

Subject Code\* BEE-110

Roll No.

2 0 2 4 0 3

B.TECH. 1<sup>st</sup> Year (EE, ECE, ECE (IOT), ME)

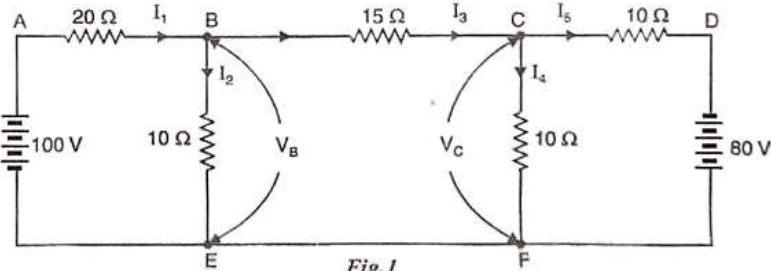
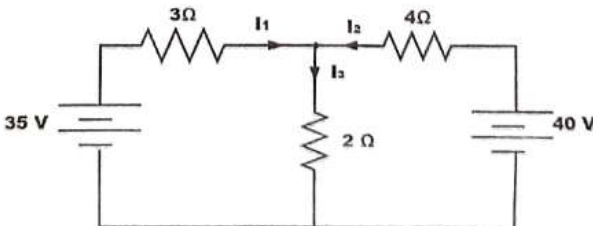
MINOR EXAMINATION:2024-25

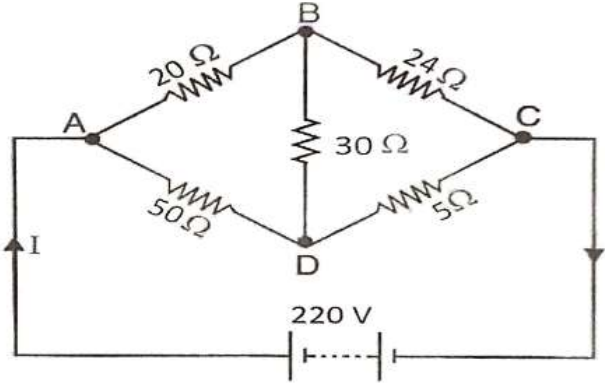
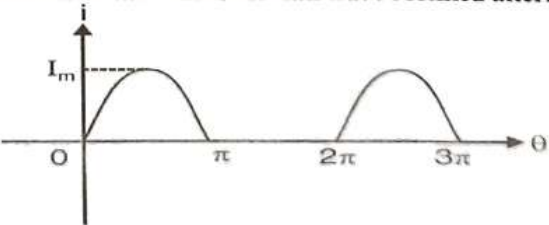
Basic Electrical Engineering

Time: 2Hr.

Max. Marks: 20

Note- Answer all questions

Q.1	Attempt any Two parts of the following.	Marks
a)	<p>Find the currents in the various branches of the circuit shown in Fig.1 by Nodal analysis.</p>  <p style="text-align: center;">Fig.1</p>	4
b)	<p>Explain resonance in a series RLC circuit, including the resonance curve. Derive the equation for the resonant frequency. Additionally, define the Q-factor and bandwidth of a series resonant circuit.</p>	4
c)	<p>Write the Statement of superposition theorem. In the network shown in Fig.2, find the different branch currents by superposition theorem.</p>  <p style="text-align: center;">Fig.2</p>	4
Q.2	<p>Attempt any Two parts of the following.</p>	
a)	<p>State and prove the Maximum Power Transfer Theorem, including the condition for maximum power delivery to a load.</p>	3
b)	<p>State and explain Thevenin's Theorem, including the steps to find the Thevenin's equivalent circuit, and provide an example.</p>	3

c)	<p>A Wheatstone bridge has the following details: <math>AB = 20\ \Omega</math>, <math>BC = 24\ \Omega</math>, <math>CD = 5\ \Omega</math>, <math>DA = 50\ \Omega</math> and <math>BD = 30\ \Omega</math>. A d.c. source of 220V is connected between A and C with A positive. Determine the resistance between terminals A and C and the current delivered by the source using delta/ star transformation.</p> 	3
Q.3	Attempt any Two parts of the following.	
a)	What are the advantages of three-phase over single-phase AC systems?	3
b)	A coil having a resistance of $7\ \Omega$ and an inductance of $31.8\ \text{mH}$ is connected to 230 V, 50 Hz supply. Calculate (i) the circuit current (ii) phase angle (iii) power factor (iv) power consumed and (v) voltage drop across resistor and inductor.	3
c)	<p>Find the average value and r.m.s. value for half wave rectified alternating current.</p> 	3

Subject Code\* BEE-110

Roll No.

