V_B , V_{BC} . Assume $\beta = 100$.  Fig Q2(b) $V_{CC} = 15$ V $V_{BE} = 0.7$ V	6	L3	CO1
	c.	Explain the : i) Operating point ii) Load line analysis.	4	L2	CO1

Module – 2					
Q.3	a.	Define h-parameters and hence derive h-parameter model of a CE BJT.	6	L2	CO2
	b.	Explain the effect of various capacitors on frequency response.	4	L2	CO2
	c.	Derive the expressions for A_v , A_i , Z_i and Z_o for CE fixed bias configuration using complete hybrid equivalent model.	10	L3	CO2
OR					
Q.4	a.	State and explain Millers Theorem and its dual.	8	L2	CO2
	b.	Consider a single stage CE amplifier with $R_s = 1K$ and $R_L = 1.2K\Omega$, Calculate A_{is} , R_{is} , A_v , A_{is} power gain and R_o if $h_{ie} = 1.1$, $h_{re} = 2.5 \times 10^{-4}$, $h_{fe} = 50$, $h_{oe} = 25 \mu A/V$.	6	L3	CO2
	c.	Explain hybrid – Pi model and multistage frequency effects.	6	L2	CO2
Module – 3					
Q.5	a.	Draw and explain the two stage RC coupled CE-CE cascaded amplifier.	6	L2	CO2
	b.	Derive an expression for R_{if} (input resist) for a feedback amplifier employing current series feedback.	10	L3	CO2
	c.	What are the advantages of negative feedback in amplifiers?	4	L2	CO2
OR					
Q.6	a.	Determine the voltage gain, input and output impedance with feedback for voltage series having $A = -100$, $R_i = 10 K\Omega$ and $R_o = 20 K\Omega$ for feedback $\beta = -0.1$.	4	L3	CO2
	b.	Derive the expression for input resistance for a voltage shunt feedback amplifier.	10	L2	CO2
	c.	With necessary equivalent diagram obtain the expression for Z_{in} , A_v , Z_o for a Darlington emitter follower.	6	L3	CO2

Module – 4					
Q.7	a.	A, single ended Class A transformer coupled amplifier employs a transistor with $I_m = 1A$ $P_d = 10W$ $V_{CEO} = 40V$ feeds, a 2.5Ω load, calculate the maxim power that can be to a load. Determine that turns ratio of the output transformer.	6	L2	CO3
	b.	With the help of neat circuit diagram explain the operation of transistor Colpitt's oscillator and derive the expression for the frequency of oscillation.	10	L2	CO3
	c.	Explain Cross over distortion.	4	L2	CO3
OR					
Q.8	a.	Explain the operation complementary symmetry Class B amplifier with a neat circuit diagram.	6	L2	CO3
	b.	A, single transistor amplifier with transformer coupled load produces harmonic amplitude in the output as, $B_0 = 1.5 \text{ mA}$, $B_1 = 120 \text{ mA}$, $B_2 = 10 \text{ mA}$ $B_3 = 4 \text{ mA}$ $B_4 = 2 \text{ mA}$ $B_5 = 1 \text{ mA}$.	4	L3	CO3
	c.	Derive the expression for the frequency of a wien bridge oscillator and explain its operation with a neat circuit diagram.	10	L2	CO3
Module – 5					
Q.9	a.	A JFET has $g_m = 6mV$ at $V_{as} = -1V$, find I_{DSS} of if pinch – off voltage $V_P = -2.5V$.	4	L3	CO5
	b.	Draw and explain the construction n-channel D-MOSFET.	10	L2	CO5
	c.	Draw and explain a small signal low frequency model for JFET.	6	L2	CO5
OR					
Q.10	a.	With necessary equivalent circuit obtain the expression for A_v Z_{in} , Z_o for a fixed biased JFET amplifier.	10	L2	CO5
	b.	List the difference between i) FET and BJT ii) JFET and MOSFET	10	L2	CO5

CBCS SCHEME

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BEE304

Third Semester B.E./B.Tech. Degree Examination, June/July 2026 Transformers and Generators

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.	Derive EMF equation of single phase transformer.	6	L2	CO1
	b.	Explain how to transfer equivalent circuit parameters from primary to secondary winding in a single phase transformer.	6	L2	CO1
	c.	With the help of phasor diagram explain the operation of practical transformer connected to upf, lagging pf and leading pf loads.	8	L2	CO1
OR					
Q.2	a.	With a neat circuit diagram explain the tests to be conducted to predetermine efficiency and regulation of a 1 ϕ transformer.	8	L2	CO1
	b.	5 kVA, 500/250 V, 50 Hz single phase transformer gave the following readings: OC test 500 V 1A 50 W (HV side open) SC test 25 V 10 A 60 W (LV side open) Determine : i) Efficiency on full load 0.8 pf lagging ii) Voltage regulation on full load 0.8 pf leading iii) Efficiency at 60% of full load, 0.8 pf lagging iv) Draw equivalent circuit parameters referred to primary and insert all the values in it.	8	L3	CO1
	c.	Discuss the various losses occurring in a 1 ϕ transformer.	4	L2	CO1

Module – 2

Q.3	a.	With a neat sketch, explain the constructional features of 3 ϕ transformers.	6	L2	CO2
	b.	Discuss the 3 ϕ transformer connections. Explain any 2 type of connection with diagram.	8	L2	CO2
	c.	Enumerate the advantages of 3 ϕ transformer over single phase transformers.	6	L2	CO2

OR

Q.4	a.	Why parallel operation of 2 or more transformers needed? Mention the necessary conditions to be satisfied for parallel operation.	6	L2	CO2
	b.	Derive expression for load sharing between 2 transformers having un equal voltage ratio's connected in parallel.	6	L3	CO2
	c.	A 20 kVA, 2300/230V, 2 winding transformer is to be used as an autotransformer, with constant source voltage of 2300 V at full load upf, calculate the power output, power transformed and power conducted, if the η of the 2 winding transformer at 0.6 pf is 96%, find the auto transformer efficiency at the same power factor.	8	L4	CO2

Module – 3

Q.5	a.	What is armature reaction? What are their effects, briefly explain.	6	L2	CO3
	b.	What are the causes for harmonics in synchronous generators? Explain the methods of elimination of harmonics.	8	L3	CO3
	c.	With a neat sketch explain the equivalent circuit of synchronous generators.	6	L2	CO3

OR

Q.6	a.	With the help of neat sketches, explain how the voltage regulation can be determined using EMF method from OC and SC test results.	10	L2	CO3
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b.	The OC and SC test results for a 3 ϕ Y-connected 1000 kVA, 1905 V, 50 Hz alternator are	10	L4	CO3																					
	<table><tr><td>V_{oc} (line)</td><td>760</td><td>1500</td><td>1700</td><td>1905</td><td>2300</td><td>2600</td></tr><tr><td>I_{sc} (A)</td><td>-</td><td>-</td><td>-</td><td>335</td><td>-</td><td>-</td></tr><tr><td>I_f (A)</td><td>10</td><td>20</td><td>25</td><td>30</td><td>40</td><td>50</td></tr></table>				V _{oc} (line)	760	1500	1700	1905	2300	2600	I _{sc} (A)	-	-	-	335	-	-	I _f (A)	10	20	25	30	40	50
	V _{oc} (line)				760	1500	1700	1905	2300	2600															
	I _{sc} (A)				-	-	-	335	-	-															
I _f (A)	10	20	25	30	40	50																			
R _a = 0.2 Ω /ph. Find its full load regulation at 0.85 lagging by MMF method.																									

Module – 4

Q.7	a.	With a neat sketch explain two reaction theory.	8	L2	CO4
	b.	What are the conditions to be satisfied when 2 alternators are connected in parallel?	6	L2	CO4
	c.	Explain reluctance power and effects of saliency.	6	L2	CO4

OR

Q.8	a.	With a neat phasor diagram, derive expression for the power output of a salient pole alternator. Draw the variation of power v/s load angle δ .	10	L2	CO4
	b.	Explain capability curve of alternator.	6	L2	CO4
	c.	What is hunting in synchronous generator? Explain.	4	L2	CO4

Module – 5

Q.9	a.	With a neat block diagram, explain wind energy conversion system.	8	L2	CO5
	b.	With a neat sketch, explain horizontal axis WECS.	6	L3	CO5
	c.	Enumerate advantages and disadvantages of WECS.	6	L2	CO5

OR

Q.10	a.	Explain the basic components of solar cell, with a neat sketch.	6	L2	CO5
	b.	With a neat sketch, explain grid tied solar pv generation system.	8	L3	CO5
	c.	List the advantages and disadvantages of solar pv generation.	6	L2	CO5

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Third Semester B.E./B.Tech. Degree Examination, June / July 2026

Digital Logic Circuits

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.	Explain canonical minterm form and canonical maxterm form with an example.	06	L1	CO1
	b.	Find the prime implicants and essential prime implicants of the following function. $f(a,b,c,d) = \sum m (0, 2, 5, 7, 8, 10, 13, 15) + \sum d (1, 4, 11, 14)$	06	L3	CO1
	c.	Reduce the following function using K – map technique. i) $f(a, b, c, d) = \sum m (0, 1, 4, 8, 9, 10)$ ii) $f(a, b, c, d) = \pi M (0, 2, 3, 8, 9, 12, 13, 15)$	08	L2	CO1
OR					
Q.2	a.	Find the reduced SOP form of the following function using NAND gates only. $F(a, b, c, d) = \sum m (4, 5, 6, 7, 8, 9, 10, 11)$	08	L2	CO1
	b.	Simplify the following Boolean expression by using Quine Mc-cluskey minimization technique. $f(a,b,c,d) = \sum m (0, 2, 3, 6, 7, 8, 10, 12, 13)$	12	L3	CO1
Module – 2					
Q.3	a.	Implement the following using decoder 74138 : i) $F_1(a,b,c) = \sum m (2, 6, 7)$ ii) $F_2(a,b,c) = \pi m (1, 2, 4, 6,)$	06	L3	CO2
	b.	Design full adder with truth table, K – map and logic diagram.	06	L3	CO2
	c.	Explain with a neat diagram Look – ahead carry adder.	08	L2	CO2
OR					
Q.4	a.	Design one – bit comparator with truth table and K – map.	10	L3	CO2
	b.	Implement $u = \sum m (4, 5, 7, 9, 11, 12, 13, 15)$ using i) 8 – 1 MUX ii) 4 – 1 MUX	10	L3	CO2
Module – 3					
Q.5	a.	Explain SR latch with circuit diagram, logic symbol and function table. Also explain application of SR latch.	10	L2	CO3
	b.	With a neat circuit diagram explain working of a master slave JK flip – flop along with waveform.	10	L2	CO3

OR

Q.6	a.	With a neat circuit diagram explain the working of master slave SR flip – flop along with waveform.	11	L2	CO3
	b.	Derive the characteristic equation for the following flip – flops : i) JK flip – flop ii) D – flip- flop iii) T flip – flop	09	L2	CO3

Module – 4

Q.7	a.	Explain universal shift register with neat circuit diagram.	10	L2	CO4
	b.	Design a synchronous mod – 6 counter using D flip – flop.	10	L3	CO4

OR

Q.8	a.	Explain binary ripple counter with neat circuit diagram, function table and waveform.	10	L2	CO4
	b.	Design a synchronous counter with a counting sequence 0, 1, 4, 6, 7, 5, 0 using JK flip – flop.	10	L3	CO4

Module – 5

Q.9	a.	Explain Mealy and Moore model with neat block diagram.	10	L2	CO5
	b.	Construct the transition table, state table and state diagram for the Mealy sequential circuit given below.	10	L3	CO5

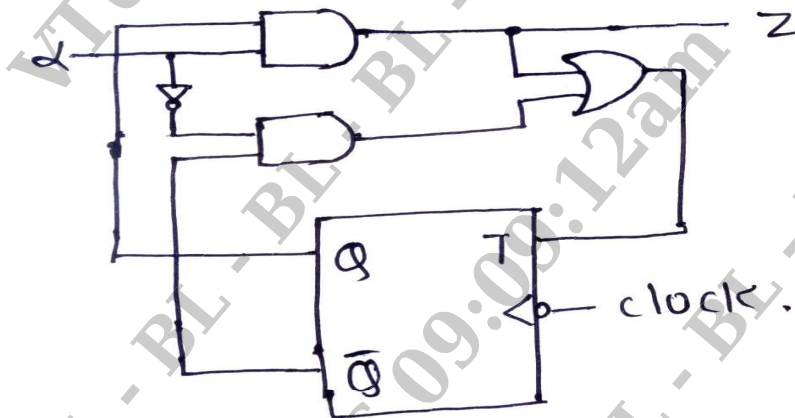


Fig. Q.9(b)

OR

Q.10	a.	Realize the system represented by the following state diagram using D flip – flop.	10	L3	CO5
	b.	Explain EPROM and flash memory.	10	L2	CO5

Fig. Q.10(a)

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BEE401

Fourth Semester B.E./B.Tech. Degree Examination, June/July 2026

Electric Motors

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 meant by Back emf? Explain its significance.	6	L1	CO1
	b.	Derive the torque equation of a DC motor.	6	L3	CO1
	c.	A DC motor takes an armature current of 110 A at 480 V. The armature circuit resistance is 0.2 ohms. The machine has 6 poles and the armature is lap connected with 864 conductors. The flux per pole is 0.05 wb. Calculate, (i) The speed (ii) The torque developed by the armature.	8	L3	CO1
OR					
Q.2	a.	Explain the characteristics of DC shunt motors.	6	L2	CO1
	b.	With neat diagram, explain the Swineburne's test on a DC motor. Mention the demerits of this test.	8	L3	CO1
	c.	Explain the power flow diagram with losses in DC motors.	6	L3	CO1
Module – 2					
Q.3	a.	Derive torque equation for a 3 ϕ Induction motor and derive condition for maximum torque.	8	L3	CO2
	b.	Sketch and explain the typical torque-slip characteristics of a 3 phase IM. (Three phase Induction Motor)	6	L3	CO2
	c.	The power input to the rotor of 440 V, 50 Hz, 6 pole, 3 ϕ Induction motor is 80 kW, the rotor EMF is observed to make 100 complete alternations per minute. Calculate (i) The slip (ii) The rotor speed (iii) The mechanical power developed.	6	L3	CO2

