Basavarajeswari Group of Institutions

BALLARI INSTITUTE OF TECHNOLOGY & MANAGEMENT

(Autonomous Institute under Visvesvaraya Technological University, Belagavi)

USN | | | | | | | | | | |

Course Code **22ESC142/242**

First Semester B.E. Degree Examinations, March/April 2024

INTRODUCTION TO ELECTRICAL ENGINEERING

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 ohms law. Mention its limitations.	**06**	(2: 1: 1.3.1)
	b.	A resistance of 10 Ω is connected in series with two resistances each of 15 Ω arranged in parallel. What resistance must be shunted across the parallel combination so that the total current taken will be 1.5 A from the 20 V supply?	**07**	(3 : 1: 2.1.2)
	c.	State and explain Kirchhoff's law with an example.	**07**	(2 : 1: 2.1.2)
		OR		
2.	**a.**	State and explain Faraday's Laws of Electromagnetic Induction.	**06**	(2: 1: 1.3.1)
	b.	Coil A and B in a magnetic circuit have 600 turns and 500 turns respectively. A current of 8 A in coil A produces a flux of 0.04 Wb. If the coefficient of coupling is 0.2, calculate (i) self-inductance of both the coils (ii) flux linking with coil B (iii) average emf induced in coil B when flux with it changes from zero to full value in 0.02 sec (iv) mutual inductance.	**07**	(3 : 1: 2.1.2)
	c.	Explain Fleming's rules and Lenz law.	**07**	(2 : 1: 1.3.1)
		MODULE – 2		
3.	**a.**	Define RMS value of a sinusoidal varying current and find the relation with its maximum value.	**06**	(2: 2: 1.3.1)
	b.	The equation of an AC is given by $I=42.42\sin(628t)$ A. Calculate (i) Maximum value (ii) frequency (iii) RMS value (iv) average value (v) form factor (vi) peak factor.	**07**	(3 : 2: 2.1.2)
	c.	Three alternating currents $I_1=141\sin(\omega t+\pi/4)$, $I_2=30\sin(\omega t+\pi/2)$ and $I_3=20\sin(\omega t-\pi/6)$ are fed in a common conductor. Find the equation for the resultant current, Its RMS value and average value.	**07**	(3 : 2: 2.1.2)
		OR		
4.	**a.**	With necessary circuit diagram, vector diagram and wave forms prove that the power drawn by the pure inductance in ac circuit is zero.	**06**	(2: 2: 1.3.1)
	b.	An alternating voltage of $(160+j120)$ V is applied to a circuit and the current is given by $(6+j8)$ A. find the values of circuit elements, Power and power factor of the circuit Assuming f = 50 Hz.	**07**	(3 : 2: 2.1.2)
	c.	A circuit consists of a resistance of 10 Ω, an inductance of 16 mH and a capacitance of 150 μF connected in series. A supply of 100 V at 50 Hz is given to the circuit. Find the current, power factor and power consumed by the circuit. Draw the vector diagram.	**07**	(3 : 2: 2.1.2)

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

MODULE – 3

5.	**a.**	With neat sketch explain the construction details of core and shell type 1-Ø transformer.	**06**	(2: 3: 1.3.1)
	b.	Derive an EMF equation of a transformer.	**07**	(2: 3: 1.3.1)
	c.	The transformer is rated at 100 KVA at full load its copper losses is 1200 watts and iron loss is 960 watts. Calculate the efficiency at (i) full load UPF (ii) half load at 0.85 PF (iii) 75% of full load at UPF.	**07**	(3: 3: 2.1.2)

OR

6.	**a.**	Define Slip of a 3-Ø Induction motor. Show that rotor frequency is $f^1=Sf$.	**07**	(2: 3: 1.3.1)
	b.	Explain the concept of rotating magnetic field of a 3-Ø Induction motor with neat phasor diagrams.	**06**	(2: 3: 1.3.1)
	c.	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 the I.M, (ii) its speed when slip is 0.04 (iii) frequency of the rotor EMF when the speed is 600 rpm.	**07**	(3: 3: 2.1.2)

MODULE – 4

7.	**a.**	With a neat sketch explain the salient and non-salient type rotor of a 3-Ø synchronous generator. Mention its advantages.	**06**	(2: 4: 1.3.1)
	b.	Derive EMF equation of a 3-Ø synchronous generator with necessary notations.	**07**	(2: 4: 1.3.1)
	c.	A six pole 3 phase star connected alternator has an armature with 90 slots and 12 conductors per slot. It revolves at 1000 RPM, the flux per pole is 0.5 Wb. Calculate the EMF generated. If the distribution factor is 0.97 and the coil is full pitched.	**07**	(3: 4: 2.1.2)

OR

8.	**a.**	Illustrate the single line diagram approach of an electric power system.	**07**	(2: 4: 1.3.1)
	b.	With neat block diagram explain the concept of producing electric power from solar power plant.	**06**	(2: 4: 1.3.1)
	c.	With neat block diagram explain the concept of wind power generation.	**07**	(2: 4: 1.3.1)

MODULE – 5

9.	**a.**	Illustrate with necessary conditions, how a single lamp is controlled from two different places?	**07**	(2: 5: 1.3.1)
	b.	Define a UNIT w.r.t electrical energy and explain about two-part electrical tariff.	**06**	(2: 5: 1.3.1)
	c.	The domestic power load in a house comprises of 8 lamps of 100 watts each 3 fans of 80 watts and one refrigerator of 0.5 HP one electric heater of 1KW calculate (i) current drawn from 230V supply (ii) energy consumed in a day, if on an average only a quarter of the load is present all the times.	**07**	(3: 5: 2.1.2)

OR

10.	**a.**	Define earthing and explain pipe earthing in detail.	**07**	(2: 5: 1.3.1)
	b.	Write a short note on (i) Fuse (ii) MCB	**07**	(2: 5: 1.3.1)
	c.	Explain the concept of an Electric shock and safety precautions to avoid shock.	**06**	(2: 5: 1.3.1)

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