Code No: 181AH **R22**

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B. Tech I Year I Semester Examinations, September - 2023

ELECTRICAL CIRCUIT ANALYSIS –I

(Electrical and Electronics Engineering)

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

Note: This question paper contains two parts A and B.
i) **Part- A** for 10 marks, ii) **Part - B** for 50 marks.

- Part-A is a compulsory question which consists of ten sub-questions from all units carrying equal marks.
- Part-B consists of **ten questions** (numbered from 2 to 11) **carrying 10 marks each**. From each unit, there are two questions and the student should answer one of them. Hence, the student should answer five questions from Part-B.

PART- A

(10 Marks)

1.a)	Define active elements and passive elements.	[1]
b)	How much energy does a 100-W electric bulb consume in two hours?	[1]
c)	Given the sinusoid 5 sin ($4\pi t - 60^0$), calculate its angular frequency and time period.	[1]
d)	What is the resonance circuit?	[1]
e)	State Milliman's theorem.	[1]
f)	What is the condition of maximum power transfer theorem with d.c. excitation.	[1]
g)	List out the advantages of poly phase systems.	[1]
h)	Define phase sequence.	[1]
i)	What is use of dot convention in magnetic circuits?	[1]
j)	Define planar graph.	[1]

PART - B

(50 Marks)

2.a)	State and explain Kirchhoff's laws.	
b)	Determine the power dissipated by 3Ω the circuit shown in figure 1.	[4+6]

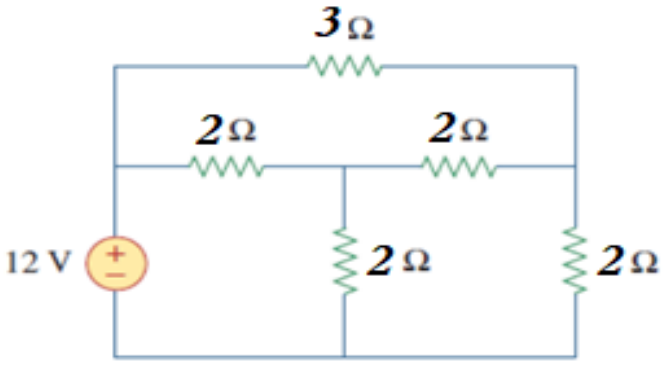

Figure 1

OR

3.a) Derive the expression for energy stored in capacitor.

b) Find the voltages at the three nonreference nodes in the circuit of figure 2. [4+6]

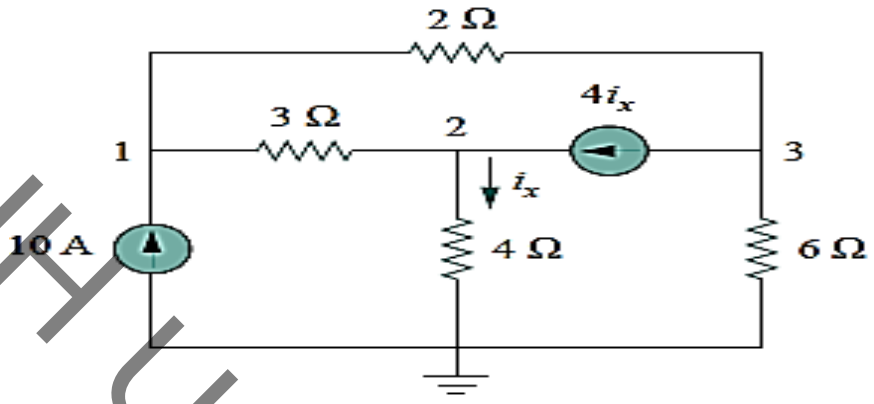

Figure 2

4.a) Calculate V_O in the circuit in figure 3.

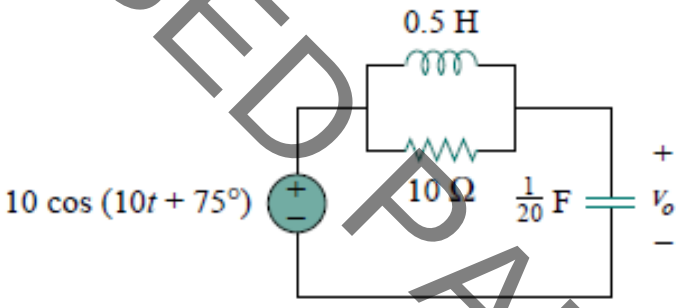

Figure 3

b) A sinusoidal source supplies 10 kVA reactive power to load Z = 250 ∟− 75° Ω. Determine i) the power factor ii) the apparent power delivered to the load and iii) the peak voltage. [5+5]

OR

5.a) An a.c. circuit consists of a pure resistance of 10 Ω and is connected across an a.c. supply of 230 V, 50 Hz. Calculate (i) current (ii) power consumed and (iii) equations for voltage and current.

b) A coil having a resistance of 7 Ω and an inductance of 31·8 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. [4+6]

6.a) Use superposition to find V_X in the circuit in figure 4.