OR					
Q.4	a.	Define slip of a three phase IM and explain the effect of slip on rotor parameters.	10	L1	CO2
	b.	A 400 V, 4 pole, 3 ϕ , 50 Hz star connected Induction Motor and reactance has a rotor resistance per phase equal to 0.01 Ω and 0.1 Ω respectively. Determine (i) Starting torque (ii) Slip at which maximum torque will occur. (iii) Speed at which maximum torque will occur (iv) Maximum torque (v) Full load torque if full load slip is 4%. Assume ratio of stator to rotor turns as 4.	10	L3	CO2
Module – 3					
Q.5	a.	Draw and explain the phasor diagram of a 3 ϕ Induction motor under loaded condition.	6	L2	CO3
	b.	Explain with a neat circuit diagram, the construction and operation of a double cage induction motor, draw the equivalent circuit and speed torque characteristics.	8	L3	CO3
	c.	Briefly explain the various losses occurring in a 3 ϕ induction motor.	6	L3	CO3
OR					
Q.6	a.	Explain No Load Test and Blocked Rotor Test in a 3 ϕ Induction Motor.	6	L3	CO3
	b.	Derive the approximate equivalent circuit referred to stator of an Induction Motor.	8	L3	CO3
	c.	Explain the phenomenon of logging and crawling in a 3 ϕ Induction Motor.	6	L3	CO3
Module – 4					
Q.7	a.	What is the necessity of starter for a 3 ϕ Induction Motor? With a neat diagram, explain the operation of a Star-Delta starter.	10	L1	CO4
	b.	Enumerate the speed control methods of a 3 ϕ IM and explain any two methods in detail.	10	L1	CO4
OR					
Q.8	a.	Explain the double field revolving theory as applied to a single phase Induction Motor and prove that it cannot produce any starting torque.	10	L3	CO4
	b.	With a schematic connection diagram, explain the construction, working and applications of capacitor start 1 ϕ Induction Motor.	10	L2	CO4

Module – 5

Q.9	a.	With a neat diagram, explain the principle of operation of a 3 ϕ synchronous motor.	6	L2	CO5
	b.	Explain the principle of operation of a linear induction motor. Draw its characteristics for various control voltages.	6	L2	CO5
	c.	Briefly explain the V and Inverted V curve of a synchronous motors and the methods of obtaining them.	8	L2	CO5
OR					
Q.10	a.	Explain the construction working characteristics and applications of a.c. servomotor.	8	L2	CO5
	b.	Describe a phenomenon of hunting in synchronous machine and methods to overcome this.	6	L3	CO6
	c.	What is a synchronous condenser? What are its applications?	6	L3	CO6

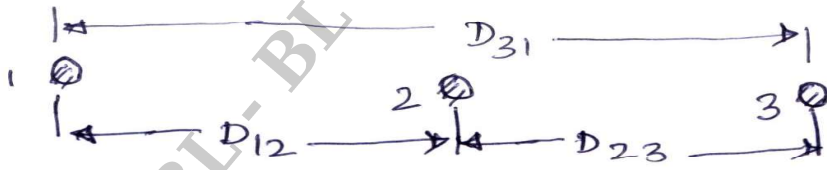
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Fourth Semester B.E./B.Tech. Degree Examination, June /July 2026 Transmission and Distribution

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.	With the help of single line diagram, discuss the structure of electrical power system indicating the standard voltages.	06	L2	CO1
	b.	A transmission line has a span of 150 m between level supports. The conductor has a cross – sectional area of 2cm^2 . The tension in the conductor is 2000 kg. If the specific gravity of the conductor material is 9.9 gm/cm^3 and wind pressure is 1.5 kg /m lengths, calculate the sag. What is the vertical sag?	07	L3	CO1
	c.	Define string efficiency. What are the methods of increasing string efficiency? Discuss.	07	L1	CO1
OR					
Q.2	a.	Discuss how increase in transmission voltage if a transmission line results in i) Reduced volume of conductor material ii) Increased transmission efficiency.	06	L2	CO1
	b.	Discuss the desirable properties of insulators. Explain any one type of insulator with neat sketch.	07	L2	CO2
	c.	An insulator string consists of three units each having a safe working voltage of 15 kv. The ratio of self capacitance to shunt capacitance of each unit is 8.1, find the maximum safe working voltage of the string. Also find the string efficiency.	07	L3	CO2
Module – 2					
Q.3	a.	Derive an expression for the inductance of a three phase overhead line due to internal and external flux.	10	L4	CO3
	b.	Explain the concept of self GDM and mutual GDM.	04	L2	CO3
	c.	Calculate the inductance of each conductor in a 3 – phase, 3 – wire system when the conductors are arranged in a horizontal plane with spacing such that $D_{31} = 4\text{m}$, $D_{12} = D_{23} = 2\text{m}$. The conductors are transposed and have a diameter of 2.5 cm as shown in fig. Q.3 (c).	06	L3	CO3
 Fig. Q.3 (c)					

OR

Q.4	a.	Derive an expression for the line to neutral capacitance for a 3 – phase overhead transmission line when the conductors are unsymmetrically spaced.	10	L4	CO3
	b.	Compare single circuit and double circuit lines.	05	L2	CO3
	c.	Calculate the capacitance of a 100 km long 3 – phase, 50 Hz overhead transmission line consisting of 3 conductors each of diameter 2 cm and spaced 2.5 m at the corners of an equilateral triangle.	05	L3	CO3

Module – 3

Q.5	a.	Discuss how transmission lines are classified.	06	L4	CO3
	b.	A 3 – phase, 50Hz transmission line 100 km long delivers 20 MW at 0.9 p.f lagging and at 110 kv. The resistance and reactance of the line per phase per km are 0.2Ω and 0.4Ω respectively. While capacitance admittance is 2.5×10^{-6} siemen/km/phase. Calculate: i) The current and Voltage at the sending end ii) Efficiency of Transmission. Use nominal T – method.	08	L3	CO4
	c.	Derive an expression for ABCD constants of a medium transmission line using nominal π method. Also prove that the line is symmetrical and reciprocal.	06	L4	CO4

OR

Q.6	a.	What are A, B, C and D parameters? Briefly explain.	04	L2	CO4
	b.	Derive an expression for ABCD constants of a medium transmission line using T – method. Also prove that the line is symmetrical and reciprocal.	06	L4	CO4
	c.	A balanced 3 – phase load of 30 mw is supplied at 132 KV, 50 Hz and 0.85 p.f lagging by means of Transmission line. The series impedance of a single conductor is $(20 + j52)$ ohms and the total phase –neutral admittance is 315×10^{-6} siemen using nominal T method determine i) A, B, C and D constants of the line ii) Sending end voltage iii) Regulation of the line	10	L3	CO4

Module – 4

Q.7	a.	Briefly explain the factors influencing the corona.	06	L2	CO5
	b.	Derive an expression for critical disruptive voltage and visual critical voltage reference to corona.	08	L4	CO5
	c.	A 132 KV line with 1.956 cm dia. Conductors is built so that corona takes place if the line voltage exceeds 210 KV (rms). If the value of potential gradient at which ionization occurs can be taken as 30 KV per cm. Find the spacing between the conductors.	06	L3	CO5

OR

Q.8	a.	With the help of cross sectional diagram, discuss the construction of single core cable.	08	L2	CO5
	b.	Discuss the different types of cables based on the voltage level.	07	L2	CO5
	c.	A single-core cable has a conductor diameter of 1 cm and insulation thickness of 0.4 cm. If the specific resistance of insulation is $5 \times 10^{14} \Omega - \text{cm}$, calculate the insulation resistance for a 2 km length of the cable.	05	L3	CO5

Module – 5

Q.9	a.	Discuss the following terms with reference to distribution system. i) Radial feeder ii) Parallel feeder iii) Loop feeder iv) Interconnected network.	10	L2	CO6
	b.	A single phase ring distributor ABC is fed at A. The loads at B and C are 20A at 0.8 p.f lagging and 15A at 0.6 p.f lagging respectively; both expressed with reference to the voltage at A. The total impedance of the three sections AB, BC and CA are $(1 + j1)$, $(1 + j2)$ and $(1 + j3)$ ohms respectively. Find the total current fed at A and the current in each section. Use Thevenin's theorem to obtain the results.	10	L3	CO6
OR					
Q.10	a.	Discuss the limitations of distribution system.	04	L2	CO6
	b.	Discuss the power quality and various reliability aids.	08	L2	CO6
	c.	A 3 – phase, 4 – wire distributor supplies a balanced voltages of 400 / 230 V to a load consisting of 30 A at p.f 0.866 lagging for R – phase, 30 A at p.f 0.866 loading for Y – phase and 30A at unity p.f. for B – phase. The resistance of each line conductor is 0.2 Ω . The area of cross section of neutral is half of any line conductor. Calculate the supply end voltage for R – phase. The phase sequency is RYB.	08	L3	CO6

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BEE403

Fourth Semester B.E/B.Tech. Degree Examination, June/July 2026 Microcontrollers

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
1	a.	Draw and explain the architecture of 8051 Microcontroller.	8	L2	CO1
	b.	Explain the internal RAM memory organization of 8051 Microcontroller.	6	L2	CO1
	c.	Explain with the help of neat diagram how to interface external ROM memory to 8051 Microcontroller.	6	L2	CO1
OR					
2	a.	List and explain the various types of special function registers of 8051 Microcontroller.	8	L3	CO1
	b.	Explain functions of the following pins of 8051 Microcontroller : i) $\overline{EA}$ ii) ALE iii) $\overline{PSEN}$ iv) RST.	8	L1	CO1
	c.	Explain the concept of stack memory with necessary instructions.	4	L2	CO1
Module – 2					
3	a.	Write an assembly language program to realize NOR operation.	6	L3	CO2
	b.	Write a program to copy a block of 10 bytes of data from RAM locations starting at 35 H to RAM locations starting at 60 H.	6	L3	CO2
	c.	Explain the arithmetic instructions of 8051 Microcontroller with examples.	8	L2	CO2
OR					
4	a.	Write a program that finds the number of 1's in a given byte.	6	L3	CO2
	b.	Write an assembly language program for finding largest number in an array.	6	L3	CO2
	c.	Explain the following instructions with examples : i) DJNZ R2, BACK ii) JNB bit, target iii) DA A iv) SWAP A.	8	L2	CO2

Module – 3

5	a.	Explain the bit structure of TCON register.	8	L1	CO3
	b.	Write an 8051C program to toggle all bits of port P2 and P3 continuously with 200 ms delay. Use the inverting operator.	6	L3	CO3
	c.	Write 8051C program to create a square wave of 50% duty cycle on P1.5 bit. Use Timer 0, Mode 1.	6	L3	CO3

OR

6	a.	Write a 8051C program to send out the value 44H serially one bit at a time via P2.0. The MSB should go out first.	6	L3	CO3
	b.	Explain Mode -1 programming of 8051 timer. Describe the different steps to program in Mode - 1.	8	L2	CO3
	c.	Write an 8051C program to convert packed BCD 0X29 to ASCII and display the bytes on P1 and P2.	6	L3	CO4

Module – 4

7	a.	Explain the bit contents of SCON register.	6	L1	CO4
	b.	Write an 8051C program to transfer the letter 'Y' serially at 4800 baud continuously. Use 8 bit data, 1 stop bit.	6	L3	CO4
	c.	Explain the six interrupts in the 8051 Microcontroller by using interrupt vector table.	8	L2	CO4

OR

8	a.	Explain the serial communication modes 0 and 1 of 8051 Microcontroller.	8	L2	CO4
	b.	Explain the connection diagram of MAX232 chip to 8051 Microcontroller.	6	L2	CO4
	c.	Write a 8051C program that continuously gets a single bit of data from P1.7 and sends it to P1.0, while simultaneously creating a square wave of 200 μ s period on P2.5. Use timer 0 to create the square wave. Assume XTAL = 11.0592 MHz.	6	L4	CO4

Module – 5

9	a.	Write 8051C program to rotate stepper motor in anti clockwise direction.	6	L3	CO5
	b.	Explain the interfacing of LCD to 8051 Microcontroller.	8	L2	CO5
	c.	Draw the interfacing diagram between 8051 Microcontroller and keyboard and explain.	6	L2	CO5
OR					
10	a.	Explain the steps to program the ADC 0808 along with timing diagram.	8	L2	CO5
	b.	Explain the interfacing of 8051 Microcontroller with DC motor through opto isolator.	6	L2	CO5
	c.	Explain the pin diagram of 8255 chip.	6	L1	CO5

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Fourth Semester B.E./B.Tech. Degree Examination, June/July 2026

OPAMPS and LIC

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 instrumentation amplifier? Explain how differential instrumentation amplifier, using a transducer bridge, can measure any change in physical energy.	07	L3	CO1
	b.	For an inverting amplifier obtain exact and approximate expression for gain A_f .	07	L2	CO1
	c.	Design the instrumentation amplifier with maximum input bias current of 850 nA. The circuit is to provide an output ranging from 5 V to 10 V when the input is 10 mV to 20 mV [$I_B = 500$ nA, $I_2 = 100 I_{B(max)}$]	06	L3	CO1
OR					
Q.2	a.	For the non-inverting amplifier configuration obtain expression for closed loop gain A_f from basic concepts, write the expression for input resistance with feedback.	07	L3	CO1
	b.	Consider adder circuit with 3 inputs V_a , V_b and V_c . Assuming inverting mode, show that this circuit can be used as summing circuit and averaging circuit.	07	L2	CO1
	c.	Design the inverting amplifier using 741 op-amp with supply of ± 12 V and gain of 20. Input voltage given to the circuit is 0.5 V. [$I_{B(max)} = 500$ nA]. Draw waveforms.	06	L3	CO1
Module – 2					
Q.3	a.	Derive expression for gain and phase angle of first order low-pass Butterworth filter.	06	L3	CO2
	b.	Explain phase lag all pass filter and derive the expression for the phase shift produced by the filter.	07	L1	CO2
	c.	A first order low pass filter with cut-off frequency of 500 Hz the resistance value designed is 31.4 K Ω . calculate the new value of resistance, if the cut-off frequency is to be changed to 2 KHz. Assume capacitor value as constant.	07	L3	CO2
OR					
Q.4	a.	Explain : (i) Line regulation (ii) Load Regulation (iii) Ripple rejection with respect to voltage regulators.	06	L1	CO2

