Hall Ticket Number:

Code No. : 12313

VASAVI COLLEGE OF ENGINEERING *(AUTONOMOUS)*, HYDERABAD

Accredited by NAAC with A++ Grade

B.E. (E.E.E) II-Semester Main & Backlog Examinations, September-2022

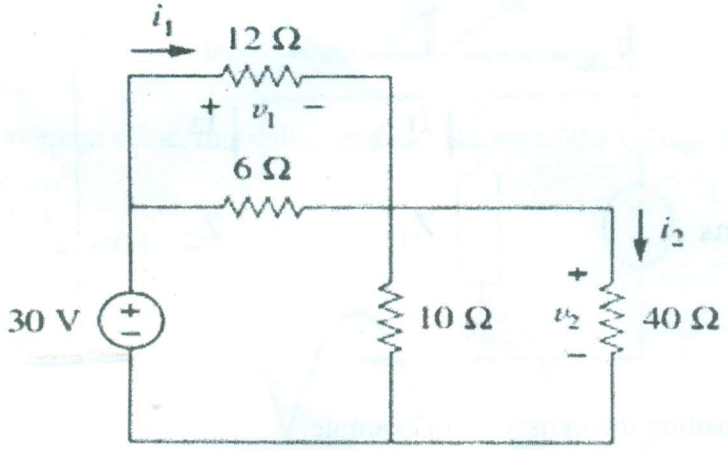
Circuit Theory

Time: **3 hours** Max. Marks: **60**

*Note: Answer all questions from **Part-A** and any **FIVE** from **Part-B***

Part-A (10 × 2 = 20 Marks)

Q. No.	Stem of the question	M	L	CO	PO
1.	Differentiate active and passive elements.	2	1	1	1
2.	State Kirchhoff's voltage law.	2	1	1	1
3.	Given two sinusoids $v_1 = -4\sin(377t+25^0)$ and $v_2 = 5\cos(377t-40^0)$. State which sinusoid is leading.	2	2	2	2
4.	Define peak factor of a periodic signal.	2	1	2	1
5.	Sketch the phasor diagram of series RC circuit.	2	1	3	1
6.	Define the term power factor.	2	1	3	1
7.	Draw the Norton's equivalent circuit.	2	1	4	1
8.	State the Tellegen's theorem.	2	1	4	1
9.	Differentiate balanced three phase load and unbalanced three phase loads.	2	1	5	1
10.	In a balanced three phase system, assuming positive sequence, if Van = 220 $\angle 30^0$ V rms then obtain Vbn and Vcn.	2	2	5	2
	Part-B (5 × 8 = 40 Marks)				
11. a)	Derive an expression for energy stored in a capacitive element from fundamentals.	4	2	1	2
b)	Apply voltage division and current division principles to determine voltages v_1 and v_2 and hence find i_1 and i_2 in the circuit shown below.	4	3	1	2



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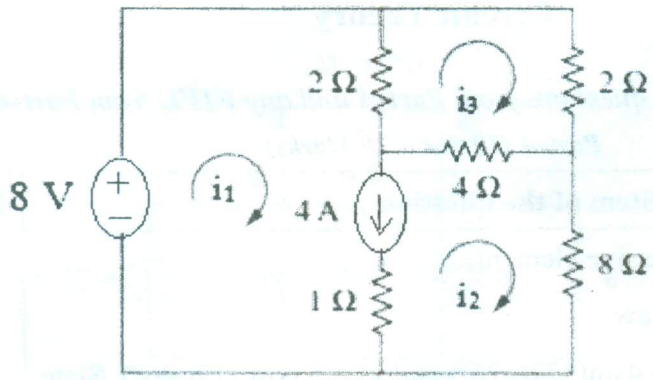
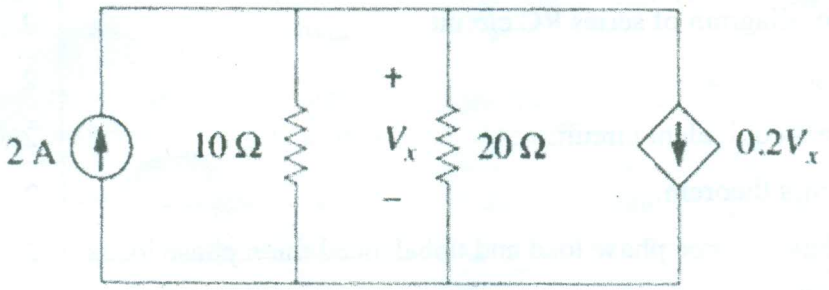
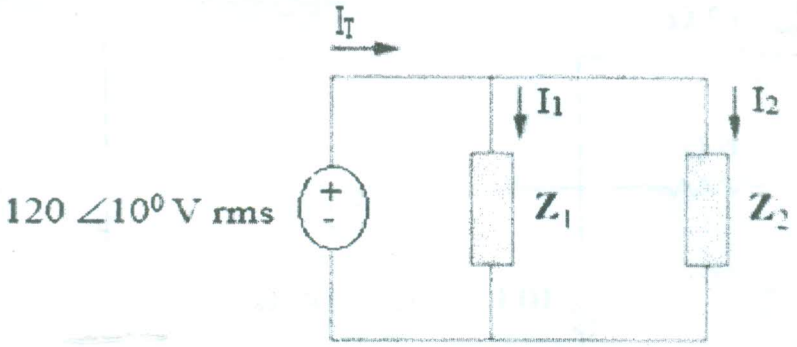
12. a)	Determine the mesh currents i_1, i_2 and i_3 of the circuit shown in figure below.	4	4	2	2



