BACHELOR OF ENGINEERING (ELECTRICAL ENGINEERING) FIRST YEAR SECOND SEMESTER - 2019

PRINCIPLES OF ELECTRICAL ENGINEERING-II

Time: Three Hours | Full Marks 100
(50 Marks for each part)

Use a separate Answer-Script for each part

Answer Any three questions
2 marks for neat and well-organized answers

Part I

Question No.			Marks
1.	(a)	Prove that for a balanced three-phase three-wire star-connected system line voltage is $\sqrt{3}$ times the phase voltage. Draw the relevant phasor diagram.	4+2
	(b)	A set of balanced impedances of $Z_{ph}=5\angle 30^0\ \Omega$ are connected in star across a balanced three-phase supply of 400V. If the phase sequence is ABC, then calculate the line current, power-factor, total active, reactive and apparent power of the load.	10
2.	(a)	What is Millman's theorem? Explain how neutral shift can be determined with the help of Millman's theorem.	2+6
	(b)	Three impedances $Z_A=10\angle 60^0\Omega$, $Z_B=12\angle -30^0\Omega$ and $Z_C=8\angle 40^0\Omega$ are connected in star across a balanced three-phase four-wire 400V supply of phase sequence ABC. Calculate the neutral current.	8
3.	(a)	Two non-sinusoidal currents are given by $i_1 = 40\sin(\omega t-20^0) - 6\sin(5\omega t-230^0)$ A $i_2 = 28\cos(\omega t-30^0) + 16\sin(3\omega t+40^0) - 5\cos(5\omega t-240^0)$ A Write the expression for the resultant of these two non-sinusoidal currents.	8
	(b)	A 3-phase, 3-wire delta connected system has the following phase emfs: $V_{AB}=(200+j40)V$, $V_{BC}=(-60-j220)V$ and $V_{CA}=(-40+j232)V$. Calculate the symmetrical components of the phase emfs.	8
4.	(a)	Explain how three-phase power can be measured by two-wattmeter method. Draw the relevant circuit and phasor diagrams.	8

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Question No.			Marks
	(b)	Find out the Fourier series for the non-sinusoidal wave as shown in Fig.1	8

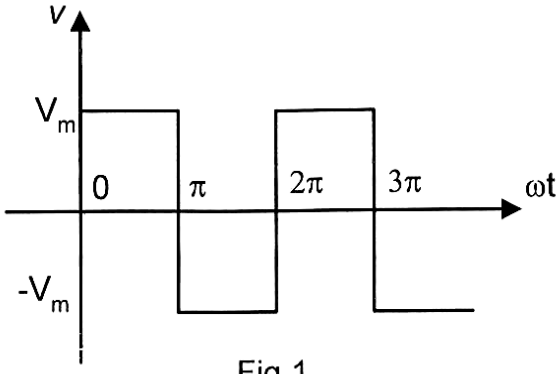


Fig.1

5.	(a)	The voltage applied across a circuit is given by $v = 230\sin(\omega t-20^0) + 120\sin(3\omega t+40^0) + 60\sin(5\omega t-30^0)$ Volts and the current through the circuit is given by $i = 25\sin(\omega t+40^0) + 11\sin(3\omega t+70^0) + 5\sin(5\omega t-80^0)$ Amps. Calculate the active power drawn by this circuit due the non-sinusoidal voltage and current. Also, calculate the corresponding power factor.	8
	(b)	The voltage across a series R-L circuit is given by $v = 220\sin(\omega t+40^0) - 88\cos(3\omega t-240^0)$ Volts. The resistance and the inductance are 5Ω and 20mH, respectively. What will be reading of the voltmeter connected across the inductance, if f=50Hz?	8

