Basavarajeswari Group of Institutions

BALLARI INSTITUTE OF TECHNOLOGY & MANAGEMENT

(Autonomous Institute under Visvesvaraya Technological University, Belagavi)

USN											Course Code	2	1	B	E	E	1	3

First Semester B.E. Degree Make-up Examinations, August 2022

BASIC ELECTRICAL ENGINEERING

(Common to all Branches)

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

Note: ***1. Answer any* FIVE *full questions, choosing* ONE *full question from each module.***
2. Missing data, if any, may be suitably assumed

Q. No		*Question*	*Marks*	*(RBTL:CO:PI)*
		MODULE – 1		
1.	**a.**	State and explain Kirchoff's voltage law with an example.	**04**	(2 :1 : 1.3.1)
	b.	Calculate the current flowing in 1 Ω branch and power supplied by 10 V source of the circuit shown in figure Q1.b.	**08**	(3 :1 : 1.4.1)

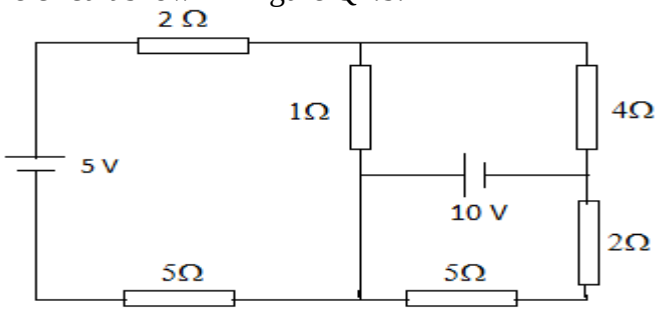

Fig. Q.1b.

	c.	With the help of neat diagrams state and explain Faraday's laws and Lenz's law of electromagnetic induction.	**08**	(2 :1 : 1.3.1)
		(OR)		
2.	**a.**	An expression for sinusoidal voltage and current are given by $v = 70.71\sin(100\pi t)$ volt and $i = 7.071\sin(100\pi t - \pi/3)$ Amp respectively. Show these two quantities as phasors.	**04**	(2 :1 : 1.4.1)
	b.	Calculate current and energy supplied by 6 V source in 2 hours, with (i) 3 Ω alone removed (open) and (ii) 4 Ω alone removed (open) from the circuit shown in Fig. Q2.b.	**08**	(3 :1 : 1.4.1)

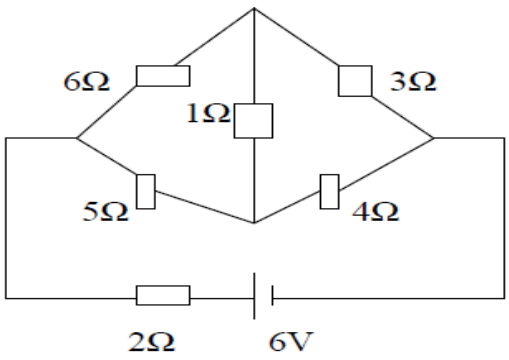

Fig.Q.2b.

	c.	Define RMS, Mean values of sinusoidal voltage and derive an expression for RMS voltage.	**08**	(2 :1 : 1.3.1)

Note: **(RBTL - Revised Bloom's Taxonomy Level: CO - Course Outcome: PI - Performance Indicator)**

MODULE - 2

3.	**a.**	Show that in a purely capacitive circuit, current leads voltage by $\pi/2$ radians. Draw relevant waveforms.	**04**	(2 :2 : 1.3.1)
	b.	With the help of neat circuit diagram and phasor diagram show that line current is $\sqrt{3}$ times phase current and line voltage is equal to phase voltage in a balanced delta connected system.	**08**	(2 :2 : 1.3.1)
	c.	An R-L-C series circuit consisting of R= 5 Ω, L = 0 .12 H and C = 50 μF is connected across a 250 V, 50 Hz supply. Calculate supply current, power factor, apparent power and draw the phasor diagram.	**08**	(3 :2 : 1.4.1)