BEE405B					
	b.	Explain adjustable voltage regulator with neat diagram.	07	L2	CO2
	c.	A voltage follower regulator has $V_S = 25\text{ V}$, $R_S = 20\ \Omega$, $R_1 = 470\ \Omega$, $V_2 = 15\text{ V}$, $Z_2 = 10\ \Omega$ and $I_{L(\max)} = 75\text{ mA}$. Analyze the circuit to determine the (i) Line regulation (ii) Load regulation (iii) Ripple rejection.	07	L3	CO2
Module – 3					
Q.5	a.	Sketch the circuit of a triangular/rectangular waveform generator. Draw the output waveforms and explain the circuit operation.	10	L2	CO3
	b.	A triangular/rectangular wave generator uses UA741 op-amp with $\pm 15\text{ V}$ supply. Design a suitable circuit to obtain triangular output of 5 V peak to peak, frequency variation from 200 Hz to 2 KHz and duty cycle adjustment from 20% to 80% of total time period.	10	L3	CO3
OR					
Q.6	a.	Explain the operation of voltage to current converter with grounded load with a neat circuit diagram.	10	L2	CO3
	b.	Design a non-inverting Schmitt trigger circuit to have $UTP = 3\text{ V}$ and $LTP = -5\text{ V}$. Use 741 op-amp with $V_{cc} = \pm 15\text{ V}$. Let $[I_2 = 500\ \mu\text{A}]$.	10	L3	CO3
Module – 4					
Q.7	a.	Explain precision full wave rectifier with non-saturating precision half wave rectifier and summing circuit.	10	L2	CO4
	b.	Explain : (i) Peak detectors (ii) Sample and Hold circuits.	10	L2	CO4
OR					
Q.8	a.	Explain how analog to digital conversion is done using successive approximation method.	10	L2	CO4
	b.	Explain working of R-2R DAC with neat diagram and waveforms.	10	L2	CO4
Module – 5					
Q.9	a.	What is PLL? With the help of block diagram explain the operation of PLL in detail.	10	L2	CO5
	b.	Explain how XOR gates can be used as phase detector in PLL.	10	L3	CO5
OR					
Q.10	a.	With pin diagram and pin function explain the internal architecture of 555 timer IC.	10	L2	CO5
	b.	With circuit diagram and waveforms explain Astable multivibrator testing 555 timer IC.	10	L3	CO5

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CBCS SCHEME

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21EE52

Fifth Semester B.E./B.Tech. Degree Examination, June / July 2026 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. Distinguish between Open Loop and Closed Loop Control Systems with examples. (08 Marks)
- b. For the rotational mechanical system shown in fig. Q. 1 (b), draw the electrical network based on torque – current analogies. Give all necessary cause – effect equations.

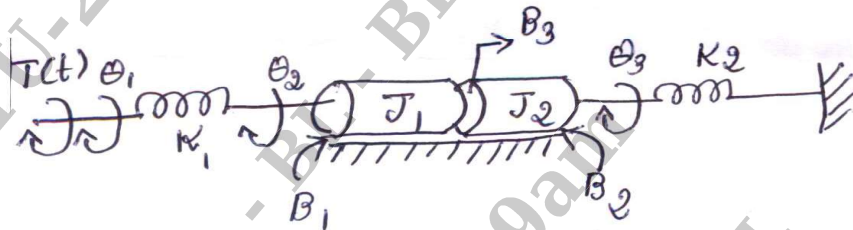


Fig. Q. 1 (b)

(12 Marks)

OR

- 2 a. Derive the transfer function of armature controlled DC servomotor. (08 Marks)
- b. Draw the mechanical network for the mechanical system shown in fig. Q. 2 (b). Draw the analogous electric circuit in which force is analogous to current.

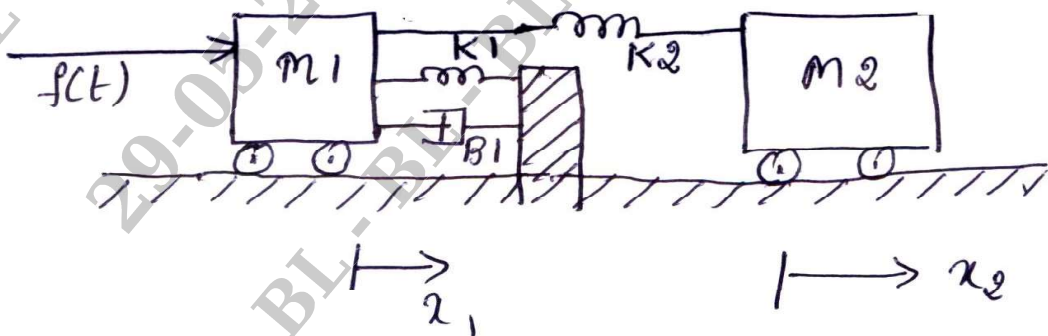


Fig. Q. 2 (b)

(12 Marks)

Module-2

- 3 a. Reduce the block diagram shown in fig. Q. 3 (a) and then find $\frac{C}{R}$.

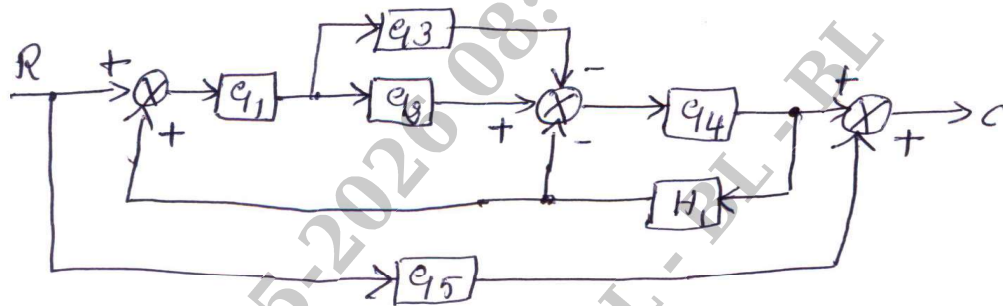


Fig. Q. 3 (a)

(08 Marks)

- b. Find the transfer function $\frac{C(s)}{R(s)}$ for the signal flow graph shown in fig. Q. 3 (b).

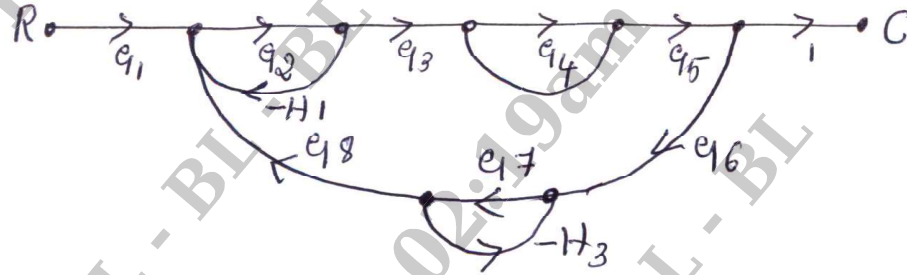


Fig. Q. 3 (b)

(08 Marks)

- c. Define : i) Source and sink node ii) Loop and forward path.

(04 Marks)

OR

- 4 a. Obtain the transfer function $\frac{C(s)}{R(s)}$ using block diagram reduction method.

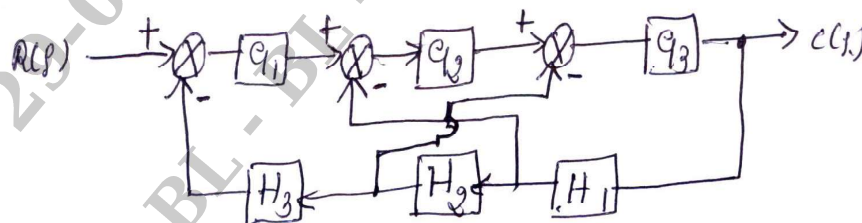


Fig. Q. 4 (a)

(08 Marks)

- b. Illustrate how to perform following connection with block diagram reduction technique.
- i) Combining blocks in parallel
 - ii) Moving a summing point after a block.
 - iii) Assuming point with three inputs
 - iv) Eliminating a feedback loop
- (08 Marks)
- c. Explain Mason's gain formula indicating each term. (04 Marks)

Module-3

- 5 a. Derive an expression for rise time and maximum overshoot for a second order system excited by a step input [underdamped case] (08 Marks)
- b. A unity negative feedback control system is characterized by an open loop transfer function $G(s)H(s) = \frac{K}{s(s+10)}$. Determine system gain 'K' such that damping ratio is 0.5. For this K value find rise time, peak time, settling time and peak overshoot. Assume system is subjected to IV. (07 Marks)
- c. Investigate the stability of a closed loop system whose characteristic equation is given by $s^5 + 3s^4 + 7s^3 + 20s^2 + 6s + 15 = 0$ (05 Marks)

OR

- 6 a. Explain the difficulties encountered while solving using R – H criterion and how do you eliminate these difficulties with example. (08 Marks)
- b. For the characteristic equation given by $s^4 + 25s^3 + 15s^2 + 20s + K = 0$, determine
- i) The range of K so that system is stable asymptotically
 - ii) The value of 'K' so that system is marginally stable and frequency of sustained oscillations. (07 Marks)
- c. Derive the expression for step response, rise time and settling time of a first order system. (05 Marks)

Module-4

- 7 a. A negative feedback control system is characterized by $G(s)H(s) = \frac{K}{s(s+1)(s+2)(s+3)}$. Sketch the root locus plot for all values of K ranging from 0 to ∞ . Mark all salient points on root locus. (14 Marks)
- b. Explain the following terms with respect to root locus.
- i) Breakaway point
 - ii) Asymptotes
 - iii) Angle of departure
- (06 Marks)

OR

- 8 a. Derive an expression for resonant peak and band width for a second order system. (08 Marks)
- b. Using bode plots investigate the stability of negative feedback control system. Whose open – loop transfer function is given by $G(s)H(s) = \frac{50}{s(0.5s+1)(0.05s+1)}$. (12 Marks)

Module-5

- 9 a. Using Nyquist stability criterion, investigate the stability of a closed loop transfer function whose open loop transfer function is given by $G(s)H(s) = \frac{10}{(s+1)(s+2)}$. (12 Marks)
- b. Explain the steps to solve problems using Nyquist criterion. (08 Marks)

OR

- 10 a. Explain PID controller and discuss the effect of this on the behaviour of the system. (10 Marks)
- b. Explain the step by step design procedure of lead compensating network. (10 Marks)

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CBCS SCHEME

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BEE501

Fifth Semester B.E./B.Tech. Degree Examination, June/July 2026 Engineering Management & Entrepreneurship

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.	Explain briefly the levels of management and the skills required at each level.	10	L2	CO1
	b.	Discuss in detail the steps involved in planning.	10	L2	CO1
OR					
Q.2	a.	Distinguish between management and administration.	10	L2	CO1
	b.	Discuss the steps involved in decision making process.	10	L2	CO1
Module – 2					
Q.3	a.	Describe the principles of an organization.	10	L2	CO2
	b.	Explain the importance of staffing in an organization.	10	L2	CO2
OR					
Q.4	a.	Explain the requirements of effective direction.	10	L2	CO2
	b.	Discuss Maslow's theory of hierarchical needs.	10	L2	CO2
Module – 3					
Q.5	a.	Discuss business ethics and corporate governance.	10	L2	CO3
	b.	Explain the steps involved in control process.	10	L2	CO3
OR					
Q.6	a.	Explain the important characteristics of leadership.	10	L2	CO3
	b.	Discuss the social responsibilities of business towards different groups.	10	L2	CO3
Module – 4					
Q.7	a.	Describe entrepreneurial competencies.	10	L2	CO4
	b.	Explain capacity building for entrepreneurs.	10	L2	CO4
OR					
Q.8	a.	Discuss the concept of entrepreneurial mobility focusing on its types.	10	L2	CO4
	b.	Explain the models of Business opportunity evaluation.	10	L2	CO4

Module – 5					
Q.9	a.	Discuss the contents of a business plan.	10	L2	CO5
	b.	Explain why do some business plan fail.	10	L3	CO5
OR					
Q.10	a.	Describe the objectives and functions of National Small Industries Corporation (NSIC).	10	L2	CO5
	b.	Explain, how business can be developed using, (i) State Financial Corporation (SFC) (ii) State Industrial Development Corporation (SIDC)	10	L3	CO5

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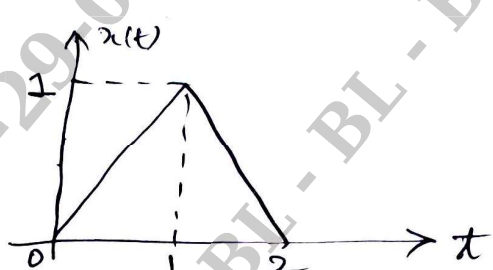
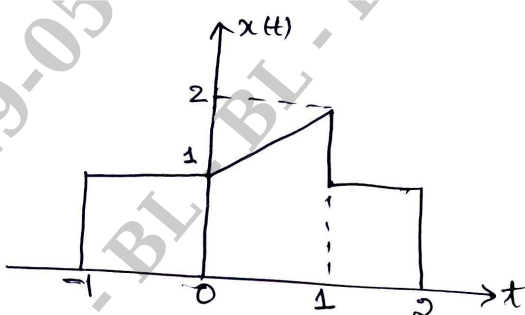
Fifth Semester B.E./B.Tech. Degree Examination, June/July 2026

Signals and DSP

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.	Define signal? Discuss the classification of signals with examples.	8	L2	CO1
	b.	Determine and sketch the Odd and Even part of the signal shown in Fig.Q1(b) below.  Fig.Q1(b)	4	L3	CO1
	c.	Determine whether the given signals are periodic or non-periodic. If periodic determine its fundamental period i) $x(n) = \sin^2\left(\frac{\pi}{4} \times n\right)$ ii) $x(t) = \cos(2t) + \sin(3t)$.	8	L3	CO1
OR					
Q.2	a.	For the signal $x(t)$ shown in Fig.Q.2(a). Perform the following operations on the given signal. i) $x(t - 3)$ and $x(t + 3)$ ii) $x(2t + 2)$ and $x(t/2 - 2)$.  Fig.Q2(a)	8	L3	CO1
	b.	Determine whether the given signal is energy or power signals i) $x(t) = e^{-5t} \cdot u(t)$ ii) $x(t) = u(t) + u(t - 2)$.	8	L3	CO1
	c.	Discuss the properties of system.	4	L2	CO1

Module – 2

Q.3	a.	Determine the 8-point DFT of the sequence : $x(n) = \{1, 1, 1, 1\}$ For $N=8$. Also plot the Magnitude and phase plot of $X(K)$.	10	L3	CO2
	b.	State and prove the following properties of DFT. i) Circular time shift property ii) Linearity property.	6	L3	CO2
	c.	Define the IDFT of the sequence : $X(K) = \{3, 2 + j, 1, 2 - j\}$.	4	L3	CO2

OR

Q.4	a.	Perform the circular convolution of $x(n) = \{2, 1, 2, 1\}$ with $h(n) = \{1, 2, 3, 4\}$ by using DFT and IDFT method.	10	L3	CO2
	b.	Consider on FIR filter with impulse response $h(n) = \{3, 2, 1, 1\}$. If the input is given as $x(n) = \{1, 2, 3, 3, 2, 1, -1, -2, -3, 5, 6, -1, 2, 0, 2, 1\}$. Determine the output $y(n)$. Use overlap add method. Assume block length is 7.	10	L3	CO2

Module – 3

Q.5	a.	Define FFT algorithms? Discuss the advantages of FFT algorithms over the DFT.	6	L2	CO3
	b.	Discuss the differences between DIT FFT and DIF FFT algorithms.	4	L2	CO3
	c.	Determine the 8-point DFT of the sequence $x(n) = \{1, 2, 3, 4, 4, 3, 2, 1\}$ using DIT-FFT radix-2 algorithm.	10	L4	CO3

OR

Q.6	a.	Given $x(n) = (n+1)$ and $N=8$. Determine $X(K)$ by using DIF-FFT algorithm.	10	L3	CO3
	b.	Determine the circular convolution of $x(n)$ and $h(n)$ using DIF-FFT algorithm. Given : $x(n) = \{1, 1, 1, 1\}$ and $h(n) = \{1, 0, 1, 0\}$.	10	L3	CO3

Module – 4

Q.7	a.	Discuss the differences between IIR and FIR filters.	6	L2	CO4
	b.	Determine the digital system transfer function $H(z)$ for the given analog system by using impulse Invariant method. $H(S) = \frac{(S + 0.1)}{(S + 0.1)^2 + 3^2}$	8	L3	CO4
	c.	Draw the direct form – I and direct form – II realization for the given difference equation : $y(n) = \frac{-3}{8}y(n-1) + \frac{3}{32}y(n-2) + \frac{1}{64}y(n-3) + x(n) + 3x(n-1) + 2x(n-2)$	6	L3	CO4

OR

Q.8	a.	Design a Butterworth analog high pass filter that has the following specification. i) Maximum pass band attenuation = 2 dB ii) Passband edge frequency = 200 rad/sec iii) Minimum stop band attenuation = 20 dB iv) Stop band edge frequency = 100 rad/sec.	10	L3	CO4
	b.	Compare Butterworth and Chebyshev filter methods.	4	L2	CO4
	c.	Transform $H(s) = \frac{s+a}{(s+a)^2 + b^2}$ into digital filter using impulse invariant technique.	6	L3	CO4

Module – 5

Q.9	a.	Discuss the advantages and disadvantages of FIR filters.	6	L2	CO5
	b.	For the given FIR filter with the difference equation : $y(n) = x(n) + \frac{3}{4}x(n-1) + \frac{17}{8}x(n-2) + \frac{3}{4}x(n-3) + x(n-4)$ Draw the direct form – I.	6	L3	CO5
	c.	The frequency responses of an FIR filter is given by $H(\omega) = e^{j3\omega} (1 + 1.8 \cos 3\omega + 1.2 \cos 2\omega + 0.5 \cos \omega)$ Determine the coefficients of the impulse response $h(n)$ of the FIR filter.	8	L3	CO5

OR

Q.10	a.	Define window function. Discuss the classification of window function. Explain any four window functions with equations along with time domain and magnitude response curve.	10	L3	CO5
	b.	The desired frequency response of the low pass filter is given by $H_d(e^{j\omega}) = H_d(\omega) = \begin{cases} e^{-j3\omega}; & \omega < 3\pi/4 \\ 0; & 3\pi/4 < \omega < \pi \end{cases}$ Determine the frequency response of FIR filter if the hamming window is used, with $N = 7$.	10	L4	CO5

CBCS SCHEME

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BEE503

Fifth Semester B.E./B.Tech. Degree Examination, June/July 2026

Power Electronics

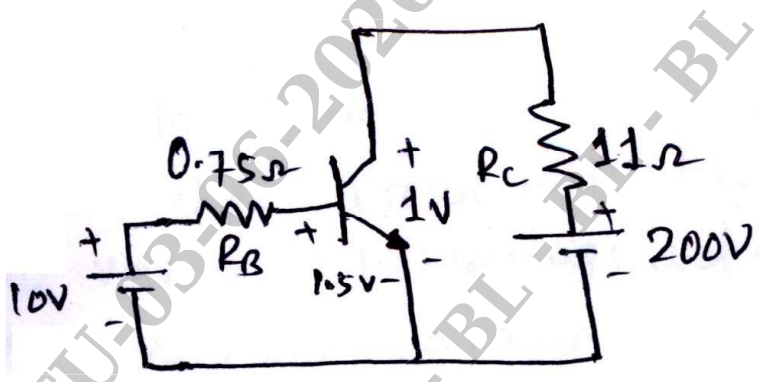
Time: 3 hrs.

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.	Explain different types of power electronic converters and mention applications for each type of power electronic converters.	10	L2	CO1
	b.	Analyze the reverse recovery characteristics of a power diode and derive equations for reverse recovery time t_{rr} and reverse recovery current I_{RR} .	10	L3	CO1
OR					
Q.2	a.	With circuit diagram and waveforms, explain the operation of single phase full wave bridge diode rectifier with purely resistive load. Derive the expression for average and RMS value of output voltage.	10	L3	CO2
	b.	With circuit diagram and waveforms of control signal and output voltage, explain the control characteristics of B.J.T and S.C.R.	6	L2	CO1
	c.	The reverse recovery time of a diode is $t_{rr} = 5 \mu s$ and the rate of fall of the diode current is $di/dt = 50 A/\mu s$. Determine : i) The storage charge Q_{RR} ii) The peak reverse current I_{RR}	4	L3	CO1
Module – 2					
Q.3	a.	What is the necessity of base drive control in a power transistor? Explain proportional base control.	8	L2	CO3
	b.	With the help of necessary waveform, explain the switching characteristics of power MOSFET.	8	L2	CO3
	c.	Compare power BJT and power MOSFET.	4	L2	CO3
1 of 4					

OR

Q.4	a.	Discuss the need for providing isolation of gate drive from power circuit and explain electric isolation using pulse transformer.	8	L2	CO3
	b.	For the transistor switch of Fig.Q.4(b) i) Calculate forced beta, ' β_f ' of transistor ii) If the manufacturer's specified ' β ' is in the range 8 to 40, calculate the minimum overdrive factor. iii) Obtain the power loss ' P_T ' of the transistor.	8	L4	CO3
					
Fig.Q.4(b)					
	c.	Explain forward biased Safe Operating Area (SOA) of transistor with respect to switching limit.	4	L2	CO3

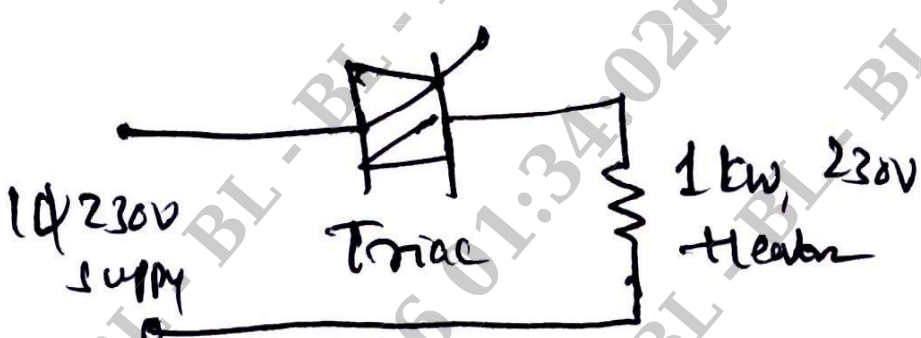
Module – 3

Q.5	a.	Explain the V-I characteristics of SCR. Also define latching and holding current.	10	L2	CO4
	b.	Derive an expression for the anode current of thyristor with the help of a two transistor analogy.	10	L3	CO4

OR

Q.6	a.	What is the need for protection of thyristors? Explain how thyristors are protected against high $\frac{di}{dt}$ and $\frac{dv}{dt}$	10	L3	CO4
	b.	Explain synchronized UJT triggering circuit with the help of relevant waveforms.	6	L2	CO4
	c.	A SCR is connected in series with 0.5H inductor and 20 Ω resistance. A 100V DC voltage is applied to this circuit. If the latching current of the SCR is 4 mA. Determine the minimum width of the gate trigger pulse required to properly turn-on the SCR.	4	L4	CO4

Module – 4

Q.7	a.	Draw the circuit diagram of single phase half-wave controlled rectifier circuit with RL load sketch the input voltage, output voltage and output current waveforms. Also derive an expression for average value of output voltage.	10	L3	CO5
	b.	A single phase fullwave A.C voltage controller operates on a single phase supply voltage of 230 V rms at 50 Hz. If the triac is triggered at a delay angle of 45°, during each half cycle of input supply (Refer Fig.Q.7(b)). Calculate : i) RMS value of output voltage ii) RMS value of output current iii) RMS value of TRIAC current iv) Input power factor  Fig.Q.7(b)	10	L4	CO5
OR					
Q.8	a.	Explain the working of a bidirectional single phase A.C. voltage controller with 'R' load, with neat circuit diagram and relevant waveforms. Derive the equation for $V_o(\text{rms})$.	10	L3	CO5
	b.	With the help of a neat circuit diagram and waveform explain single phase dual converter operating in circulating current mode.	10	L2	CO5

Module – 5

Q.9	a.	Explain the principle of operation of step up chopper with suitable circuit diagram. Derive the expression for average output voltage.	10	L3	CO5
	b.	A dc chopper has an input voltage of 200 V and a load resistance of $8\ \Omega$. The voltage drop across thyristor is 2V and the chopper frequency is 800 Hz. The duty cycle $\alpha = 0.4$. Determine : i) Average output voltage ii) R.M.S. output voltage iii) Chopper efficiency	6	L4	CO6
	c.	Write note on Chopper Control Techniques.	4	L2	CO6
OR					
Q.10	a.	With circuit diagram and waveform, explain the operation of single phase full bridge inverter supplying resistive load.	10	L2	CO6
	b.	Explain single phase transistorized current source inverter with the help of necessary circuit and waveforms. Also write its advantages and disadvantages.	10	L2	CO6

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Fifth Semester B.E./B.Tech. Degree Examination, June/July 2026

Power Electronics for Renewable Energy Systems

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.	Explain the i-V characteristics of PV cell from the basic concepts of diode.	5	L1	CO1
	b.	Discuss briefly the different controlled and uncontrolled power semiconductor devices.	5	L2	CO1
	c.	Discuss the impact of different renewable energy sources on environmental issues.	10	L2	CO1
OR					
Q.2	a.	List out the advantages and disadvantages of conventional energy sources.	5	L1	CO1
	b.	Discuss the importance of Non-conventional energy sources.	5	L2	CO1
	c.	Explain the i-V characteristics and idealized characteristics of GTO and MCT.	10	L1	CO1
Module – 2					
Q.3	a.	Derive the relationship between input and output impedance of buck-boost converter, illustrating with relevant waveforms and thereby discuss the impact of this impedance relation on MPPT.	10	L4	CO2
	b.	Starting with 3- ϕ , 3-pulse rectifier circuit, explain the configuration and operation of 12-pulse rectifier circuits.	10	L3	CO2
OR					
Q.4	a.	Explain the Hill climbing and voltage sampling MPPT algorithm applied to PV system.	10	L2	CO2
	b.	Describe the grid connected and islanding modes of operation in a PV system with condition and transition between them.	10	L2	CO2

Module – 3					
Q.5	a.	Explain the MPPT algorithm with P(w) characteristics and with wind speed measurement along with block diagram.	10	L1	CO3
	b.	What are the control techniques used in wind turbines and explain each of the control technique.	10	L1	CO3
OR					
Q.6	a.	Discuss the grid and requirements for wind energy systems.	10	L2	CO3
	b.	With a neat sketch, explain analysis of Back-to-Back PWM VSI for DFIG turbines.	10	L2	CO3
Module – 4					
Q.7	a.	With a neat diagram, explain the power generation using different ocean energy sources.	10	L3	CO4
	b.	Discuss the hydrogen energy conversion process, advantages and disadvantages of hydrogen energy systems.	10	L2	CO4
OR					
Q.8	a.	With a neat sketch, explain the Biomass energy systems.	10	L3	CO1
	b.	Illustrate the operating principle and characteristics of fuel cells.	6	L3	CO1
	c.	What are the advantages and disadvantages of fuel cells?	4	L1	CO1
Module – 5					
Q.9	a.	What is an AC Microgrid? Draw and explain the AC microgrid with schematic illustration.	10	L1	CO5
	b.	Classify the power converters required for AC microgrid and thereby explain the simplified version of different grid connected power converters.	10	L2	CO5
OR					
Q.10	a.	Illustrate the hybrid AC and DC microgrid with the help of block diagram.	10	L3	CO5
	b.	With the help of block diagram, explain the virtual impedance control of the grid power converter in AC microgrid.	10	L3	CO5