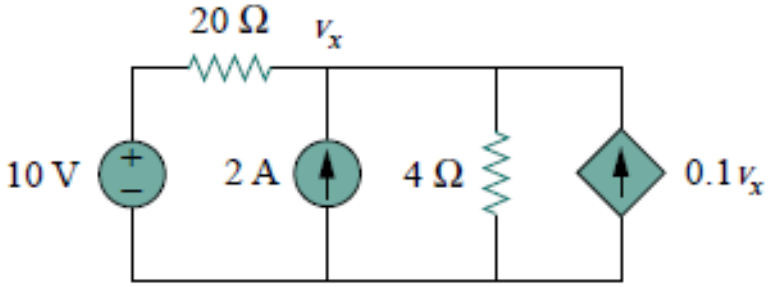

Figure 4

b) Find the Norton equivalent circuit for the circuit across 'a' and 'b' terminals in figure 5. [5+5]

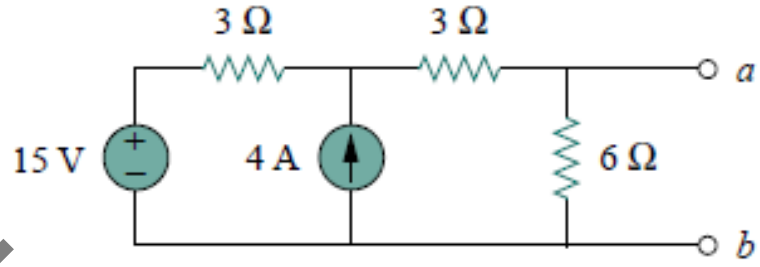

Figure 5

OR

7. Using Thevenin's theorem, find V_O in the circuit in figure 6. [10]

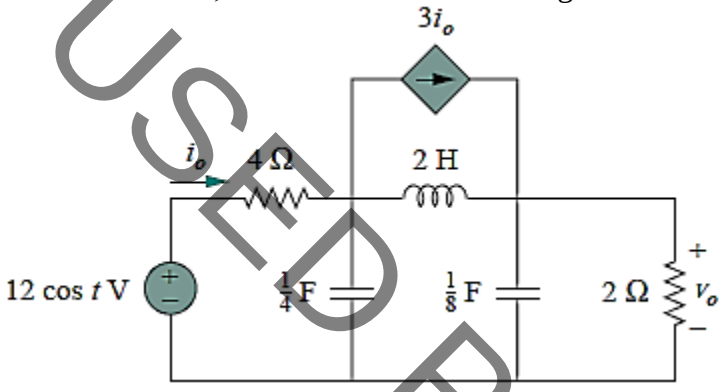

Figure 6

8.a) Derive the relation between line and phase voltages and currents for balanced star connected system.

b) A positive-sequence, balanced delta connected source supplies a balanced delta connected load. If the impedance per phase of the load is (18 + j12) Ω and $I_a = 22.5 \angle 35^\circ$A, find I_{AB} and V_{AB}. [5+5]

OR

9.a) What are the different methods used for measuring power in three phase circuits?

b) A balanced three-phase star connected generator with Vph = 220 V supplies an unbalanced star connected load with Z_{AN} = (60 + j80) Ω, Z_{BN} = (100 − j120) Ω, and Z_{CN} = (30 + j40) Ω. Find the total complex power absorbed by the load. [5+5]

10.a) Derive the expression for equivalent inductance of two coils connected in series with differential coupling circuits.

b) Find Vo in the circuit of figure 7. [4+6]

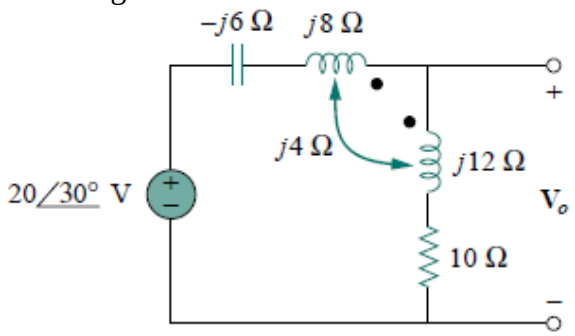

Figure 7

OR

11.a) Describe the procedure for obtaining Incidence matrix with an example.

b) For the network shown in figure 8. draw the oriented graph, select a suitable tree and obtain the fundamental cut-set matrix. [4+6]

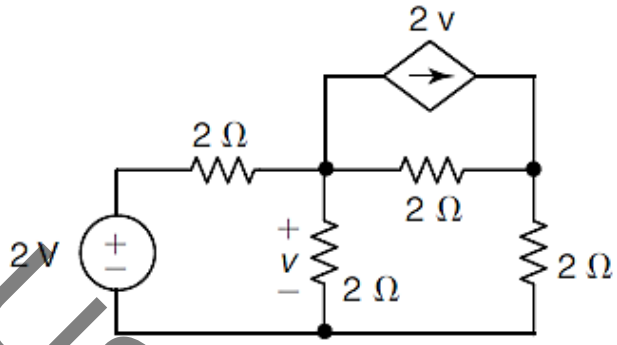

Figure 8

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