Hi-Tech Institute of Engineering & Technology	
DEPARTMENT OF ELECTRICAL ENGINEERING	
MODEL PAPER-1, ODD SEMESTER-2023-24,	
Semester:1st	**Course/Branch: B.Tech**
Subject Code:BEE101	**Subject Name: Fundamentals of Electrical Engineering**
Faculty Name: Rashmi Tayal/ Omkar Singh	
Time: 3: 00 Hours	***Total Marks: 70***

Note: Attempt all Sections. If you require any missing data, then choose suitably.

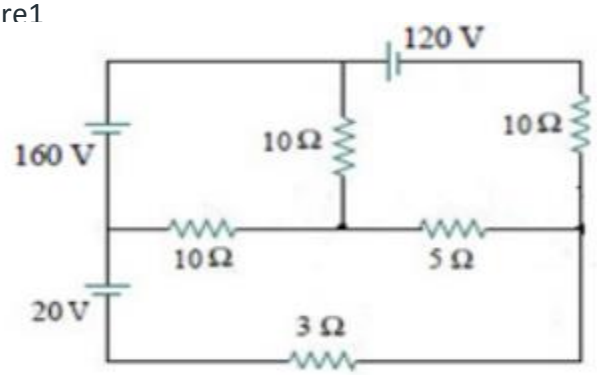
SECTION A

1. Attempt *all* questions in brief. 2X7=14

Q No.	Question	Marks	CO
a.	If the supply voltage applied across a pure capacitor is given by: **v(t) = Vm Sin ωt**. Prove that the average power in a pure capacitive circuit is zero.	**2**	**2**
b.	Explain various independent and dependent energy sources. Also draw their symbols.	**2**	**1**
c.	Why the transformer's rating is given in KVA?	**2**	**3**
d.	Give applications of DC motor and Synchronous motor.	**2**	**4**
e.	Define: Arcing time of fuse, melting time of fuse and operating time of fuse.	**2**	**5**
f.	Explain Hysteresis loss and eddy current loss in a transformer.	**2**	**3**
g.	Describe briefly the following elements with examples: (i) Unilateral & Bilateral (ii) Active & Passive	**2**	**1**

SECTION B

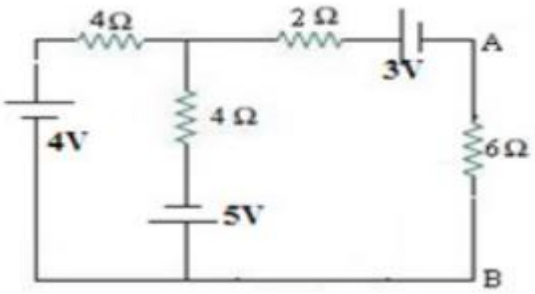
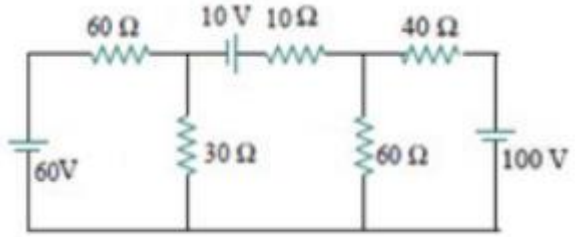
2. Attempt any *three* of the following: c7X3= 21

Q No.	Question	Marks	CO
a.	Calculate the current in 5 ohm branch by mesh analysis in the circuit shown in figure1  Fig. 1	**7**	**1**
b.	Determine the expression for instantaneous power and average power in case of R-L series circuit connected to a single phase sinusoidal voltage of v= V_m Sin *w*t. Also draw the instantaneous power waveform.	**7**	**2**

c.	Derive the EMF equation in a transformer. The maximum efficiency of a 100 KVA, 1100/440 V, 50 Hz transformer is 96%, This occurs at 75% of full load at 0.8 p.f. lagging. Find the efficiency of transformer at 3.4 FL at 0.6 p.f. leading.	**7**	**3**
d.	Derive the EMF equation for a DC generator. A 4-pole dc shunt generator with a wave-wound armature has to supply a load of 500 lamps each of 100W at 250V allowing drop of 1V/brush, calculate the speed at which the generator should be driven. The flux per pole is 30mWb and the armature and shunt field resistance are respectively 0.05Ω and 62.5Ω. The number of armature conductors is 390.	**7**	**4**
e.	Write a short note on Switch Fuse Unit, stating its advantages with circuit diagram. Differentiate among the following: (i) MCB and MCCB (ii) ELCB and RCCB	**7**	**5**

SECTION C

3. Attempt any *one* part of the following: 7X1= 7

Q No.	Question	Marks	CO
a.	Differentiate between Mesh and Loop. Apply Mesh analysis to calculate the mesh currents as shown in figure 2:  Fig. 2	**7**	**1**
b.	Determine the current in 30 ohms branch of the circuit shown in figure 3 by nodal Analysis.  Fig. 3	**7**	**1**

4. Attempt any *one* part of the following: 7X1= 7

Q No.	Question	Marks	CO
a.	Find the rms value, average value, peak factor and form factor for an alternating sinusoidal waveform represented by $v(t) = V_m \sin \omega t$.	**7**	**2**
b.	Derive expression of resonance frequency for series RLC circuit. A series circuit consists of a resistance of 10Ω, and inductance of 50mH and a variable capacitance in series across a 100V, 50Hz supply. Calculate- (i) The value of capacitance to produce resonance. (ii) Voltage across the capacitance. (iii) Q-factor.	**7**	**2**

5. Attempt any *one* part of the following: 7X1= 7

Q No.	Question	Marks	CO
a.	Draw the complete equivalent circuit model of a practical transformer and Explain its different parameters.	**7**	**3**
b.	What is voltage regulation in a transformer? A 100 kVA, single phase, 50 Hz transformer has an iron loss of 600 W and a copper loss of 1.5 KW at full load. Calculate the efficiency at: (i) full load and 0.8 pf. Lagging, and (ii) half load and unity p.f.	**7**	**3**

6. Attempt any *one* part of the following: 7X1= 7

Q No.	Question	Marks	CO
a.	Discuss the operating principle of three phase induction motor. A 440 V, 50 Hz, 3 phase Induction motor is running at 1450 rpm. Find (i) The number of poles (ii) Slip of the motor (iii) Frequency of rotor current.	**7**	**4**
b.	Explain, why Synchronous motor is not self-starting?	**7**	**4**

7. Attempt any *one* part of the following: 7X1= 7

Q No.	Question	Marks	CO
a.	Explain the terms battery back-up. Write a short note on characteristics of batteries.	**7**	**5**
b.	Explain requirement of earthing for electrical equipment. What is the difference between neutral and earthing? Also explain the classification of earthing.	**7**	**5**