CBCS SCHEME

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21EE61

Sixth Semester B.E./B.Tech. Degree Examination, June/July 2026 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. What is Management? Explain different functions of Management. (08 Marks)
- b. Distinguish between Management and Administration. (06 Marks)
- c. Discuss the importance of Planning. (06 Marks)

OR

- 2 a. What is Decision Making? How is it classified? What are the steps involved? (10 Marks)
- b. Differentiate between :
 - i) Strategic Planning and Tactical planning.
 - ii) Single use plans and Standing plans. (10 Marks)

Module-2

- 3 a. What are principles of Organisation? (07 Marks)
- b. Explain Directing , Controlling and Styles of leadership. (06 Marks)
- c. Differentiate between Process and Purpose Departmentalization. (07 Marks)

OR

- 4 a. What are Committees? How are they classified? (06 Marks)
- b. What is Co-ordination? What are its techniques? (08 Marks)
- c. What are the steps involved in controlling? (06 Marks)

Module-3

- 5 a. What are the major characteristics of an Entrepreneur? Explain each in brief. (10 Marks)
- b. Define 'Business Ethics'. Discuss the factors that affect business ethics. (10 Marks)

OR

- 6 a. Explain the term 'Social Audit'. What are its benefits and limitations? (08 Marks)
- b. How Entrepreneurs are classified? (06 Marks)
- c. Differentiate between Entrepreneur and Intrapreneur. (06 Marks)

Module-4

- 7 a. Elaborate the role and importance of small scale industries in India. (07 Marks)
b. What are the government policies towards development and promotion of SSI's in India? (07 Marks)
c. What are Ancillary and Tiny industries? (06 Marks)

OR

- 8 a. What is the impact of globalization on SSI in India? (07 Marks)
b. What are the central and state level institutional support available for business enterprises? (07 Marks)
c. Explain the effect of WTO/GATT on SSI. (06 Marks)

Module-5

- 9 a. Write short notes on :
i) Project scheduling
ii) Project evaluation and selection. (10 Marks)
b. Explain Meaning , Objectives and Characteristics of Project Management. (10 Marks)

OR

- 10 a. Explain the uses and limitations of CPM and PERT. (10 Marks)
b. Write note on :
i) Human and Administrative aspect project management.
ii) Pre – requisites for successful project implementation. (10 Marks)

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21EE63

Sixth Semester B.E./B.Tech. Degree Examination, June/July 2026 Signals and 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. Compare the following classification of signals :

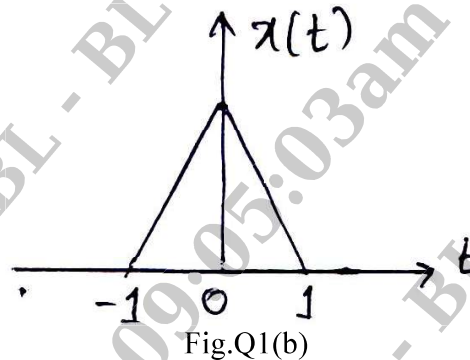
- i) Continuous-time and Discrete-time signals
- ii) Even and Odd signals.

(06 Marks)

b. Sketch the following signals for $x(t)$ as shown in Fig.Q1(b). Find :

- i) $x(3t + 2)$ ii) $x(4t - 2)$ iii) $x(2t - 4)$ iv) $x(-2t - 1)$.

(08 Marks)



c. Determine whether the given system is

- i) Linear
- ii) Time invariant
- iii) Memory less
- iv) Causal
- v) Stable for

$$T\{x(t)\} = e^{x(t)}$$

(06 Marks)

OR

2 a. Consider a continuous-time LTI system with unit impulse response.

$$h(t) = u(t) \text{ and } x(t) = e^{-at} u(t) \text{ for } a > 0$$

Find the output of the system using convolution method.

(10 Marks)

b. Consider an input $x(n)$ and unit impulse response $h(n)$ given by

$$x(n) = \alpha^n u(n), 0 < \alpha < 1 \text{ and } h(n) = u(n).$$

Evaluate using convolution.

(10 Marks)

Module-2

3 a. Prove the following DFT properties :

- i) Linearity
- ii) Circular –time shift.

(06 Marks)

b. Find the 5-point DFT of the sequence $x(n) = \{1, 1, 1, 0, 0\}$. Sketch the magnitude and phase spectrum.

(08 Marks)

c. Determine whether the following signals are periodic or not. If periodic find the fundamental period.

i) $x(t) = \cos 100 \pi t + \sin 50 \pi t$

ii) $x(n) = \cos\left(\frac{n}{8}\right) \cos\left(\frac{n\pi}{8}\right)$.

(06 Marks)

OR

4 a. Compute circular convolution using DFT and IDFT for the following sequence :

$$x_1(n) = \{2, 3, 1, 1\} \text{ and } x_2(n) = \{1, 3, 5, 3\}.$$

(08 Marks)

b. A long sequence $x(n)$ is filtered through a filter with impulse response $h(n)$ to yield the output $y(n)$. If $x(n) = \{1, 4, 3, 0, 7, 4, -7, -7, -1, 3, 4, 3\}$ and $h(n) = \{1, 2\}$

Compute $y(n)$ using overlap add technique. Use only 5-point circular convolution in your approach.

(12 Marks)

Module-3

5 a. Obtain the 8-point DFT of the following sequence using Radix-2 DIT-FFT algorithm for the sequence :

$$x(n) = \{1, 1, 1, 1, 0, 0, 0, 0\}.$$

(10 Marks)

b. If $x_1(n) = \{1, 2, 0, 1\}$ and $x_2(n) = \{1, 3, 3, 1\}$. Obtain $x_1(n) \otimes x_2(n)$ by using DIT-FFT algorithm.

(10 Marks)

OR

- 6 a. First 5-points of the 8-point DFT of a real valued sequence is given by $X(0) = 0$, $X(1) = 2 + j2$, $X(2) = -j4$, $X(3) = 2 - j2$, $X(4) = 0$. Determine the remaining points. Hence find the original sequence $x(n)$ using inverse DIF – FFT algorithm. (14 Marks)
- b. Calculate the number of complex multiplications and complex additions required for the direct computations of DFT and FFT algorithm for $N = 8, 16$ and 32 . (06 Marks)

Module-4

- 7 a. Design an analog bandpass filter to meet the following frequency domain specifications :
- i) A -3.0103 dB upper and lower cut-off frequency of 50 Hz and 20 KHz
 - ii) A stopband attenuation of atleast 20 dB at 20 Hz and 45 KHz
 - iii) A monotonic frequency response. (10 Marks)
- b. Design a Chebyshev filter to meet the following specifications :
- i) Passband ripple : ≤ 2 dB
 - ii) Passband edge : 1 rad/sec
 - iii) Stopband attenuation : ≥ 20 dB
 - iv) Stopband edge : 1.3 rad/sec. (10 Marks)

OR

- 8 a. Determine the system function $H(z)$ of the lowest order Chebyshev filter that meets the following specifications :
- i) 3 dB ripple in the passband $0 \leq |\omega| \leq 0.3\pi$
 - ii) Atleast 20 dB attenuation in the stopband $0.6\pi \leq |\omega| \leq \pi$
- Use bilinear transformation. (12 Marks)
- b. Transform the analog filter $H_a(s) = \frac{s+1}{s^2+5s+6}$ into $H(z)$ using impulse invariant transformation. Take $T = 0.1$ sec. (08 Marks)

Module-5

- 9 a. A lowpass filter is to be designed with the following desired frequency response

$$H_d(e^{j\omega}) = H_d(\omega) = \begin{cases} e^{-j2\omega}, & |\omega| < \pi/4 \\ 0, & \pi/4 < |\omega| < \pi \end{cases}$$

Determine the filter co-efficient $h_d(n)$ and $h(n)$, if $\omega(n)$ is a rectangular window defined as

$$\omega_R(n) = \begin{cases} 1, & 0 \leq n \leq 4 \\ 0, & \text{otherwise} \end{cases}$$

Also find the frequency response.

(10 Marks)

- b. Determine the impulse response $h(n)$ of a filter having desired frequency response

$$H_d(e^{j\omega}) = \begin{cases} e^{-j(N-1)\omega/2}, & \text{for } 0 \leq |\omega| \leq \pi/2 \\ 0, & \text{for } \pi/2 \leq |\omega| \leq \pi \end{cases}$$

$N = 7$. Use frequency sampling approach.

(10 Marks)

OR

- 10 a. Obtain Direct form –II, cascade form and parallel form realization for the following system

$$y(n) = 0.75y(n-1) - 0.125y(n-2) + 6x(n) + 7x(n-1) + x(n-2).$$

(14 Marks)

- b. Obtain linear phase realization of:

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

(06 Marks)

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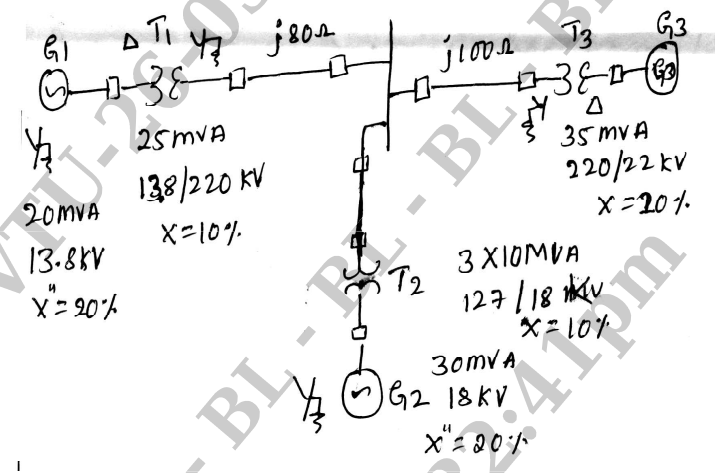
BEE601

Sixth Semester B.E. / B. Tech. Degree Examination, June/July 2026 Power System Analysis-I

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.	Define per unit value. What are the advantages of per unit system?	5	L2	CO1
	b.	Draw the reactance diagram using a base of 50 MVA and 13.8 kv on Generator G1 for the diagram shown in Fig.Q1 (b).  Fig.Q1 (b)	15	L3	CO1
OR					
Q.2	a.	Show that per unit reactance referred to a primary or secondary is same in the Transformer.	5	L2	CO1
	b.	A 300 MVA, 20kv, 3ϕ generator has a reactance of 20%. The generator supplies 2 motors M_1 and M_2 over a transmission line of 64km as shown in one line diagram. The ratings of the components are as follows: T_1 = 350MVA, 230KV-Y/20KV-Δ X=10% T_L = L = 64km, X_{TL} = 0.5j / km T_2 = compound of 3 single phase transformers each rated 127/13.2 kv, 100MVA with leakage reactance of 10% M_1 =200MVA, 13.2kv, $X''=0.2$jpu M_2 =100 MVA, 13.2kv, $X''=0.2$jpu Select the generator ratings as base and draw the reactance diagrams with all reactance marked in pu for the system shown in Fig.Q.2(b) If the motors M_1 and M_2 have i/ps of 120 MW and 60MW, at 13.2 kv and operate at UPF. Find the V_g at the terminals of the generator.	15	L3	CO1

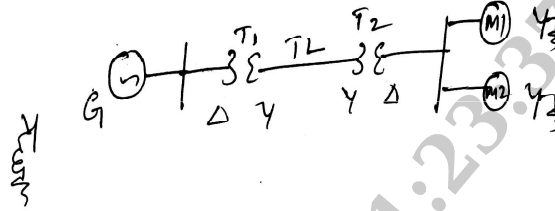


Fig.Q.2 (b)

Module – 2

Q.3	a. With the help of waveform, when subjected to 3 phase symmetrical fault, define synchronous reactance (Steady state, Transient and Sub transient condition).	10	L2	CO2
	b. For the radial network shown in Fig.Q3(b) a 3 ϕ fault occurs at F. Determine the fault current and the line V_g at 11kv bus under fault conditions. Take base MVA as 100MVA.	10	L3	CO2
OR				
Q.4	a. Write a note on selection of circuit breaker.	5	L2	CO2
	b. Explain in detail, the transients on a transmission line.	5	L2	CO2
	c. A synchronous generator and motor are rated 30000KVA (30MVA) and both have the transient reactance of 20%. The line connecting them has a reactance of 10% of the base of machine rating. The motor is drawing 20MW at 0.8 pf leading. The terminal V_g (V_t) of motor 12.8 kV. When a symmetrical 3 ϕ fault occurs at motor terminal, determine subtransient Current at generator, motor and fault point for the s/m shown in Fig.Q4(c).	10	L3	CO2

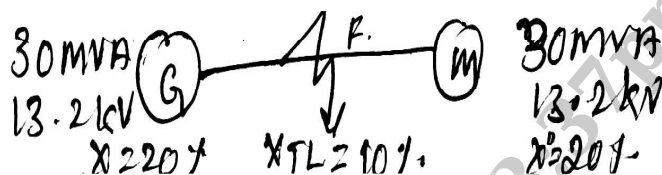


Fig. Q4 (c)

Module – 3

Q.5	a.	Express symmetrical components of voltages in terms of unbalanced phasors.	5	L2	CO3
	b.	Explain sequence impedance and sequence networks.	5	L2	CO3
	c.	Draw the +ve, -ve and zero sequence impedance networks for the power system of Fig. Q 5 (c). Choose a base of 50MVA, 220kv in the 50 Ω transmission lines and mark all reactances in Pu. The ratings of the generators and transformers are: G1: 25MVA, 11kv, $X'' = 20\%$ G2: 25MVA, 11kv, $X'' = 20\%$, 3-ϕ $\oplus$: 20MVA, 11Y/ 220 Y KV, $X = 15\%$. The -ve sequence reactance of each synchronous machine is equal to its sub transient reactance. The zero sequence reactance of lines are 250% of their +Ve sequence reactances. Take machine ratings as base in generator.	10	L3	CO3

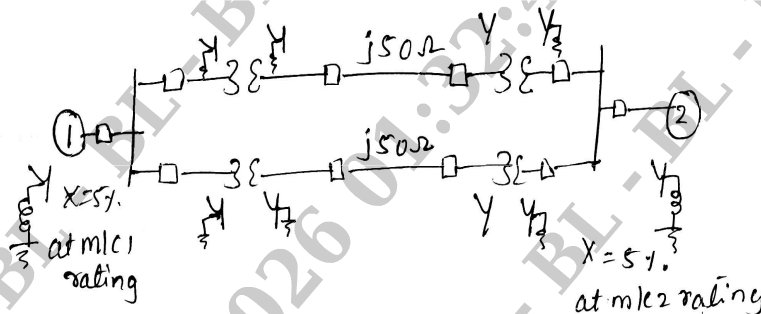


Fig. Q 5 (c)

OR

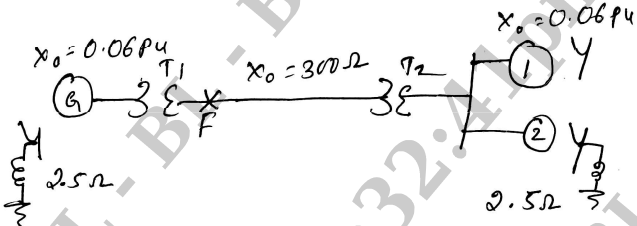
Q.6	a.	Explain phase shift of symmetrical components in Y- Δ transformer bank.	10	L2	CO3
	b.	Draw the zero sequence network for the following $\oplus$ connections for the below combinations. (i) $Y-\Delta$ (ii) $Y-Y_{\Delta}$ (iii) $\Delta-Y$ (iv) $\Delta-Y_{\Delta}$ (v) $\Delta-\Delta$	10	L3	CO3

Module – 4

Q.7	a.	Explain LLG fault which occurs through the fault impedance Z in a power system and show the inter connection of sequence network.	12	L3	CO4
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	b.	A 3- ϕ generator with an open circuit voltage of 400V is subjected to an LG fault through a fault impedance of $2j\Omega$. Determine the fault current if $Z_1 = 4j\Omega$, $Z_2 = 2j\Omega$ and $Z_0 = 1j\Omega$. Repeat the numerical for LLG and LL faults.	8	L3	CO4
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OR

Q.8	a.	Explain the series types of faults in a power system.	5	L2	CO4
	b.	A 25MVA, 11KV, 3ϕ generator has a subtransient reactance of 20%. The generator supplies 2 motors over a transmission line with $\oplus$ at both ends as shown in Fig.8 (b). The motors have rated input of 15 & 7.5 MVA, both 10kv with 25% sub transient reactances. The 3ϕ $\oplus$s are both rated 30MVA, 10.8 / 121KV, connected Δ-Y with leakage reactances of 10% each. The series reactance of line is 100Ω calculate the fault current when a single line to ground fault occurs at F. The motors are loaded to draw 15 and 7.5MW at 0.8 pf Leading. Assume that -ve sequence reactance is equal to +ve sequence. The zero sequence reactance are shown in Fig. 8 (b).  Fig. 8 (b)	15	L3	CO4

Module – 5

Q.9	a.	Explain the dynamics of synchronous machine.	8	L2	CO5
	b.	Derive swing equation with notations.	8	L2	CO5
	c.	Define stability of the system and Transient State Stability.	4	L1	CO5

OR

Q.10	a.	Explain Equal Area Criterion in a power system.	10	L2	CO5
	b.	A loss free alternator supplies 50MW to an infinite bus, the steady state stability limit being 100MW. Determine if the alternator will remain stable if the input to the prime mover of the alternator is abruptly increased by 40MW.	10	L3	CO5

Sixth Semester B.E./B.Tech. Degree Examination, June/July 2026

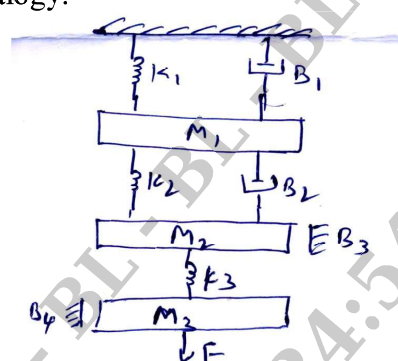
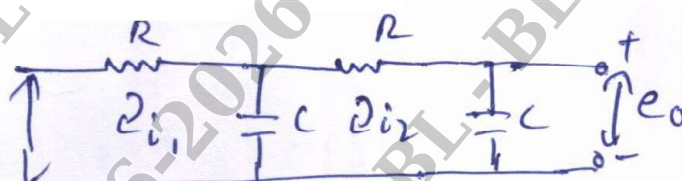
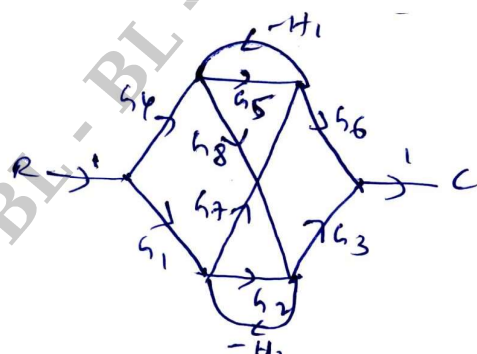
Control Systems

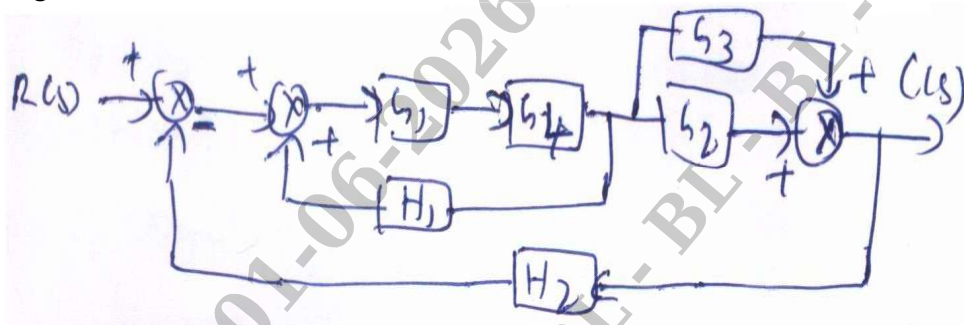
Time: 3 hrs.

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.	Derive an expression for the transfer function of an armature controlled D.C servo motor. Also construct the block diagram of a D.C. Servo motor.	12	L4	CO1	
	b.	Compare open loop and closed loop control system with examples.	8	L2	CO1	
OR						
Q.2	a.	Convert the given mechanical system into equivalent electrical system using F-V and F-I analogy.	12	L4	CO1	
						
Fig. Q2 (a)						
	b.	Obtain the transfer function of the electrical system shown in Fig. Q2 (b) below.	8	L4	CO1	
						
Fig.Q2 (b)						
Module – 2						
Q.3	a.	Obtain the transfer function using, Mason's gain formula.	10	L4	CO2	
						
Fig. Q3 (a)						

	b.	Draw and explain the following with references to signal flow graph and also define them: (i) Input node (ii) Output node (iii) Forward path (iv) Feedback loop (v) Self loop	10	L3	CO2
OR					
Q.4	a.	Obtain the transfer function for the given block diagram using block diagram reduction rules. 	10	L4	CO2
	b.	Illustrate the following block diagram, reduction rules with examples : (i) Shifting summing point before a block. (ii) Shifting a take off point after a block (iii) Blocks in parallel. (iv) Shifting a take off point before a block. (v) Blocks in series.	10	L3	CO2
Module – 3					
Q.5	a.	Draw the time response specifications of a typical second order system indicating all the parameters. Derive an expression for rise time and peak time.	8	L3	CO3
	b.	Obtain the response of a unity feedback system whose open loop transfer function for a unit step input is $G(s) = \frac{3}{s(s+4)}$	6	L3	CO3
	c.	Check the stability of the given characteristic equation using Routh's method: $s^6 + 2s^5 + 8s^4 + 12s^3 + 20s^2 + 16s + 16 = 0$	6	L3	CO3
OR					
Q.6	a.	Derive an expression for the output response $C(t)$ of a second order under damped system for a unit step input.	8	L4	CO3
	b.	For a unity feedback system with, $G(s) = \frac{20(1+s)}{s^2(2+s)(4+s)}$, find (i) Static error coefficients (ii) The steady state error when input is $r(t) = 40 + 2t + 5t^2$	6	L3	CO3

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BEE613B

Sixth Semester B.E./B.Tech. Degree Examination, June/July 2026 Embedded System Design

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.	Define an Embedded System. Compare between Embedded Systems and General Computing Systems.	08	L2	CO1
	b.	Compare Harvard and Von Neumann Architecture.	06	L2	CO1
	c.	Explain classification of Embedded Systems based on Generation.	06	L2	CO1
OR					
Q.2	a.	Give an outline on Program Storage Memory.	08	L2	CO1
	b.	Explain the purpose of Embedded Systems based on Data Collection and Data Communication.	06	L2	CO1
	c.	Explain the elements of an Embedded Systems.	06	L2	CO1
Module – 2					
Q.3	a.	Explain Operational Quality Attributes.	08	L2,5	CO2
	b.	Explain Automotive Communication Buses.	06	L2,5	CO2
	c.	Give an outline on Tools and Platform providers.	06	L2	CO2
OR					
Q.4	a.	Explain the functional block diagram of washing machine.	10	L2,5	CO2
	b.	Explain the non – operational quality attributes.	10	L2,5	CO2
Module – 3					
Q.5	a.	Discuss the fundamental issues in hardware – software co – design.	06	L5	CO3
	b.	Explain De-coder used in embedded systems.	06	L2,5	CO3
	c.	Elaborate VLSI and Integrated Circuit Design.	08	L6	CO3
OR					
Q.6	a.	Explain Multiplexer and De – multiplexer with pin diagram and truth – table.	10	L2,5	CO3
	b.	Explain Data Flow Graph (DFG) Model and Control Data Flow Graph (CDFG) Model in an Embedded System.	10	L2,5	CO3
Module – 4					
Q.7	a.	Elaborate the conversion process of Assembly language to machine language.	10	L6	CO4
	b.	Explain : •LST file, •OBJ file, •MAP file with syntax used in Embedded Systems.	10	L2,5	CO5
OR					
Q.8	a.	Give an outline on Emulators and Debuggers.	10	L2	CO5
	b.	Explain the conversion process of high level language to machine language with block diagram.	10	L2,5	CO4
Module – 5					
Q.9	a.	Discuss the operating system architecture in Embedded System.	10	L2,5	CO6
	b.	Explain the important features of Real Time Operating Systems (RTOS)	10	L2,5	CO6
OR					
Q.10	a.	Elaborate process states and state transition representation with neat flow charts.	10	L6	CO6
	b.	Explain the concept of Threads in RTOS.	10	L2,5	CO6

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BEE654B

Sixth Semester B.E./B.Tech. Degree Examination, June/July 2026 Technologies of Renewable Energy Sources

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.	Classify the various types of energy resources and explain briefly.	8	L2	CO1
	b.	Briefly discuss the causes of energy scarcity and possible solutions to energy scarcity.	8	L2	CO1
	c.	Calculate and find hour angle when it is 2h 20 min.	4	L1	CO1
OR					
Q.2	a.	With necessary diagram, explain layers of the Sun.	8	L2	CO1
	b.	Explain the factors affecting energy resource development.	8	L2	CO1
	c.	Define the following terms : (i) Hour angle (ii) Zenith angle (iii) Declination angle (iv) Altitude angle	4	L1	CO1
Module – 2					
Q.3	a.	List and explain any four popular types of solar collectors.	8	L2	CO2
	b.	Explain solar water heating system, solar pond power generation, solar cookers, solar dryers.	8	L2	CO2
	c.	Explain with the neat diagram, Heliostat field solar collectors.	4	L2	CO2
OR					
Q.4	a.	With the neat diagram, explain IV characteristics of a solar cell.	8	L2	CO2
	b.	Explain key elements of silicon solar cell.	8	L2	CO2
	c.	Explain different application of solar cell systems.	4	L2	CO2
Module – 3					
Q.5	a.	Explain the hydrogen production techniques in detail.	8	L2	CO3
	b.	Briefly explain the problems associated with hydrogen energy. List the advantages and disadvantages of hydrogen energy.	8	L2	CO3

	c.	Discuss the parameters to be considered while choosing a site for wind mills.	4	L1	CO3
OR					
Q.6	a.	With the neat diagram, explain dry steam based geothermal power plant.	6	L2	CO3
	b.	With the next diagram, explain waste recovery management scheme.	8	L1	CO3
	c.	Write the advantages and disadvantages of waste recycling.	6	L1	CO3
Module – 4					
Q.7	a.	Define Gasification. Explain the various types of gassifer with the neat diagram.	8	L2	CO4
	b.	Explain the process of anaerobic digestion with neat sketch.	8	L2	CO4
	c.	Explain the types of Biogas plant.	4	L2	CO4
OR					
Q.8	a.	Discuss the composition of biogas and benefits of biogas.	8	L2	CO4
	b.	Explain : (i) Single Basin systems (ii) Two Basin systems	8	L2	CO4
	c.	List and explain the advantages and disadvantages of tidal power	4	L2	CO4
Module – 5					
Q.9	a.	Explain the devices for harnessing wave energy.	8	L2	CO5
	b.	Discuss motion in the sea waves.	4	L1	CO5
	c.	Distinguish between Land based and floating OTEC power plants.	8	L2	CO2
OR					
Q.10	a.	Explain Rankine cycle and its working.	8	L2	CO5
	b.	Discuss the principle of ocean thermal energy conversion.	4	L1	CO5
	c.	Explain the applications of OTEC in addition to produce electricity.	8	L2	CO5

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CBCS SCHEME

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21EE71

Seventh Semester B.E./B.Tech. Degree Examination, June/July 2026 High Voltage and Power System Protection

Time: 3 hrs.