**B.TECH 1<sup>st</sup> Year**  
**SEMESTER-I, SESSION: 2024-25**  
**MAJOR EXAMINATION**  
**Basic Electrical Engineering**

Time: 3Hr.

Max. Marks: 50

Note- Answer all questions.

Q.1	Attempt any Five parts of the following.	Marks
a)	Using mesh current method, determine current $I_x$ in the circuit shown in Figure 1. <div style="text-align: center;"> <p style="text-align: center;">Figure.1</p> </div>	
b)	State and explain Norton's Theorem, including the procedure for finding the Norton Equivalent Circuit, with an example.	2
c)	Two identical cells connected in series deliver a maximum power of 1W to a resistance of 4 Ω. What is the internal resistance and e.m.f. of each cell?	2
d)	Find the current in 28 Ω resistor in the circuit shown in Figure.2. <div style="text-align: center;"> <p style="text-align: center;">Figure.2</p> </div>	2
e)	Explain resonance in a parallel RLC circuit, including the resonance curve. Derive the equation for the resonant frequency.	2
f)	For the circuit shown in Figure 3, find the circuit current when the voltage input is $250 \sin 1000t$ volts. <div style="text-align: center;"> <p style="text-align: center;">Figure.3</p> </div>	2
g)	Derive the relationships between line voltage and phase voltage, and line current and phase current in three-phase balanced circuits for a star connection.	2
Q.2	Attempt any Two parts of the following.	

$$T_m \propto I^2 R$$

$$R = \frac{T_m}{I^2}$$

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a)	Derive the expression for deflection for spring controlled attraction type moving iron instrument. Also explain the type of damping provided in moving iron instruments.	5
b)	With neat diagram explain the construction and working of an electro-dynamometer type instruments.	5
c)	The resistance of a moving coil voltmeter is 12,000 $\Omega$ . The moving coil has 100 turns and is 4 cm long and 3 cm wide. The flux density in the air gap is $6 \times 10^{-2}$ Wb/m <sup>2</sup> . Find the deflection produced by 300 V if the spring control gives a deflection of one degree for a torque of $25 \times 10^{-7}$ Nm.	5
<b>Q.3</b>	<b>Attempt any Two parts of the following.</b>	
a)	Explain how the range of instrument can be extended in PMMC ammeter and voltmeter, and What should be the resistance of the moving coil of an ammeter which requires 2.5 mA for full-scale deflection so that it may be used with a shunt having a resistance of 0.0025 $\Omega$ for a range of 0 – 10 A?	5
b)	Explain with neat diagram the construction and principle of operation of a PMMC instrument. Derive the expression for deflection torque.	5
c)	Explain the various types of errors encountered in measurement and instrumentation. Also, discuss the classification of standards.	5
<b>Q.4</b>	<b>Attempt any Two parts of the following.</b>	
a)	Write the similarities and dissimilarities between electrical and magnetic circuits.	5
b)	Discuss the principle of operation of a Single phase transformer. Derive its EMF equation and draw the approximate equivalent circuit of a transformer.	5
c)	Discuss the causes of hysteresis and eddy current losses in electrical machines. Also, explain the methods that can be used to minimize these losses.	5
<b>Q.5</b>	<b>Attempt any Two parts of the following.</b>	
a)	Explain how the open and short circuit tests are conducted on transformers to calculate the core loss and copper loss.	5
b)	Discuss the working principle of an Autotransformer, along with its advantages and disadvantages.	5
c)	Derive the expression for the condition of maximum efficiency in a transformer. Also, discuss the effect of power factor on the efficiency.	5