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 Examinations, May 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.	Find the potential difference between the points A and B in the network shown in Fig.Q1 (b).	**07**	(3 :1 : 1.4.1)

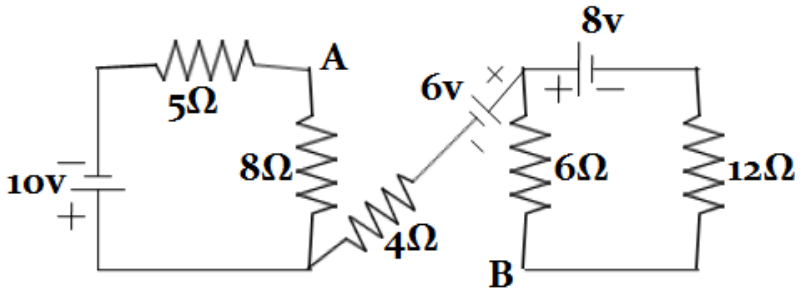


Fig.Q1(b)

	c.	Using Kirchhoff's laws determine the magnitude of currents in all the resistors for the circuit shown in Fig.Q1(c).	**07**	(3 :1 : 1.4.1)

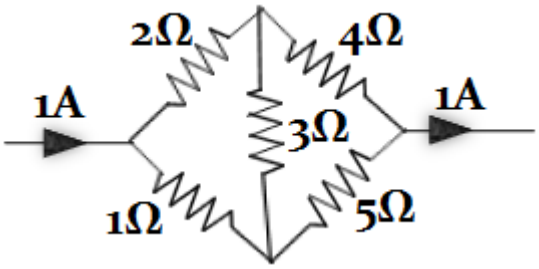


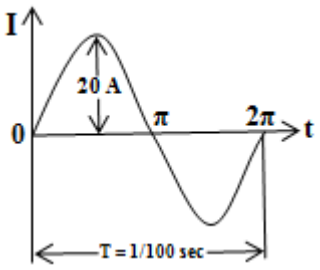
Fig.Q1(c)

(OR)

2.	**a.**	Define RMS value of an alternating quantity. Derive an expression for it in terms of maximum value.	**06**	(3 :1 : 1.3.1)
	b.	Explain with relevant diagram the generation of sinusoidal voltage in a 1-Ø AC system.	**07**	(2 :1 : 1.4.1)
	c.	For the current wave shown in Fig. Q2 (c). Determine i) Peak current ii) Average value iii) RMS value iv) Frequency v) Instantaneous value at t = 3 mS.	**07**	(3 :1 : 1.3.1)

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

Fig. Q2 (c).



MODULE - 2

3.	**a.**	Show that current lagging the voltage by an angle 90^o in case of AC through a pure inductor circuit. Draw necessary circuit diagram, vector diagram and wave forms.	**06**	(2 :2 : 1.3.1)
	b.	An e.m.f is given by $e = 100\sin(\omega t - \pi/4)$ V is applied to a circuit and the current is $i = 20\sin(314t - 1.5708)$ A. Determine frequency and circuit constants.	**07**	(3 :2 : 1.4.1)
	c.	Two circuits A and B are connected in parallel across 200 V, 50 Hz supply. Circuit A consists of 10 Ω resistance and 0.12 H inductance in series while circuit B consists of 20 Ω resistances in series with 40 μF capacitance. Calculate i) current in each branch ii) supply current iii) power dissipated in each branch.	**07**	(3 :2 : 1.4.1)

(OR)

4.	**a.**	Obtain the relation between line and phase voltages in a 3-Ø balanced star connected system.	**07**	(3 :2 : 1.4.1)
	b.	Three identical impedances each of (8+j6) Ω are connected in delta across 440 V, 50 Hz, 3-phase supply. Determine power, reactive power and total volt ampere.	**07**	(3 :2 : 1.4.1)
	c.	Explain tri-vector meter with block diagram.	**06**	(2 :2 : 1.3.1)

MODULE-3

5.	**a.**	Define pitch and distribution factors. Derive an EMF equation of a 3-Ø synchronous generator.	**06**	(2 :3 : 1.3.1)
	b.	Compare the construction of salient and smooth cylindrical rotor synchronous generator with neat diagrams.	**07**	(2 :3 : 1.3.1)
	c.	A 3-ϕ star connected synchronous generator driven at 900 rpm is required to generate a terminal voltage of 400 V at 60 Hz on open circuit. Stator has 48 slots and 4 conductors per slot. Calculate number of poles and flux per pole, winding factor is 0.966.	**07**	(3 :3 : 1.4.1)

(OR)

6.	**a.**	Derive an EMF equation of a DC Generator.	**05**	(2 :3 : 1.3.1)
	b.	A 4 pole, 220V, lap connected DC shunt motor has 36 slots and 16 conductors per slot. It draws a current of 40 A from the supply. The field and armature resistances are 100 Ω and 0.1Ω respectively. The motor develops an output of 6 kW. The flux per pole is 40 mWb. Calculate i) Back e.m.f ii) Speed iii) Gross torque iv) Shaft torque.	**07**	(3 :3 : 1.4.1)
	c.	Illustrate the characteristics of DC shunt and series motor. List their applications.	**08**	(2 :3 : 1.3.1)

MODULE-4

7.	**a.**	Explain different power losses in a transformer.	**06**	(2 :4 : 1.3.1)
	b.	The maximum efficiency of a 10 kVA, 1-Ø transformer is 98 % at full load, 0.8 p.f lagging. Determine the efficiency at i) full load, u.p.f ii) 50 % of full load, 0.8 p.f.	**07**	(3 :4 : 1.4.1)

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

	c.	A 100 kVA, 11000/550 V, 50 Hz, 1-Ø transformer has cross sectional area of 400 cm^2. Find i) number of H.V and L.V turns. ii) e.m.f/turn if flux density is 1.3 T. iii) full load primary and secondary currents.	**07**	(3 :4 : 1.4.1)
		(OR)		
8.	**a.**	Discuss the production of rotating magnetic field in a 3-Ø induction motor with waveform and vector diagrams.	**07**	(3 :4 : 1.3.1)
	b.	Derive an expression for frequency of a rotor current.	**06**	(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 ii) speed when slip is 4 % iii) frequency of rotor e.m.f, when speed is 750 rpm.	**07**	(3 :4 : 1.4.1)
		MODULE-5		
9.	**a.**	Describe an electric power system with a single line diagram.	**06**	(2 :5 : 1.3.1)
	b.	With neat block diagram explain the generation of electric power by solar energy.	**07**	(2 :5 : 1.3.1)
	c.	What is the necessity of earthing? Explain the method of pipe earthing with a neat diagram.	**07**	(2 :5 : 1.3.1)
		(OR)		
10.	**a.**	Explain 3-way control of a lamp with circuit diagram and switching table.	**07**	(2 :5 : 1.3.1)
	b.	Calculate the electrical energy consumed by a 1200 W toaster used for 30 minutes every day for 1 month. What will be the monthly electricity cost, if cost/unit is Rs. 4/-.	**07**	(2 :5 : 1.3.1)
	c.	Compare the conventional fuse and MCB.	**06**	(2 :5 : 1.3.1)

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