Max. Marks: 100

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

Module-1

- 1 a. Define Townsend's First and Second Ionization coefficients. Derive an expression for the current growth in air gap. (08 Marks)
- b. Explain the following breakdown mechanism in solid:
(i) Electromechanical breakdown
(ii) Thermal breakdown (06 Marks)
- c. Mention the advantages, limitation and application of High Voltage Engineering. (06 Marks)

OR

- 2 a. What is Paschen's Law? How do you account for the minimum voltage for breakdown under a given $P \times D$ condition? (08 Marks)
- b. Explain briefly suspended particle theory of breakdown in liquid dielectric. (06 Marks)
- c. Explain the different mechanisms by which breakdown occurs in solid dielectric. (06 Marks)

Module-2

- 3 a. With a neat sketch, explain the working of Cockcroft Walton DC generator. (10 Marks)
- b. With a neat sketch, explain principle of working and construction of electrostatic voltmeter. (10 Marks)

OR

- 4 a. Explain the principle of operation of a resonant transformer. (06 Marks)
- b. With neat sketch, explain the Marx circuit arrangement for multistage impulse generator. (08 Marks)
- c. Describe with a neat sketch the working of a Van de Graaff generator. (06 Marks)

Module-3

- 5 a. Explain the nature and causes of faults. Discuss the consequences of faults in a power system. (08 Marks)
- b. List and explain the essential qualities of protective relay. (07 Marks)
- c. With a neat diagram, explain Back-up relay. (05 Marks)

OR

- 6 a. With a neat sketch, explain the working principle of Induction disc type reverse power relay. (08 Marks)
- b. Discuss a protective scheme for ring main feeder. (06 Marks)
- c. With a neat block diagram, explain the static inverse time over current relay. (06 Marks)

Module-4

- 7 a. What are the important operating principles used in wire pilot schemes? Explain Transley scheme of wire pilot protection. (07 Marks)
- b. Describe the behaviour of simple differential protection scheme during normal, external and internal faults. (08 Marks)
- c. Explain balanced voltage differential relaying scheme. (05 Marks)

OR

- 8 a. Describe with neat sketch the percentage differential protection of a stator. (08 Marks)
- b. Explain with neat diagram the working of Buchholz relay. (07 Marks)
- c. Discuss bus zone protection with neat diagram. (05 Marks)

Module-5

- 9 a. Discuss the recovery rate theory and energy balance theory of arc interruption on AC circuit breaker. (08 Marks)
- b. Derive an expression for restriking voltage and rate of rise of restriking voltage. (08 Marks)
- c. Discuss the working of air blast circuit breaker. (04 Marks)

OR

- 10 a. With a neat sketch, explain the phenomenon of lighting. (10 Marks)
- b. Write a short note on :
(i) Insulation Co-ordination
(ii) Gas Insulated Substation (GIS) (10 Marks)

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Seventh Semester B.E./B.Tech. Degree Examination, June/July 2026

Power System Operation and Control

Time: 3 hrs.

Max. Marks: 100

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

Module-1

- 1 a. With a neat block diagram, explain the operating states of power system. (08 Marks)
- b. Explain Preventive and Emergency control in power system operation. (06 Marks)
- c. Explain the major components of energy management center. (06 Marks)

OR

- 2 a. Explain in detail the major components of SCADA in power system. (08 Marks)
- b. Explain in brief the components of remote terminal unit in power system. (06 Marks)
- c. Explain Single master-single remote, Single master – multiple RTU and multiple master-multiple RTUS configuration with neat diagrams. (06 Marks)

Module-2

- 3 a. Explain in brief the function of load frequency control and excitation voltage regulators of turbo generators with a neat schematic diagram. (08 Marks)
- b. Explain the mathematical modeling of Generator Load Model. (06 Marks)
- c. A 100 MVA synchronous generator operates on full load at frequency of 50 Hz. The load is suddenly reduced to 50 MW. Due to time lag in governor system the steam valve begins to close after 0.4 seconds. Determine the change in frequency that occurs in this time.
Given, $H = 5 \text{ kW-Sec/KVA}$ of generator. (06 Marks)

OR

- 4 a. Explain in detail the steady state analysis of ALFC. (10 Marks)
- b. With a neat diagram, explain the proportional plus integral controller. (10 Marks)

Module-3

- 5 a. With a neat block diagram, explain two area load frequency control. (10 Marks)
- b. Explain the functions of important components and their transfer functions of automatic voltage regulator of a generator with a neat diagram. (10 Marks)

OR

- 6 a. With a neat diagram, explain the load frequency control with Generation Rate Constraints (GRCs) (08 Marks)
- b. Explain the effects of the speed governor dead band on AGC. (06 Marks)
- c. Explain the digital load frequency controllers in inter connected power system. (06 Marks)

Module-4

- 7 a. Explain generation and absorption of reactive power in power system. (06 Marks)
- b. Derive the relation between voltage power and reactive power at a node in power system. (06 Marks)
- c. Explain the various methods of voltage control by injection of reactive power in power system. (08 Marks)

OR

- 8 a. Explain the tap changing transformer for voltage control in a power system. (06 Marks)
- b. Explain the methods of voltage control by using booster transformer and phase-shift transformers the power system. (10 Marks)
- c. Write a short note on voltage collapse in a power system. (04 Marks)

Module-5

- 9 a. What are the factors affecting power system security and explain the major functions of power system security. (10 Marks)
- b. With a neat flow chart, explain the contingency analysis procedure using sensitivity factors. (10 Marks)

OR

- 10 a. Explain the AC power flow security analysis with contingency case selection with the help of flow chart. (10 Marks)
- b. Explain linear least square estimations in power system. (10 Marks)

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21EE744

Seventh Semester B.E./B.Tech. Degree Examination, June/July 2026

Industrial Drives and Applications

Time: 3 hrs.

Max. Marks: 100

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

Module-1

- 1 a. With a neat block diagram, explain the various components of an Electrical Drive. (06 Marks)
- b. A motor drives two loads. One has rotational motor. It is coupled to the motor through a reduction gear with $a=0.1$ and efficiency of 90%. The load has a moment of inertia of 10kg-m^2 and a torque of 10 N-m. Other load has translational motion and consists of 1000 kg. weight to be lifted up at an uniform speed of 1.5m/s. Coupling between this load and the motor has an efficiency of 85%.. Motor has an inertia of 0.2kg-m^2 and runs at a constant speed of 1420rpm. Determine equivalent inertia referred to the motor shaft and power developed by the motor. (08 Marks)
- c. What are the load torque components? Explain any two. (06 Marks)

OR

- 2 a. Explain the speed torque conventions and multi-quadrant operation of a motor, driving a hoist load. (10 Marks)
- b. Explain the modes of operation of an electrical drive. (10 Marks)

Module-2

- 3 a. With a neat circuit diagram and necessary waveform, explain single phase fully controlled rectifier control of dc separately excited motor. Also obtain the equation for average voltage, V_a and speed, W_m . Assume discontinuous conduction. (10 Marks)
- b. A 220V, 1500 rpm, 50A separately excited dc motor with armature resistance of 0.5Ω is fed from a 3 phase fully controlled rectifier. Available ac source has a line voltage of 440V, 50Hz. Determine the value of firing angle when.
 - i) Motor is running at 1200rpm and rated torque.
 - ii) Motor is running at 800rpm and twice the rated torque. (10 Marks)

OR

- 4 a. Explain chopper control of separately excited D.C. Motor. (10 Marks)
- b. A 230V, 960 rpm 200A separately excited D.C. Motor has an armature resistance of 0.02Ω . the motor is fed from a chopper which provides both motoring and braking operations. The source has a voltage of 230V. Assuming continuous conduction.
- Calculate duty ratio of chopper for motoring operation at rated torque and 350rpm.
 - Calculate duty ratio of chopper for braking operation at rated torque and 350rpm,
 - If maximum duty ratio of chopper is limited to 0.95 and maximum permissible motor current is twice the rated, calculate maximum permissible motor speed obtainable without field weakening and power fed to the source.
 - If the motor field is also controlled in (iii), calculate field current as a fraction of its rated Value for a speed of 1200rpm. (10 Marks)

Module-3

- 5 a. Explain the effect of unbalanced source voltages and single phasing on 3-phase induction motor. (10 Marks)
- b. Explain variable frequency control of induction motor with necessary diagrams. (10 Marks)

OR

- 6 a. Explain A.C. dynamic braking of 3-phase induction motor with two lead and three lead connections. (10 Marks)
- b. A 2200V, 2600KW, 735rpm, 50HZ, 8 pole, 3-phase squirrel-cage induction motor has following parameters referred to the stator:
 $R_s = 0.075\Omega$, $R_r = 0.1\Omega$, $X_s = 0.45\Omega$, $X_r = 0.55\Omega$. Stator winding is delta connected and consists of two sections connected in parallel.
- Calculate starting torque and maximum torque as a ration of rated torque, if the motor is started by star-delta switching. What is the maximum value of line count during starting?
 - What will be the value of maximum line current and torque during starting, if the part-winding method of starting is employed?
 - If motor is started by connecting series reactors in line, what should be the value of reactors so as to limit line current to twice the rated value? (10 Marks)

Module-4

- 7 a. Explain the operation of synchronous motor fed from fixed frequency supply. (10 Marks)
- b. A single phase, 220V, 50Hz, 1425 rpm induction motor has following parameters:
 $R_s = 2\Omega$, $R_r = 5\Omega$, $x_s = x_r = 6\Omega$ and $x_m = 60\Omega$.
 It drives a fan load at rated speed when full voltage is applied. Motor speed is controlled by the stator voltage control. Calculate the motor terminal voltage for a speed of 1200rpm. (10 Marks)

OR

- 8 a. Explain the operations of voltage source inverted fed induction motor drives. Also sketch the various schemes of VSI fed induction drive. (10 Marks)
- b. With a neat circuit diagram, explain closed loop speed control and converter rating for VSI and cyclo converter induction motor drives. (10 Marks)

Module-5

- 9 a. Explain the self controlled synchronous motor drive employing load commutated thyristor inverter. (10 Marks)
- b. Explain brushless D.C. motor drive for servo applications. (10 Marks)

OR

- 10 a. Write short note on :
 i) Cement mill drives.
 ii) Steel rolling mill drives. (10 Marks)
- b. Explain variable reluctance type stepper motor and list the advantages and disadvantages. (10 Marks)

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BEE701

Seventh Semester B.E./B.Tech. Degree Examination, June/July 2026 Switch Gear and Protection

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.	List and explain the essential qualities of a protective relay.	6	L2	CO1
	b.	Derive an expression for torque produced by an Induction Relay.	8	L2	CO1
	c.	List the merits and demerits of static relay.	6	L2	CO1
OR					
Q.2	a.	Discuss various zones of protection for a modern power system.	5	L2	CO1
	b.	Write a short not on Automatic Reclosure.	5	L2	CO1
	c.	Define the following terms : i) Relay ii) Operating force iii) Pick up level iv) Reset v) Current setting.	10	L1	CO1
Module – 2					
Q.3	a.	Discuss a protection scheme for parallel feeder.	6	L2	CO2
	b.	Distinguish between Earth Fault Relay and Over Current Relay.	6	L2	CO2
	c.	Explain 3 stepped distance protection of transmission line.	8	L2	CO2
OR					
Q.4	a.	Discuss a protective scheme for ring main feeders.	6	L2	CO2
	b.	With a neat block diagram, explain the microprocessor based impedance relay.	8	L2	CO2
	c.	With a neat block diagram, explain the static inverse time overcurrent relay.	6	L2	CO2
Module – 3					
Q.5	a.	With a neat sketch, discuss the phase comparison scheme for carrier current protection.	7	L2	CO3
	b.	With Schematic diagrams, explain balanced (opposed) voltage differential protection.	7	L2	CO3
	c.	With a neat diagram, explain the working of Buchholz Relay.	6	L2	CO3

OR					
Q.6	a.	With a neat diagram, explain percentage differential protection of star-delta connected transformer.	8	L2	CO3
	b.	Explain the protection of a generator against i) Loss of excitation ii) Stator interturn fault.	8	L2	CO3
	c.	With a neat sketch, explain differential scheme for bus zone protection.	4	L2	CO3
Module – 4					
Q.7	a.	Discuss the Recovery Rate Theory and Energy Balance Theory of arc interruption in AC circuit Breaker.	6	L2	CO4
	b.	With a neat sketch and waveform, explain the interruption of capacitive current.	6	L2	CO4
	c.	Derive an expression for restriking voltage and rate of rise of restriking voltage.	8	L2	CO4
OR					
Q.8	a.	With a neat sketch, explain the working of axial blast Circuit Breaker.	7	L2	CO4
	b.	State the advantages and disadvantages of SF ₆ Circuit Breaker.	5	L2	CO4
	c.	Explain the procedure adopted in Unit test and synthetic testing of Circuit Breaker.	8	L2	CO4
Module – 5					
Q.9	a.	Define the following terms : i) Fuse ii) Fuse element iii) Rated current iv) Minimum fusing current v) Fusing factor.	6	L1	CO5
	b.	Describe the construction and operation of the HRC Cartridge fuse with indicator. Write application of the HRC fuse.	8	L2	CO5
	c.	Write discrimination between fuse and over current protective devices.	6	L1	CO5
OR					
Q.10	a.	Write note on Klydonograph and Magnetic link.	8	L1	CO5
	b.	What is a Gas Insulated Substation? Discuss its advantages and disadvantages as compared to conventional air insulated substation.	8	L2	CO5
	c.	Write short note on Arcing horn with diagram.	4	L1	CO5

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Seventh Semester B.E./B.Tech. Degree Examination, June/July 2026

