EE113ATD / EE123ATD / 22ES24D

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RV COLLEGE OF ENGINEERING®

(An Autonomous Institution Affiliated to VTU)

I / II Semester B. E. Regular / Supplementary Examinations Aug-2024

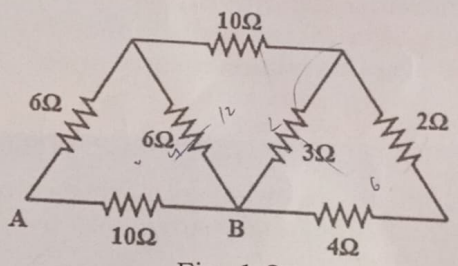
BASICS OF ELECTRICAL ENGINEERING

Time: 03 Hours *Maximum Marks: 100*

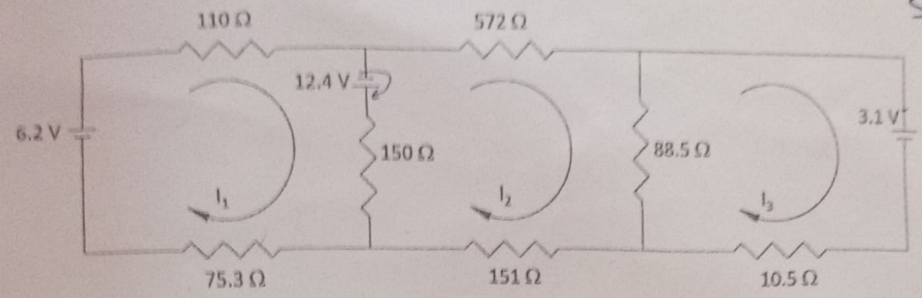
Instructions to candidates:

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 is compulsory. Answer any one full question from 3 and 4, 5 and 6, 7 and 8, 9 and 10.

PART-A

			M	BT	CO
1	1.1	Define Ohm's Law?	01	1	1
	1.2	What is the resistance of a good insulator?	01	3	2
	1.3	Determine the equivalent resistance between AB of the following circuit shown in Fig. 1.3.  Fig. 1.3			
	1.4	List out any two advantages of AC system over DC system.	02	3	2
	1.5	Define Form Factor.	01	2	1
	1.6	The complex Volt Amperes in a series circuit are $(4330 - j2500)$, and the current is $(25 + j43.3)$ A. Find the applied voltage.	01	1	1
	1.7	The power flowing in a 3 –phase, 3 –wire balanced load system is measured by two wattmeter method. The reading in a wattmeter A is 750 W and wattmeter B is 1500 W. What is the system's power factor?	02	3	2
	1.8	What are the different types of losses in transformer and which tests are conducted to calculate the losses?	02	3	2
	1.9	A 3-Phase, 4 pole, 440 V, 50 Hz induction motor runs with a slip of 5%. Find the rotor speed and frequency of the rotor current.	02	1	1
	1.10	Draw the Torque-slip curve for three-phase induction motor.	02	3	2
	1.11	Write down the advantages and disadvantages of Fuse.	02	3	1
	1.12	A geyser is rated at 2 kW, 230 V, 50 Hz. 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	2	1
			02	3	4

PART-B

2	b	State Maximum Power Transfer Theorem and prove that maximum power transfer when $R_L = R_{TH}$. Find the currents I_1, I_2 and I_3 in the circuit shown in Fig. 2b using *KVL/KCL*.  Fig. 2b	08	4	1
3	a	With neat sketch, phasor diagram and necessary waveforms, prove that average power in a pure inductive circuit is zero.	06	1	1
	b	A series *RLC* circuit containing a resistance of 12 Ω, an inductance of 0.15 *H* and a capacitor of 100 μ*F* are connected in series across a 100 *V*, 50 *Hz* supply. Calculate the total circuit impedance, voltage across each element, the circuit current, power factor, actual power consumed, reactive power and draw the voltage phasor diagram.	07	3	2
	c	i) What is resonance condition? ii) What is the power factor at resonance? iii) What is the reactive power at resonance?	03	1	2
		OR			
4	a	With a neat circuit, phasor diagram and waveforms deduce the equations for voltage, current, phase angle and average power for a series *RLC* circuit in different cases: i) $X_L > X_C$; ii) $X_L < X_C$; iii) $X_L = X_C$.	08	1	2
	b	Define: i) Average value ii) *RMS* value iii) Form Factor iv) Peak factor	04	1	1
	c	Derive Average value, *RMS* value, Form factor and Peak factor for sinusoidal current.	04	3	1
5	a	In a three-phase balanced circuit using two-wattmeter method, derive power factor, active power, reactive power and apparent power for the following connections: i) Balanced star-connected load ii) Balanced delta-connected load	10	1	2
	b	A balanced three-phase delta-connected load has per-phase impedance of $(25 + j40)\Omega$. If 400 *V*, 3-phase supply is connected to this load, find: i) phase current ii) line current iii) power supplied to the load.	06	3	1
		OR			

6	a	Prove that the efficiency of the transformer will be maximum when copper losses equal to constant losses.	06	3	1
	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 $p.f$.	08	3	2
	c	Compare core type and shell type transformers.	02	1	2
7	a	With a neat sketch and vector diagram, mathematically explain how the rotating magnetic field is produced in the three-phase induction motor.	08	2	2
	b	A 4 pole, 50 Hz induction motor has a slip of 1% at NO load. When operated at full load, the slip is 2.5%. Find the change in speed from no load to full load.	04	3	3
	c	Distinguish between Squirrel cage and Slip ring induction motor.	04	2	2
		OR			
8	a	Explain the concept of double-revolving field theory.	08	1	2
	b	Name the different types of single-phase induction motors and applications.	05	1	2
	c	A 10-pole induction motor is supplied by a 6-pole alternator, which is driven at 1200 rpm. What is the speed if the induction motor runs with a slip of 3%?	03	3	3
9	a	With the help of a block diagram, explain the concept of power transmission and power distribution.	08	1	3
	b	Estimate the total daily energy requirement for the loads shown in the table below. Also, calculate monthly electricity bill if the electricity cost is $Rs.2$/unit for the first 40 units, $Rs.4$/unit for next 50 units and $Rs.6$/unit for rest of the units.	08	5	4

Name of the appliance	*Power Rating (W)*	*Average daily usage hrs.*	*Number of appliances*
Fan	50	10	4
CFL	12	6	8
LED TV	100	5	2
Refrigerator	300	24	1
Laptop	60	5	1

OR

10	a	Define Earthing, what is the necessity of earthing and types. Explain in detail the plate earthing with neat sketch.	08	1	4
	b	What are the safety precautions to be taken to avoid electric shock?	04	5	4
	c	Differentiate between Fuse and MCB.	04	3	1