SEE MODEL QUESTION PAPER

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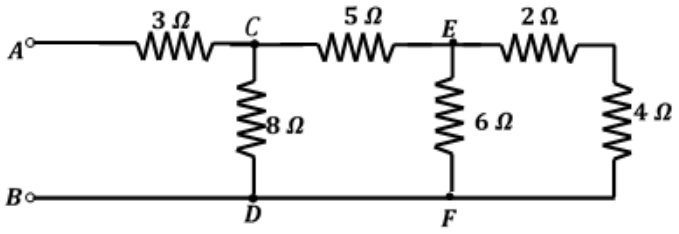
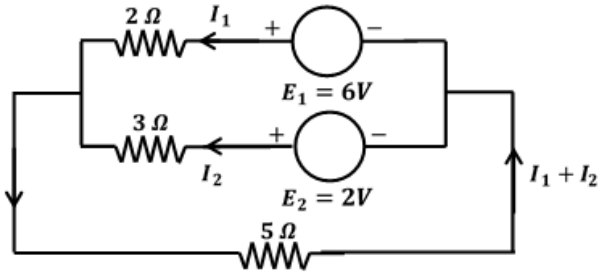
21ELE14

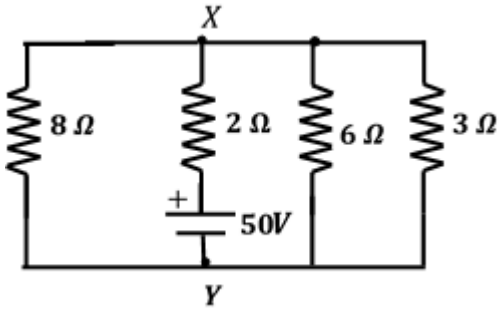
First Semester B.E. Degree Examination, March- 2022

Fundamentals of Electrical Engineering

Time: 3 hrs. **Max. Marks: 100**

Note: answer any Five full questions, choosing ONE full question from each module.

Q. No.		MODULE - 1	Marks
1	a	Show that two resistors connected in series share the total voltage directly proportional to their resistances.	06
	b	Outline the properties of series connection of resistors.	04
	c	Six resistors are connected as shown in Fig.1(c). If a battery having an e.m.f. of 24 volts and internal resistance of 1 Ω is connected to the terminals A and B, Solve for the current from the battery.  Fig.1(c)	04
	d	For the circuit shown in Fig.1(d), use branch current method of analysis and solve for currents in all resistors.  Fig.1(d)	06
2	a	Show that two resistors connected in parallel share the total current inversely proportional to their resistances	06
	b	Two resistors R1 and R2 are connected in parallel across a 250 V source and the total current drawn is 25 Amperes. If the power developed in one of the resistors is 1500 Watt, solve for the values of R1 and R2.	06

	c	For the circuit shown in Fig.2 (c), use node voltage method of analysis and solve for currents in all resistors.  Fig.2 (c)	**08**
		MODULE - 2	
3	**a**	Explain the following with respect to a sinusoidal alternating quantity: (i) Average Value (ii) Form Factor (iii) Peak Factor	**06**
	b	Show that in a pure inductor the current lag behind the voltage by 90°. Also draw the waveform for voltage and current.	**06**
	c	Two impedances $Z_1 = 3 - j4\ \Omega$ and $Z_2 = 4 + j3\ \Omega$ are connected in parallel across 150 V, 50 Hz supply. Solve for i) Current in each impedance, ii) total current, iii) power factor and iv) total power in the circuit.	**08**
4	**a**	Explain the root mean square (RMS) value of a sinusoidal alternating quantity. show that the RMS value is 0.707 times the maximum value.	**06**
	b	Show that in a series R-L circuit the average power P = VI cos Φ, where V and I are RMS values of voltage and current and Φis the angle between them.	**06**
	c	A series R-L-C circuit has the following circuit constants: $R = 12\Omega, L = 0.15\ H$ and $C = 130\mu F$. If the circuit is connected across a 100 V, 50Hz supply, solve for i) the impedance, ii) current, iii) real power and iv) reactive power of the circuit.	**08**
		MODULE - 3	
5	**a**	With the help of a phasor diagram, show that in a three phase balanced star connected system the line to line voltage is 1.732 times the phase to neutral voltage.	**06**
	b	Develop the EMF equation of three phase star connected alternator.	**06**
	c	A balanced delta connected load of $4 + j3\ \Omega$ is connected to a 3-phase, 400 V supply. Solve for i) line current, ii) Total apparent power, iii) power factor, iv) real power and v) reactive power.	**08**
6	**a**	With the help of neat sketches, explain the construction of different types of rotors of three phase alternators	**06**
	b	Show that two watt meters are sufficient to measure power in three phase star connected system	**06**
	c	A three phase, 50 Hz, 16 pole alternator with star connected winding has 144 slots with 10 conductors per slot. Solve for, i) Synchronous speed and ii) the line value of	**08**

		induced emf. Assume that flux per pole is 24.8milli Weber. Take winding factor K_w= 0.96.	
		MODULE - 4	
7	**a**	With neat sketches, explain different rotors used in induction motors.	**06**
	b	Compare Core and Shell type transformers.	**06**
	c	A transformer is rated at 100KVA. At full load its copper loss is 1200 W and its iron loss is 960 W. Solve for (a) the efficiency at full load, unity power factor (b) efficiency at half full load, 0.8 power factor.	**08**
8	**a**	Explain the concept of rotating magnetic field in a three phase induction motor	**10**
	b	Develop the emf equation of a single-phase transformer,	**06**
	c	A three phase induction motor with 6-poles runs on a 400 V, 50Hz supply. If the slip is 5%, Solve for the rotor speed and frequency of induced currents in the rotor.	**04**
		MODULE - 5	
9	**a**	With the help of a schematic diagram, explain power generation using wind energy.	**06**
	b	Explain the precautions to be taken against electric shock	**06**
	c	Explain pipe earthing with diagram	**08**
10	**a**	Explain the working of solar power plant with diagram	**06**
	b	Explain the main components of an electric vehicle with the help of schematic diagram.	**08**
	c	Explain the structure of electric supply system with the help of schematic diagram	**06**

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