b)	Determine v_x in the circuit shown below, using nodal analysis.	4	4	2	2



13. a)	Derive an expression for steady state current of series RL circuit when excited by sinusoidal source. Also draw the phasor diagram.	4	2	3	2
b)	In the circuit shown in figure below, $Z_1 = 60 \angle -30^0\ \Omega$ and $Z_2 = 40 \angle 45^0\ \Omega$. Calculate the total a) complex power, b) apparent power, c) real power, d) reactive power, e) power factor supplied by the source. $120 \angle 10^0$ V rms.	4	4	3	2



14. a)	State and explain superposition theorem with an example.	4	2	4	1

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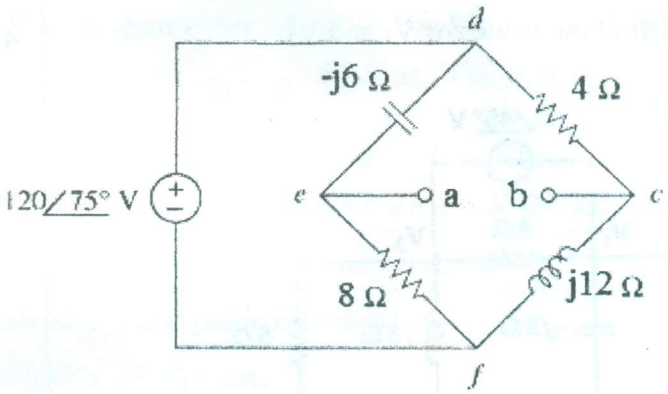
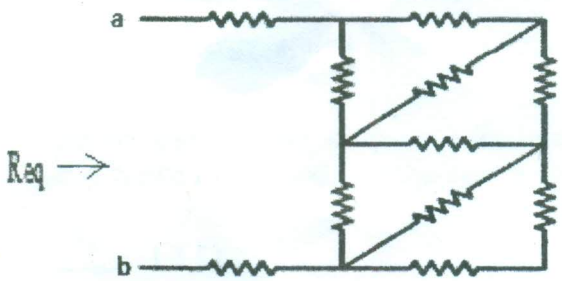
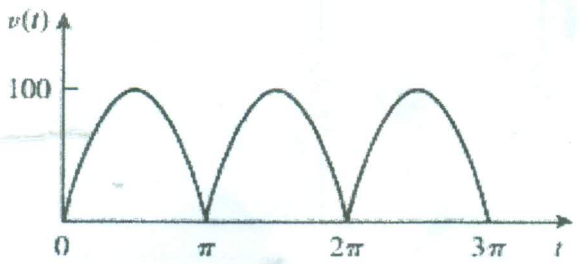
b)	Find the Thevenin's equivalent at terminals a-b of the circuit shown below.	4	4	4	2



15. a)	Express the relationship between line and phase quantities in a 3-phase balanced Star connected system. Also obtain the expression for active power in a balanced three phase system.	4	2	5	2
b)	In a balanced three-phase Y-Y system, the source is an abc sequence of voltages and Van = 230 $\angle 20^0$ V rms. The line impedance per phase is (0.6 + j1.2) Ω while the per-phase impedance of the load is (10 + j14) Ω. Calculate the line currents and the line voltages.	4	4	5	2
16. a)	For the circuit shown in figure below, determine Req between terminals a and b, if all resistors are 5 Ω.	4	4	1	2



b)	Find the average value, rms value, and form factor of the voltage waveform shown below.	4	4	2	2



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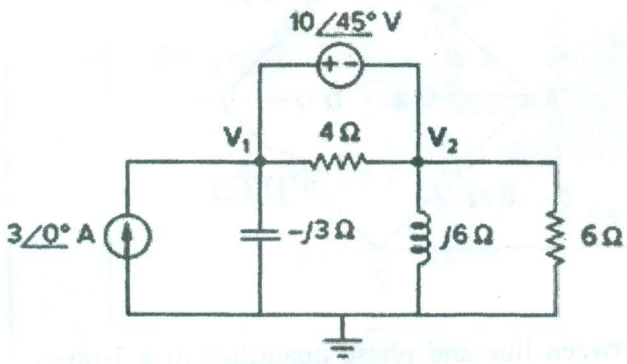
17.	Answer any ***two*** of the following:				
a)	In the circuit shown below, find the values of V_1 and V_2. 	4	4	3	2
b)	Prove that the load resistance is equal to the input equivalent resistance is the condition to get maximum power transfer in a dc circuit. Hence obtain the expression for maximum power.	4	2	4	2
c)	With a neat circuit and phasor diagram, explain the two-wattmeter method to measure the three-phase power in a three phase circuit.	4	2	5	1

M : Marks; L: Bloom's Taxonomy Level; CO; Course Outcome; PO: Programme Outcome

i)	Blooms Taxonomy Level – 1	20%
ii)	Blooms Taxonomy Level – 2	35%
iii)	Blooms Taxonomy Level – 3 & 4	45%

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