SRN | | | | | | | | | | | | |

PES University, Bengaluru

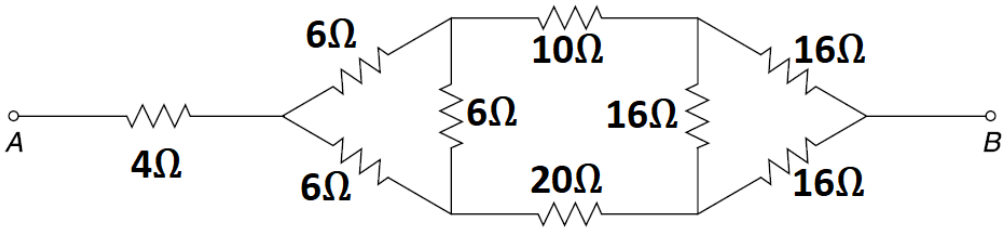
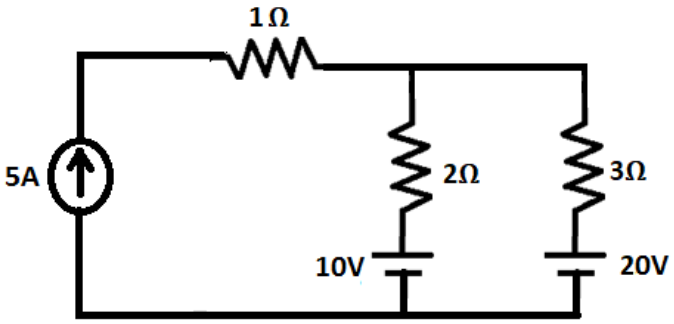
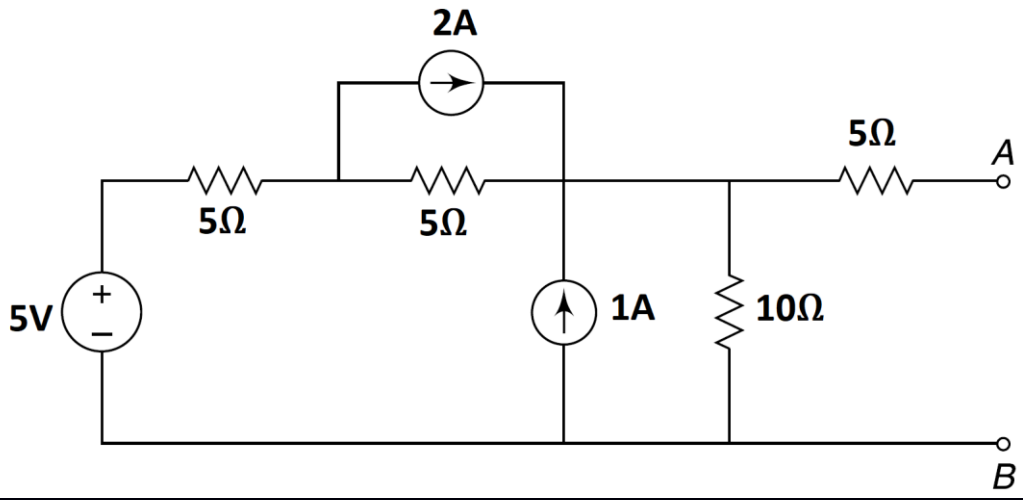
(Established under Karnataka Act No. 16 of 2013)

UE21EE141A

MARCH 2022: END SEMESTER ASSESSMENT (ESA) B TECH I SEMESTER

UE21EE141A – ELEMENTS OF ELECTRICAL ENGINEERING

Time: 3 Hrs	Answer All Questions	Max Marks: 100

1	a)	Obtain the equivalent resistance between the terminals A & B in the given network: 	6M
	b)	Determine the current through 2Ω resistor in the given network using Superposition Theorem. 	6M
	c)	Obtain the Thevenin's Equivalent of the given network between the terminals A & B. 	8M
2	a)	Impedance of a two-element parallel AC network is (6+j8) Ω. Determine the elements and their values if the supply frequency is 50Hz.	4M