(OR)

4.	**a.**	State the advantages of 3 phase systems over single phase systems.	**04**	(2 :2 : 1.3.1)
	b.	A parallel combination of two impedances, Z_1= 6+j8 Ω and Z_2= 4-j5 Ω is connected across an AC source of 100 V , 50 Hz. Calculate resistance and reactance of equivalent impedance, current drawn from supply, power factor , real power and draw the phasor diagram.	**08**	(2 :2 : 1.4.1)
	c.	Three impedances each of value (5+j6) Ω is connected in star across a three phase 400 V, 50 Hz AC supply. Determine line current, phase current, power factor and power consumed.	**08**	(3 :2 : 1.4.1)

MODULE-3

5.	**a.**	Neatly sketch cylindrical pole and salient pole rotors of a 2-pole alternator and label its different parts.	**04**	(2 :3 : 1.3.1)
	b.	State working principle of DC generator and derive an EMF equation.	**08**	(2 :3 : 1.3.1)
	c.	A 3-ϕ, 16 pole alternator has star connected armature winding with 114 slots and 10 conductors per slot. The flux per pole is 0.03 Wb and speed is 375 rpm. Find the frequency and the line EMF. Assume pitch factor (k_p)=1 and distribution factor, (k_d)=0.96.	**08**	(3 :3 : 1.4.1)

(OR)

6.	**a.**	Write the EMF equation of an alternator, state what for each symbol stands and define pitch factor.	**04**	(2 :3 : 1.3.1)
	b.	State the applications of series and shunt DC motors.	**08**	(2 :3 : 1.3.1)
	c.	A 4-pole, 240 V wave connected shunt motor when running at 1000 rpm draws line and field current of 51 A and 1 A respectively. Assuming a drop of 1 V per brush and an armature resistance of 0.1 Ω, Determine the torque developed. Also find torque when armature current reduces by 50 %.	**08**	(3 :3 : 1.4.1)

MODULE-4

7.	**a.**	What is a transformer? State its working principle.	**04**	(2 :4 : 1.3.1)
	b.	Explain different losses that occur in transformers and derive the condition for maximum efficiency.	**08**	(3 :4 : 1.3.1)
	c.	Why starters are necessary? With neat diagram explain working of Star – Delta starter used for starting a 3-ϕ induction motor.	**08**	(2 :4 : 1.3.1)

(OR)

8.	**a.**	Derive EMF equation of a transformer.	**04**	(2 :4 : 1.3.1)
	b.	Show that in a three phase induction motor supplied with balanced three phase voltage, a rotating magnetic field of constant magnitude is produced.	**08**	(2 :4 : 1.3.1)
	c.	A transformer is rated at 100 kVA. At full load , unity power factor, its copper loss is 1500 W and iron loss is 960 W. Calculate (i) the efficiency at full load and unity power factor (ii) the percentage loading at which the maximum efficiency occurs at unity power factor and hence the	**08**	(3 :4 : 1.4.1)

maximum efficiency.

MODULE-5

9.	**a.**	List the safety measures to be taken to prevent electric shock.	**04**	(2 :5 : 1.3.1)
	b.	With neat diagram explain plate earthing.	**08**	(2 :5 : 1.3.1)
	c.	With neat diagram explain single line diagram of a power system.	**08**	(2 :5 : 1.3.1)
		(OR)		
10.	**a.**	Compare open and concealed wiring.	**04**	(2 :5 : 1.3.1)
	b.	With neat circuit diagram explain 3-way wiring diagram.	**08**	(2 :5 : 1.3.1)
	c.	With neat block diagram explain generation of energy from wind.	**08**	(2 :5 : 1.3.1)

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Note: (**RBTL - Revised Bloom's Taxonomy Level: CO - Course Outcome: PI - Performance Indicator)**