Industrial Drives and Application

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.	With a neat diagram, state the essential parts of an electric drive system. Explain briefly.	10	L2	CO1
	b.	A weight of 500 kg is being lifted up at a uniform speed of 1.5 m/s by a which driven by a motor running at a speed of 1000 rpm. The moment of inertia of the motor and which are 0.5 and 0.3 kg-m ² respectively. Calculate the motor torque and equivalent moment of inertia referred to the motor shaft. In the absence of weight, motor develop a torque of 100 N-m, when running at 1000 rpm and efficiency of 100%.	10	L4	CO1
OR					
Q.2	a.	Explain the speed torque conventions and multi quadrant operation of motor driving a hoist load.	10	L2	CO1
	b.	A 6-pole, 50 Hz, 3 phase wound Rotor IM has a flywheel coupled to its shaft. The total moment of inertia of motor load flywheel is 1000 kg-m ² . Load torque is 1000 N-m of 10s duration followed by a no load period which is long enough for the drive to reach its no load speed. Motor has a slip of 3% at a torque of 500 N-m. Calculate (i) Maximum torque developed by the motor. (ii) Speed at the end of Deceleration period. Assume motor speed torque curve to be a straight line in the operating range.	10	L4	CO1
Module – 2					
Q.3	a.	With a neat circuit and graph, explain the regenerative dynamic and plugging type of braking system for separately excited DC shunt motor.	12	L2	CO2
	b.	A 200 V, 10.5 A, 2000 rpm shunt motor has the armature and field resistance of 0.5 Ω , 400 Ω respectively. It drives a load whose torque is constant at rated motor torque. Calculate motor speed if the source voltage drops to 175 V.	8	L4	CO2
OR					
Q.4	a.	Explain the operation of single phase fully controlled rectifier control of separately excited DC motor.	12	L2	CO2
	b.	A 220 V, 970 rpm, 100 A dc separately excited motor has an armature resistance of 0.05 Ω . It is braked by plugging from an initial speed of 1000 rpm. Calculate : (i) Resistance to be placed in armature circuit to limit braking current to twice the full load value. (ii) Braking torque (iii) Torque when the speed has fallen to zero	8	L4	CO2

Module – 3					
Q.5	a.	Explain the effect of unbalanced voltage and single phasing on the IM performance.	10	L2	CO3
	b.	Explain the plugging of 3 phase IM with speed torque characteristics.	10	L2	CO3
OR					
Q.6	a.	Variable frequency control of IM is more efficient than stator voltage control, why?	10	L2	CO3
	b.	A 2200 V, 50 Hz, 3 phase, 6-pole Y-connected squirrel cage IM has the following parameters : $R_s = 0.075 \Omega$, $R_r = 0.12 \Omega$, $X_s = X_r' = 0.5 \Omega$. The combined inertia of motor and load is 100 kg-m^2 . Calculate time taken and energy dissipated in the motor during starting.	10	L4	CO3
Module – 4					
Q.7	a.	With block diagrams, explain various schemes of voltage source inverter control of three phase IM drive.	10	L2	CO4
	b.	Explain the static Scherbius drive scheme of slip power recovery in Induction Motor.	10	L2	CO4
OR					
Q.8	a.	Explain the operation of self controlled synchronous motor drive employing load commutated Thyristor inverter.	10	L2	CO4
	b.	A 500 kW, 3 phase, 3.3 KV, 50 Hz, 0.8 lagging power factor, 4 pole, star connected synchronous motor has following parameter : $X_s = 15 \Omega$, $R_s = 0$, rated field current is 10 A. Calculate : (i) Armature current and power factor at half the rated torque and rated field current. (ii) Field current to get unity power at the rated torques.	10	L4	CO4
Module – 5					
Q.9	a.	What are the main features of stepper motors, which are responsible for its wide spread use. Also mention its advantages.	10	L2	CO5
	b.	With the help of block diagram, explain the closed loop variable speed drive employing sinusoidal PMAC motor fed from current regulated voltage source inverter.	10	L2	CO5
OR					
Q.10	a.	Explain with diagrams, screw down operation in a rolling mill drive.	10	L2	CO5
	b.	With schematic, explain the wire section in paper mill drive and mention the types of motors, used in paper mill drive.	10	L2	CO5

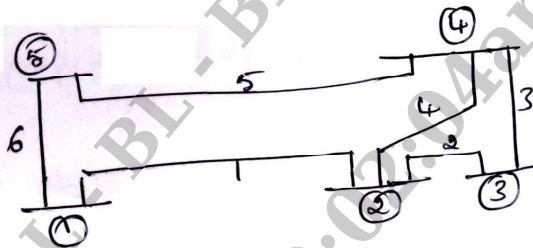
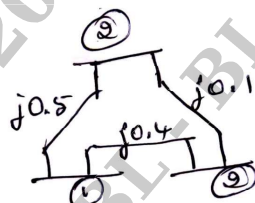
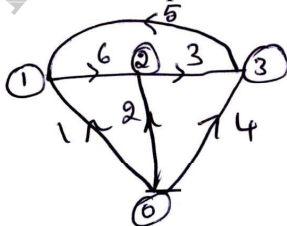
Seventh Semester B.E./B.Tech. Degree Examination, June/July 2026

Power System Analysis - II

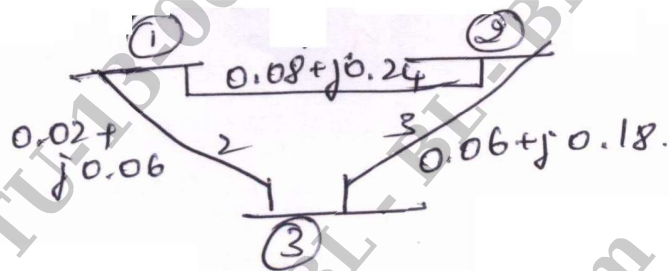
Time: 3 hrs.

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.	Explain with an example, primitive networks in, (i) Impedance form (ii) Admittance form		6	L2	CO1
	b.	Explain with an example, (i) Oriented graph (ii) Basic cutsets (iii) Basic loops		6	L2	CO1
	c.	For the network shown in Fig. Q1 (c) below, draw the graph and mark a tree. How many trees will this graph have? Mark the basic cutsets and basic loops.	 Fig. Q1 (c)	8	L3	CO1
OR						
Q.2	a.	For the system shown in Fig. Q2 (a). Obtain Y_{Bus} by inspection method. Take bus ① as reference. The marked impedances are in p.u.	 Fig. Q2 (a)	6	L3	CO1
	b.	For the network shown in Fig. Q2 (b) form the bus incidence matrix A, branch path incidence matrix K and loop incidence matrix C.	 Fig. Q2 (b)	6	L3	CO1

	c.	Derive an expression for bus admittance matrix (Y_{Bus}) using singular transformation method.	8	L2	CO1
Module – 2					
Q.3	a.	Explain with suitable algorithmic steps involved in, Gauss-Seidal iterative method for load flow solution (GSLF) method.	6	L2	CO2
	b.	Explain the importance of load flow studies in power system analysis.	6	L2	CO2
	c.	Derive the static load flow equations (SLFE) (in polar form).	8	L2	CO2
OR					
Q.4	a.	For the power system shown in Fig. Q4 (a) all buses except slack bus are PQ buses. Calculate the voltages at the end of 1 st iteration using Gauss Seidal Load Flow (GSLF) method.	10	L3	CO2
		Fig. Q4 (a)			
	b.	What are the constraints to be considered for a load flow solution?	5	L2	CO2
	c.	Classify the Buses in power system for conduction of load flow solution.	5	L2	CO2
Module – 3					
Q.5	a.	A sample 3 Bus system has slack bus, PQ Bus, PV Bus (one each). Write the structural form power system Jacobian matrix (J) with necessary equations to calculate its elements.	10	L2	CO3
	b.	Explain with a flowchart Newton Raphson Load Flow (NRLF) method to solve load flow problem (Polarform).	10	L2	CO3
OR					
Q.6	a.	Explain in brief the important assumption made in arriving at Fast Decoupled Load Flow method (FDLF) from NRLF method.	10	L2	CO3
	b.	Explain with a flow chart FDLF method (in polar form).	10	L2	CO3
Module – 4					
Q.7	a.	A power plant consisting of two units $IC_1 = 40 + 0.2p_1$ and $IC_2 = 30 + 0.25p_2$. Find the total yearly saving in fuel cost in rupees for optimal scheduling of a load of 130 MW as compared to equal distribution of same load between them.	8	L3	CO4
	b.	Write a brief note on the performance curves of a thermal power station for economic load dispatch neglected.	6	L2	CO4

	c.	Derive the expression for economic dispatch with transmission load dispatch studies.	6	L2	CO4
OR					
Q.8	a.	Derive an expression for condition for economic load dispatch including transmission loss (B-coefficients).	8	L2	CO4
	b.	Explain the algorithm steps in dynamic programming approach to solve unit commitment problem.	8	L2	CO4
	c.	What is unit commitment? What are the constraints to be considered in unit commitment? Explain in brief.	4	L1	CO4
Module – 5					
Q.9	a.	Consider the system in Fig.Q9 (a), obtain Z_{Bus} by using Building algorithm.	10	L3	CO5
		 Fig. Q9 (a)			
	b.	Explain with necessary equations the Z_{Bus} formulation under the following modification - Type – 1, Type – 2, Type – 3, Type – 4 (without mutual coupling)	10	L2	CO5
OR					
Q.10	a.	Write an explanatory note on methods employed for numerical solution of swing equation : (i) Runge Kutta method (ii) Point by Point method.	10	L2	CO5
	b.	Derive the swing equation for conducting power system stability studies.	10	L2	CO5

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Seventh Semester B.E./B.Tech. Degree Examination, June/July 2026

Electric Vehicle Technologies

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.	State the advantages of electric vehicle over the IC engine vehicles. Also state the difference in architecture between IC engine vehicles and electric vehicles.	10	L2	CO1
	b.	Explain the general configuration of Electric Vehicles with neat block diagram.	10	L2	CO1
OR					
Q.2	a.	Define : i) Speed Ratio ii) Rolling Resistance iii) Aero dynamic drag iv) Tractive effort.	10	L1	CO1
	b.	With neat sketch, explain the architecture of Hybrid Electric Drive Trains.	10	L2	CO1
Module – 2					
Q.3	a.	Define series hybrid electric drive train and explain the configuration of series hybrid electric drive train with neat diagram with different operating modes.	12	L2	CO2
	b.	Explain the Power Rating Design of the traction motor of series hybrid drive train with speed torque characteristics of an electric motor.	8	L3	CO2
OR					
Q.4	a.	Explain the following control strategies employed in a parallel hybrid electric drive train. i) Max.SOC of PPS control strategy ii) Engine on-off control strategy	12	L2	CO2
	b.	With neat schematic diagram, explain the operation of parallel hybrid electric drive train.	8	L2	CO2

Module – 3					
Q.5	a.	Explain the following Battery parameters : i) Battery capacity ii) Open circuit voltage iii) Discharge rate iv) State of charge.	12	L2	CO3
	b.	With neat sketch, explain the components of Battery cell.	8	L2	CO3
OR					
Q.6	a.	Explain with neat sketch, the basic principle and operation of fuel cell.	10	L2	CO3
	b.	List the different types of fuel cells. And explain the Proton Exchange Membrane Fuel Cell (PEMFC)	10	L2	CO3
Module – 4					
Q.7	a.	What are DC Fast Chargers? Explain the working principle of dc fast chargers.	8	L2	CO4
	b.	With neat block diagram, explain the Electric Vehicle Charging Station Architecture in detail.	12	L2	CO4
OR					
Q.8	a.	Explain the control structure of micro grids.	12	L3	CO4
	b.	Write a note on V2G power converter and G2V power converter.	8	L2	CO4
Module – 5					
Q.9	a.	Explain the architecture of vehicle supervisory controller.	10	L2	CO5
	b.	What is Power Split Hybrid? Explain the operation of mechanical power split hybrid mode.	10	L2	CO5
OR					
Q.10	a.	What do you mean by Modal Control Strategy? Explain the series and parallel control strategies in Hybrid Electric Vehicles.	12	L3	CO5
	b.	What is Regeneration? Explain the principle of Regeneration mode in Hybrid Electric Vehicle.	8	L3	CO5

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BEE755B

Seventh Semester B.E./B.Tech. Degree Examination, June/July 2026

Energy Conservation and Audit

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.	Differentiate between Primary and Secondary energy sources with examples.	10	L2	CO1
	b.	Discuss the term 'Long Term Energy Scenario' for India.	10	L2	CO1
OR					
Q.2	a.	What are the salient features of Energy Conservation Act 2001?	10	L2	CO1
	b.	Explain Energy Sector Reforms and Energy Security.	10	L2	CO1
Module – 2					
Q.3	a.	Define Power Factor. Explain the importance of power factor improvement.	10	L1	CO1
	b.	With a neat sketch, explain the construction and working of a soft starter.	10	L1	CO1
OR					
Q.4	a.	What is Electricity Billing? Explain two types of electricity billing.	10	L1	CO2
	b.	Explain Energy Efficient Motors and Variable speed drives.	10	L2	CO2
Module – 3					
Q.5	a.	What is Energy Audit? Explain its importance and advantages of energy audit.	10	L2	CO3
	b.	What are the different types of energy audit? Explain briefly.	10	L1	CO3
OR					
Q.6	a.	Explain the energy use profiles and audits for constructing the energy use profile.	10	L2	CO3
	b.	What are the steps involved in Detailed Energy Audit.	10	L1	CO3
1 of 2					

Module – 4

Q.7	a.	What are the distinguished features of electricity as a commodity?	10	L1	CO4
	b.	Explain the pillars of market design of electricity as commodity.	10	L2	CO4

OR

Q.8	a.	Distinguish between Conventional Tariff and Availability Based Tariff.	10	L2	CO4
	b.	Explain framework of Indian Power Sector.	10	L2	CO4

Module – 5

Q.9	a.	What is Demand Side management? Explain the scope of DSM and evolution of DSM.	10	L2	CO5
	b.	Explain the DSM planning and implementation.	10	L2	CO5

OR

Q.10	a.	What are the Energy Saving Tips applicable to the buildings?	10	L1	CO5
	b.	Explain Water Audit and method of Water Audit.	10	L2	CO5

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