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PES University, Bengaluru

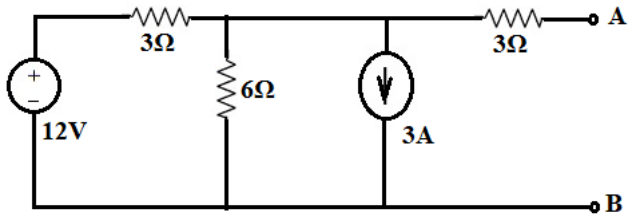
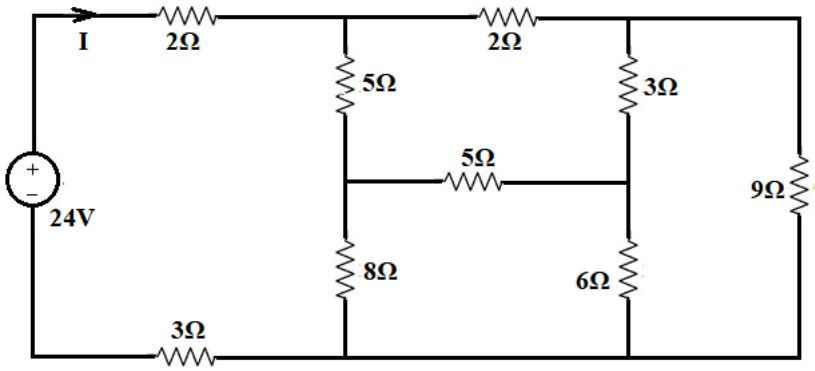
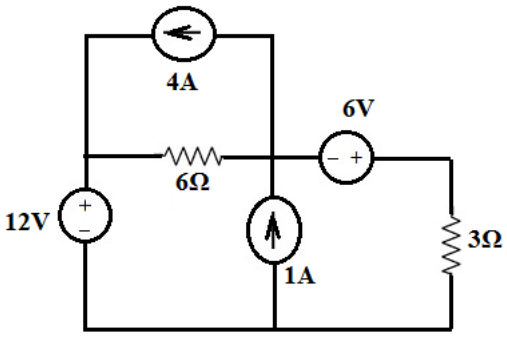
(Established under Karnataka Act No. 16 of 2013)

UE20EE101

AUGUST 2021: END SEMESTER ASSESSMENT (ESA) B TECH II SEMESTER

UE20EE101 – ELEMENTS OF ELECTRICAL ENGINEERING

Time: 3 Hrs	Answer All Questions	Max Marks: 100

1	a)	Obtain the Thevenin's equivalent across the terminals A & B in the network shown below: 	6M
	b)	Determine the source current I in the network shown below by applying star delta transformations: 	6M
	c)	Find the current through 3Ω resistor in the network shown below using Superposition Theorem: 	8M
2	a)	A series RLC circuit draws a current of 10A when connected to 230V, 50Hz supply. If the total active power drawn from the source is 500W and the circuit behaves effectively like a capacitive circuit (series RC type), determine i) Power factor of the circuit ii) Capacitance in the circuit if Inductance is 10 mH	6M

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	b)	Three circuit elements R = 6Ω, L = 6.366mH and C = 318.31μF are connected in parallel across a 230V, 50Hz single phase AC supply. Determine i) Admittance of each branch ii) Input Admittance iii) Supply Current	6M
	c)	An AC circuit has two branches A & B connected in parallel across a 200V, 50 Hz supply. Branch A consists of a coil with inductance 19.1mH and resistance 8Ω. Branch B takes a leading current from the supply. If the total power drawn from the source is 5 KW and the overall power factor is 0.95 Lag, determine the resistance and capacitance in branch B.	8M
3	a)	With a neat labelled circuit diagram, derive the relationship between line current and phase current in a balanced delta connected three phase system.	6M
	b)	A balanced three phase star connected load is supplied from a balanced three phase 400V, 50Hz system. The current in each phase is 30A and lags by 60° behind that phase voltage. Determine i) Resistance and Inductance per phase ii) Total Reactive Power Draw a neat labelled phasor diagram representing the three phase voltages and three phase currents, considering the first phase voltage as reference.	6M
	c)	Draw a neat circuit diagram representing two wattmeter method of measuring three phase active power. With the help of a neat phasor diagram derive an expression to find power factor.	8M
4	a)	A 10KVA single phase transformer working on a 50Hz AC supply supplies power at a load voltage of 500V. If the maximum value of core flux is 10mWb and number of primary turns is 400, determine i) Number of secondary turns ii) Primary induced EMF iii) Full load primary and secondary currents iv) Net cross-sectional area of the core if maximum flux density is 1.4T	6M
	b)	With proper nomenclature, derive the electromagnetic torque equation of a DC Motor.	7M
	c)	A 4 pole three phase Induction Motor is supplied power from 415V, 50 Hz three phase supply. It has no load and full load slips of 1% and 4% respectively. Determine i) Synchronous speed ii) Motor Speed and Rotor frequency under No load condition iii) Motor Speed and Rotor frequency under Full load condition iv) Rotor frequency when the motor is just about to start	7M
5	a)	Write a short note on i) MCB ii) Pressure Cables	4M
	b)	The power consumed in the inductive load is 5 KW at 0.6 lagging power factor. The input voltage is 230 V, 50 Hz (Single Phase). Find the value of the capacitor C which must be placed in parallel, such that the resultant power factor of the input current will be 0.95 lagging.	8M

c) The following table gives average consumption hours for various loads in a typical household: 8M

S.No.	Name of the Appliance	Wattage	Average consumption hours per day
1.	Four LED Bulbs	15W each bulb	8 hours each bulb
2.	Four Ceiling Fans	60W each fan	10 hours each fan
3.	Television	50W	8 hours
4.	Refrigerator	150W	24 hours
5.	Water Pump	750W	30 minutes
6.	Geyser	1KW	1 hour

Considering a 30-day month, Determine

i) the total number of units consumed in a month.

ii) Monthly bill for the above consumption units considering a domestic connection of 3KW sanctioned load with the tariff details listed in a table below

S.No.	Type of Charges	Tariff Details
1.	Fixed Charges for the sanctioned load	Rs. 85/- For first kW Rs. 95/- For every additional kW
2.	Energy consumption Charges	0 – 50 Units @ Rs. 4.1/- Per Unit 51 – 100 Units @ Rs. 5.55/- Per Unit 101 – 200 Units @ Rs. 7.1/- Per Unit Above 200 Units @ Rs. 8.15/- Per Unit
3.	Fuel Adjustment Charges	@ 8 Paise per unit consumed
4.	Tax applicable only for units consumed	@ 9% (Note: Only applicable for Units consumed and not for Fixed charges and fuel adjustment charges)

Consider an overall tax of 9% only on energy consumption charges.