Ref. No. **Ex/EE/5/T/121/2019**

BACHELOR OF ENGINEERING (ELECTRICAL ENGINEERING) EXAMINATION, 2019

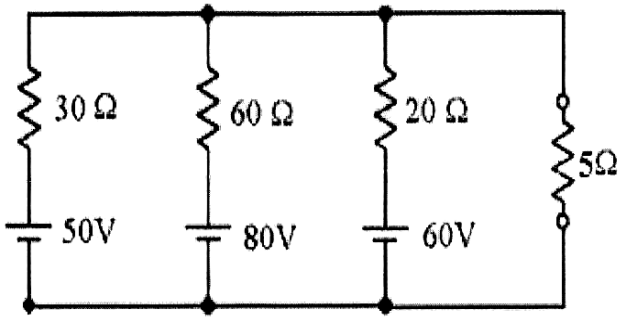
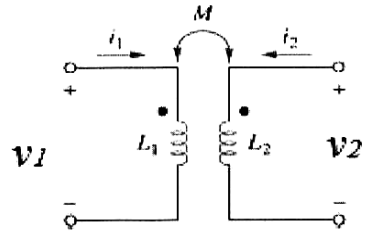
(1st Year 2nd Semester)

SUBJECT : PRINCIPLES OF ELECTRICAL ENGINEERING -II

Full Marks -100

Time : Three hours **(50 marks for each part)**

Use a separate Answer-Script for each part

	Part II **Answer any *THREE* questions.** **Two marks reserved for neatness and well organized answer.**	**Marks**
1.a)	State the following theorems: a) Tellegen's Theorem; b) Compensation Theorem; c) Substitution Theorem	3*3=9
b)	State Millman's Theorem and use it to find out the current through the 5 Ohm load resistance. 	7
2.a)	Find out the locus of the current for a series R-C circuit having constant reactance but variable resistance and draw the corresponding circle diagram.	6
b)	Find out the locus of the current for a series R-L circuit having constant resistance but variable reactance and draw the corresponding circle diagram.	6
c)	If a coil of unknown resistance and reactance is connected in series with a 200V, 50Hz supply, the current locus diagram is found to have a diameter of 5A and when the value of resistor is 15 Ohm, the power dissipated is maximum. Calculate the reactance and resistance of the coil and the value of the maximum power in the circuit and the maximum current.	4
3.a)	Find out the energy stored in a coupled circuit as shown in figure below. 	5

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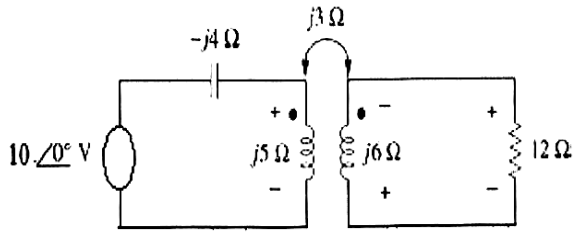
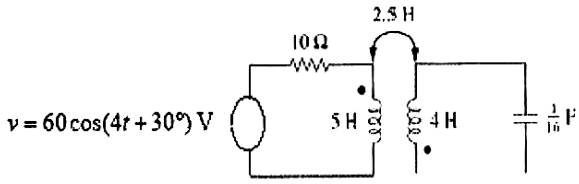
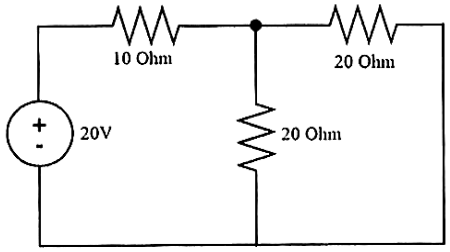
b)	Find out the loop currents in the given coupled circuit. 	5
c)	Consider the coupled circuit given below and find the coefficient of coupling and the energy stored in the coupled inductors at time t = 1 second 	6
4. a)	Define Transformer. Explain the working principle of transformer.	2+2
b)	Draw the phasor diagram for a single phase practical transformer on lagging load.	4
c)	Derive the EMF equation of an ideal two winding single phase transformer.	5
d)	Draw the equivalent circuit of a transformer referred to primary side.	3
5. a)	State Reciprocity Theorem and verify it for the circuit given below. 	5
b)	Name the electrical parameters that remain constant in the primary and secondary of a single phase two winding transformer.	2
c)	Can a transformer work on DC? Give proper reasons for your answer	2
d)	Derive the expression for equivalent inductance in series opposing connection of coupled circuits.	3
e)	What are non-linear resistances and inductances?	4