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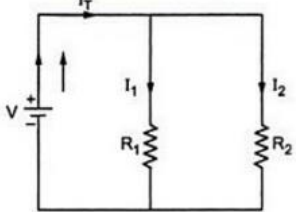
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RV COLLEGE OF ENGINEERING®
 (An Autonomous Institution affiliated to VTU)
I/II Semester B. E. Fast-Track Examinations Jan/Feb - 2023
Common to All Branches
ELEMENTS OF ELECTRICAL ENGINEERING

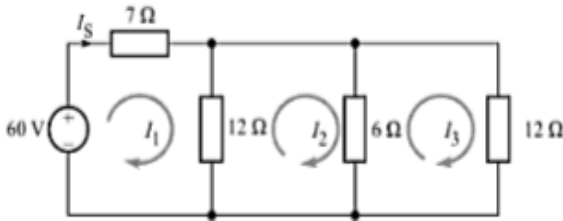
*Time: 03 Hours**Maximum Marks: 100***Instructions to candidates:**

1. Answer all questions from Part A. Part A questions should be answered in first three pages of the answer book only.
2. Answer FIVE full questions from Part B. In Part B question number 2, 7 and 8 are compulsory. Answer any one full question from 3 and 4 & one full question from 5 and 6.

PART-A

1	1.1	Find the magnitude of the total current if $R_1=10\Omega$, $R_2=20\Omega$ and $V=50V$ for the circuit shown in Fig. 1.1.	
		 <p style="text-align: center;">Fig. 1.1</p>	02
	1.2	Define peak factor and form factor of an alternating quantity.	02
	1.3	Draw the phasor diagram and waveform of voltage and current of a RL series circuit.	02
	1.4	Mention any two advantages of three phase over single phase AC voltage.	02
	1.5	The primary of a 50 Hz step down transformer has 480 turns and is fed from 6400V supply. Determine i) the peak value of the flux produced in the core and ii) the voltage across the secondary winding if it has 20 turns.	02
	1.6	A 6 pole induction motor is connected to a 50 Hz supply. It is running at a speed of 970 rpm. Find the synchronous speed and the slip.	02
	1.7	Justify why DC series motors cannot be started without load?	02
	1.8	Mention the type of alternator used in nuclear power station and that in hydel power station.	02
	1.9	List any four factors affecting the choice of wiring system.	02
	1.10	A geyser is rated at 3kW, 230V, 50Hz. If it is switched ON for one hour daily, what would be the energy cost saving, at the rate of Rs. 2.50 per unit if it is replaced by a solar water heater?	02

PART-B

2	a	State and Explain Kirchoff laws.	04
	b	Apply mesh analysis to determine current drawn from the source in the network shown in Fig. 2.b	
	c	Define and derive RMS value of an alternating quantity.	
		 <p>Fig. 2.b</p>	06
3	a	Derive the expression of power in a RLC series circuit. Also draw the relevant phasor diagram and waveforms.	10
	b	Two wattmeter method is used to measure the power absorbed by a 3-phase induction motor. The wattmeter readings are 12.5kW and -4.8kW. Find i) the power absorbed by the machine ii) Load power factor iii) Reactive power taken by the load.	06
		OR	
4	a	With circuit diagram and phasor diagram show that two wattmeter's are enough to measure three-phase power. Also derive the expression for power factor.	10
	b	A pure inductive coil allows a current of 10 A to flow from a 230V, 50 Hz supply. Find i) Inductance of the coil ii) Power absorbed and iii) equations for voltage and current.	06
5	a	With neat sketches explain the constructional features of a single phase transformer.	06
	b	A single phase, 20 kVA transformer has 1000 primary turns and 2500 secondary turns. The net cross sectional area of the core is 100 cm ² , When the primary winding is connected to 500V, 50 Hz supply. Calculate i) the maximum value of the flux density in the core ii) the voltage induced in the secondary winding and iii) the primary and secondary full load currents.	06
	c	A 3 phase, 4 pole , 400V, 50 Hz induction motor runs with a slip of 4%. Find the rotor speed and frequency.	04
		OR	
6	a	Explain with circuit diagram and phasor diagram the concept of rotating magnetic field in an induction motor.	06
	b	A 600 kVA transformer has an efficiency of 92% at full load, unity p.f. and half full load , 0.9 p.f. Determine its efficiency at 75% of full load and 0.9 p.f.	06
	c	A 3 phase induction motor has 6 poles and runs at 960 RPM on full load. It is supplied from an alternator having 4 poles and running at 1500 RPM. Calculate the full load slip and the frequency of the rotor currents of the induction motor.	04

7	a	Draw the cross sectional view of a D.C machine and explain the function of various parts of the same.	06																				
	b	Derive the EMF equation of an Alternator.	06																				
	c	A 3-phase, 10 pole star connected alternator runs at 600 rpm. It has 120 stator slots with 8 conductors per slot and the conductors of each phase are connected in series. Determine the phase and line e.m.f's. If the flux per pole is 56 mWb. Assume full –pitch coils and distribution factor as 0.96	04																				
8	a	Estimate the electricity bill for the following loads																					
		<table><tr><td>Name of the Appliance</td><td>Power Rating (W)</td><td>Avg. Daily Usage Hrs</td><td>No. of Appliances</td></tr><tr><td>CFL</td><td>12</td><td>6</td><td>3</td></tr><tr><td>Fan</td><td>50</td><td>8</td><td>2</td></tr><tr><td>TV (21")</td><td>150</td><td>2</td><td>1</td></tr><tr><td>Computer</td><td>250</td><td>3</td><td>1</td></tr></table>	Name of the Appliance	Power Rating (W)	Avg. Daily Usage Hrs	No. of Appliances	CFL	12	6	3	Fan	50	8	2	TV (21")	150	2	1	Computer	250	3	1	
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	CFL	12	6	3																			
	Fan	50	8	2																			
	TV (21")	150	2	1																			
	Computer	250	3	1																			
	Take electricity cost to be Rs.6 per unit.	06																					
b	With the diagram explain the working of MCB.	05																					
c	What is the necessity of earthing the electrical appliances? Explain with diagram plate earthing.	05																					