SRN | | | | | | | | | | | |

	b)	A series RLC circuit consumes 2KW of power when connected across 200V, 50Hz Single phase AC supply. If the overall resistance of the circuit is 5Ω and the circuit behaves effectively as Capacitive type (series RC type), determine i) Power factor of the network ii) Total Reactive Power iii) Capacitance, if the inductance is 10mH What is the value of extra inductance to be connected in series so that circuit will be in resonance?	8M
	c)	Two branches A & B are connected in parallel across a 200V, 50 Hz, Single phase AC supply. If branch A carries a current of 2A at 0.8 lagging power factor and the supply current is 5A at 0.985 lagging power factor, determine i) Impedance of each branch ii) Power consumed by branch B Draw the phasor diagram of the circuit representing the supply voltage, branch currents and the supply current.	8M
3	a)	With a neat labelled circuit diagram, derive the relationship between line voltage and phase voltage in a balanced star connected three phase system.	6M
	b)	A balanced delta connected three phase inductive load draws real and apparent powers of 16KW & 20KVA from a balanced three phase 400V, 50Hz supply. Determine i) Line current ii) Impedance per phase iii) Power factor of the Load iv) Resistance & Inductance per phase	6M
	c)	Three impedances (6+j8) Ω each are connected in delta across a balanced three phase 400V, 50Hz supply. Determine i) Line current ii) Readings of the two wattmeters connected to measure the input power. If this delta load is reconnected as star load and the supply voltage is reduced to 200V, determine the new values of line current & wattmeter readings.	8M
4	a)	An 8 pole, 50Hz three phase induction motor runs at a speed of 740 rpm under No Load condition & has a slip of 5% under Full load condition. Determine i) Synchronous speed ii) Slip under No Load condition iii) Full load speed iv) Frequency of rotor currents under Full load v) Frequency of rotor currents when the motor is standstill	6M
	b)	A 10KVA, 2000V/200V, 50 Hz, Single phase transformer has 75 turns on its secondary. If the net cross sectional area of the core is 100 cm^2, determine i) Rated primary and secondary currents ii) Number of Primary turns iii) Primary and Secondary currents under half-load condition iv) Maximum value of Flux Density in the core v) EMF induced per turn on either side	7M
	c)	With proper nomenclature, derive the EMF equation of a DC Generator.	7M

SRN | | | | | | | | | | | |

5 a) Write a short note on the following: 4M

i) Fuse

ii) Classification of cables based on voltage rating

b) Three Loads are connected across a single-phase AC supply with particulars as follows: 6M

Load 1: Heating Load of 5KW

Load 2: Inductive Load of 5KVA at 0.8 Lagging Power factor

Load 3: Inductive Load of 3KW at 0.6 Lagging Power factor

Determine

i) Total Active Power & Reactive Power

ii) Total Apparent Power

iii) Over all Power factor

What must be the KVAR rating of Capacitor to be connected in Parallel to bring Power factor to Unity?

c) The following table gives average consumption hours for various loads in a typical household: 10M

S.No.	**Name of the Appliance**	**Wattage**	**Average consumption hours per day**
1.	Air conditioner	2000W	1 Hour
2.	TV	50W	8 hours
3.	Three LED Bulbs	20W each bulb	6 hours each bulb
4.	Two Ceiling Fans	75W each fan	8 hours each fan
5.	Refrigerator	100W	24 hours
6.	Water Pump	750W	30 minutes

Considering a 30-day month, determine

i) Total number of units consumed in a month

ii) Monthly bill for the above consumption units considering a domestic connection of 5KW sanctioned load with tariff details listed in a table below:

S.No.	Type of Charges	Tariff Details
1.	Fixed Charges for sanctioned load	Rs. 85/- for first KW Rs. 95/- for every additional KW
2.	Energy Consumption Charges	0 to 50 units ----- Rs. 4.1 per unit 51 to 100 units ----- Rs. 5.55 per unit 101 to 200 units ----- Rs. 7.1 per unit Above 200 units ----- Rs. 8.15 per unit
3.	Fuel Adjustment Charges	@ 14 Paisa per unit of energy consumed

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