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RV COLLEGE OF ENGINEERING
Autonomous Institution affiliated to VTU
I Semester B.E. April -2023 Examinations
ELECTRICAL AND ELECTRONICS ENGINEERING
BASICS OF ELECTRICAL ENGINEERING
(2022 SCHEME)

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, and 9 and 10.

PART-A (Objective type for one or two marks) (True & false and match the following questions are not permitted)			
1	1.1	State Thevenin's theorem. Draw the equivalent circuit.	2
	1.2	The resistance of two coils is 25 ohms when connected in series, and 6 ohms when connected in parallel. Determine the individual resistances of the two coils.	2
	1.3	Define (i) Form factor (ii) Peak factor	2
	1.4	A coil has an inductance of 25 mH and negligible resistance. Calculate its reactance at 50 Hz.	2
	1.5	Three identical resistors of 20 ohm are connected in star to a 415 V, three phase, 50 Hz supply. Calculate the total power taken by the load.	2
	1.6	Two wattmeters are used to measure the power in 3 phase balanced system. What is the power factor when one reads twice the other?	2
	1.7	A 3-phase, 4 pole, 440V, 50Hz induction motor runs with a slip of 4%. Find the rotor speed and frequency of the rotor current.	2
	1.8	List the types of single-phase induction motor.	2
	1.9	What is the purpose of earthing electrical appliances?	2
	1.10	Write any four safety precautions to avoid electric shock.	2
PART-B (Maximum subdivisions is limited to 3 in each question)			
UNIT-I			
2	a	State and prove maximum power transfer theorem for dc circuits.	8
	b	Use Thevenin's theorem to determine the current through and the voltage across the 25 Ω resistor given in Fig. 1. <div style="text-align: center;"> <pre> graph LR Vs[V_s] --- V20[20 V] V20 --- R10_1[10 Ω] R10_1 --- Node1 Node1 --- R10_2[10 Ω] Node1 --- Node2 Node2 --- R10_3[10 Ω] R10_3 --- R25[25 Ω] R25 --- Node3 Node3 --- Node1 </pre> </div>	8
Fig. 1			

UNIT-II																							
3	a	What is an impedance triangle? Explain and draw the impedance triangle for a series RL and series RC single-phase a.c. circuits. Also, deduce an expression for the resonant frequency of a series RLC single-phase a.c. circuit.	10																				
	b	A resistance of $10\ \Omega$ is connected in series with an inductance of 0.05 H and a capacitance of $300\ \mu\text{F}$ to a 100 V a.c. supply. Calculate the value and phase angle of the current when the frequency is 50 Hz .	6																				
OR																							
4	a	Derive the form factor and peak factor of half wave and full wave rectified sine wave.	8																				
	b	A coil and a non-inductive resistor are connected in series across a 200 V , 50 Hz supply. The voltages across the coil and resistor are 120 V and 140 V respectively. If the supply current is 0.5 A , calculate: (i) the resistance and inductance of the coil; (ii) the power dissipated in the coil; (iii) the power factor of the coil; (iv) the power factor of the circuit.	8																				
UNIT-III																							
5	a	With the aid of a phasor diagram, obtain the relationship between the line and phase values of voltage in a three-phase, star connected system.	8																				
	b	A 100 kVA , 50 Hz , $440/11000\text{ V}$, 1-phase transformer has an efficiency of 98.5% when supplying full-load current at 0.8 power factor lagging, and an efficiency of 99% when supplying half full-load current at unity power factor. Find the core losses and the copper losses corresponding to full-load current. At what value of load current will the maximum efficiency be attained?	8																				
OR																							
6	a	Explain briefly the action of a transformer and show that the voltage ratio of the primary and secondary windings is the same as their turns ratio.	6																				
	b	A three-phase load consists of three similar inductive coils, each of resistance $50\ \Omega$ and inductance 0.3 H . The supply is 415 V , 50 Hz . Calculate: (i) the line current; (ii) the power factor; and (iii) the total power when the load is: star-connected and delta-connected.	10																				
UNIT-IV																							
7	a	Explain the working principle of a single-phase induction motor with the help of neat sketch.	8																				
	b	A 4-pole, 3-phase induction motor operates from a supply whose frequency is 50 Hz . Calculate (i) the speed at which the magnetic field of the stator is rotating; (ii) the speed of the rotor when the slip is 0.04 ; (iii) the frequency of the rotor current when the slip is 0.03 .	8																				
OR																							
8	a	Explain the concept of rotating magnetic field of an Induction Motor. Explain and draw the torque-slip characteristic of a three phase induction motor.	10																				
	b	Describe the construction of a single-phase induction motor with the aid of diagram.	6																				
UNIT-V																							
9	a	Explain the concept of power transmission and distribution through block diagrams.	6																				
	b	<p>Discuss the types of tariff of electricity bill.</p> <p>Estimate Total Daily Energy Requirement for the following loads.</p> <table border="1"> <thead> <tr> <th>Name of the Appliance</th><th>Power Rating (W)</th><th>Avg. Daily Usage Hrs</th><th>No. of Appliances</th></tr> </thead> <tbody> <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> </tbody> </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	10
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Fan	50	8	2																				
TV (21")	150	2	1																				
Computer	250	3	1																				

		Take electricity cost to be Rs.6 per unit.	
		OR	
10	a	What are the types of earthing? Explain with diagram any two types of earthing.	8
	b	Write a short note on: i) Fuse and ii) Miniature Circuit Breaker	8

Signature of Scrutinizer:

Signature of Chairman

Name:

Name:

Course Code:	22ES14D
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PART-A

Q.No	1.1	1.2	1.3	1.4	1.5	1.6	1.7	1.8	1.9	1.10
B T	2	2	1	2	2	2	2	1	2	2
COs	1	1	1	1	2	2	3	3	4	4

PART-B

Question No		B T Levels	Cos addressed		Question No		BT Levels	Cos addressed
2	a	3	1		3	a	2	2
	b	3	1			b	3	2
	c					c		
	d					d		
4	a	3	1		5	a	3	2
	b	3	2			b	3	3
	c					c		
	d					d		
6	a	2	3		7	a	3	3
	b	3	3			b	3	3
	c					c		
	d					d		
8	a	3	3		9	a	3	4
	b	3	3			b	3	4
	c					c		
	d					d		
10	a	2	4					
	b	3	4					
	c							
	d							

Signature of Scrutinizer:

Signature of Chairperson:

Name:

Name: