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 | / | 2 | 3 |

First/Second Semester B.E. Degree Examinations, September/October 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 Kirchhoff's laws.	06	(2 :1 : 1.3.1)
	b.	A current of 10 A flows through two ammeters A and B connected in series. The voltage across A and B are 0.2 V and 0.3 V respectively. Determine how the same current will divide in A and B when they are connected in parallel? Also find the energy dissipated in both the ammeters for 36 min.	07	(3 :1 : 1.4.1)
	c.	Using Kirchhoff's laws determine the magnitude and direction of current in 100 Ω resistor as shown in Fig.Q1(c).	07	(3 :1 : 1.4.1)

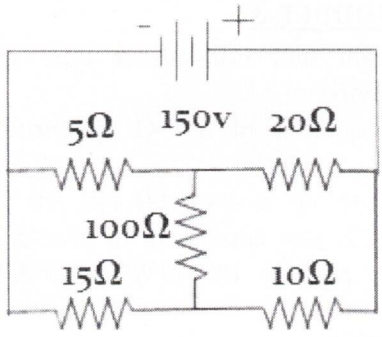

Fig.Q1(c)

(OR)

2.	a.	Show that the numerical value of $V_{rms} = 0.707\ V_m$ in 1-Ø AC system.	07	(3 :1 : 1.3.1)
	b.	Explain with relevant diagrams the generation of sinusoidal voltage in a 1-Ø AC system.	06	(2 :1 : 1.3.1)
	c.	Three alternating currents $i_1 = 141\sin(\omega t + \pi/4)$ A, $i_2 = 30\sin(\omega t + \pi/2)$ A and $i_3 = 20\sin(\omega t - \pi/6)$ A are fed into a common conductor. Find the equation for the resulting current, its rms value, form factor and peak factor.	07	(3 :1 : 1.4.1)
		MODULE - 2		
3.	a.	With necessary circuit diagram, vector diagram and waveforms prove that the power drawn by the pure inductor in ac circuit is zero.	07	(2 :2 : 1.3.1)
	b.	Using power triangle, define and explain the different types of power in 1-Ø AC system.	06	(2 :2 : 1.3.1)

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

c. For the AC circuit shown in Fig. Q3(c), find the total impedance of the circuit, voltage across 3.2 Ω resistor, real, reactive and apparent power of the circuit. **07** (3 :2 : 1.4.1)

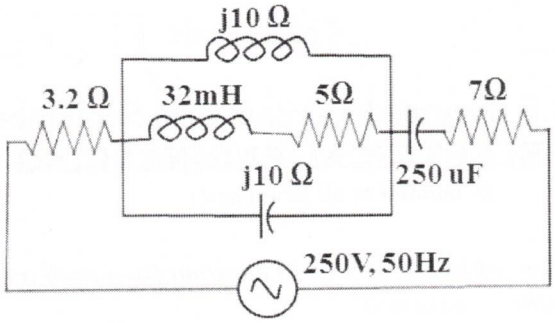

Fig.Q3(c)

(OR)

4. a. Find the relation between the phase and line quantities of voltage and current for a 3-Ø delta connection and deduce the power equation from the same. **07** (2 :2 : 1.3.1)

b. A star connected load consists of 6 Ω resistance, 8 Ω inductive reactance and 6 Ω capacitive reactance in each phase. A supply of 440 V at 50 Hz is applied to the load. Find the line current, power factor and power consumed by the load. **07** (3 :2 : 1.4.1)

c. Briefly explain the functionality of tri-vector meter. **06** (2 :2 : 1.3.1)

MODULE-3

5. a. With a neat sketch explain the salient and non-salient type rotor construction of a 3-Ø synchronous generator. **06** (2 :3 : 1.3.1)

b. Derive the expression for the EMF equation of a 3-Ø synchronous generator. **07** (2 :3 : 1.3.1)

c. Find the number of armature conductors of a 3-Ø, 50 Hz, 10 pole alternator having 90 slots. The winding is star connected to give a line voltage of 11 kV where the flux per pole is 160 mWb. K_p=0.939, K_d=0.959 **07** (3 :3 : 1.4.1)

(OR)

6. a. Derive the expression for the EMF equation of a DC generator. **06** (2 :3 : 1.3.1)

b. A 4 pole, 220 V, lap wound DC shunt motor has 36 slots, 16 conductors per slot. It draws 40 A from the supply. The armature & field resistances are 0.1 Ω & 110 Ω respectively. The motor develops an output of 6 kW and flux per pole is 40 mWb. Calculate (i) speed of the armature, (ii) torque developed by the armature, (iii) shaft torque. **07** (3 :3 : 1.4.1)

c. Illustrate the characteristics of DC shunt and series motor and list their applications. **07** (2 :3 : 1.3.1)

MODULE-4

7. a. With neat sketch explain the constructional details of core and shell type 1-Ø transformer. **06** (2 :4 : 1.3.1)

b. Derive the condition for maximum efficiency of a 1-Ø transformer. **07** (2 :4 : 1.4.1)

c. A 10 kVA, 400/200 V, 50 Hz, 1-Ø transformer has a full load copper loss of 200 W & has a full load efficiency of 96 % at 0.8 pf lag. Determine the iron loss. What would be the efficiency at half the full load at UPF? **07** (3 :4 : 1.4.1)

(OR)

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

8.	a.	In detail, illustrate the concept of rotating magnetic field of a 3-Ø induction motor.	07	(2 :4 : 1.3.1)
	b.	Define slip of a 3-Ø induction motor. Show that frequency of rotor emf $f^{1}=sf$.	07	(2 :4 : 1.3.1)
	c.	A 3-Ø induction motor with 4 poles is supplied from an alternator having 6 poles and running at 1000 rpm. Calculate (i) synchronous speed of an induction motor (ii) motor speed when slip is 0.04 (iii) frequency of the rotor EMF when the speed is 600 rpm.	06	(3 :4 : 1.4.1)

MODULE-5

9.	a.	Illustrate the single line diagram approach of an electric power system.	06	(2 :5 : 1.3.1)
	b.	With neat block diagram explain the concept of producing electric power by solar energy.	07	(2 :5 : 1.3.1)
	c.	Outline the importance of service mains. Also draw the neat layout of overhead service main and label it.	07	(2 :5 : 1.3.1)

(OR)

10.	a.	Illustrate with necessary conditions, how a single lamp is controlled from three different places?	07	(2 :5 : 1.3.1)
	b.	Define earthing and explain the plate earthing in detail.	06	(2 :5 : 1.3.1)
	c.	The domestic power load in a house comprises 8 lamps of 100 W each, three fans of 80 W each, one refrigerator of 0.5 HP and one electric heater of 1 kW. Calculate (i) current drawn from 230 V supply, ii) energy consumed in a day, if on an average only a quarter of the load is present all the time.	07	(2 :5 : 1.4.1)

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