Code No: 181AH **R22**

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B. Tech I Year I Semester Examinations, March/April - 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)	What are the independent sources?	[1]
b)	Define super mesh.	[1]
c)	Write the relations between real power, reactive power and apparent power.	[1]
d)	Define Form factor of a sinusoidal waveform.	[1]
e)	What are the limitations of maximum power transfer theorem?	[1]
f)	State Milliman's theorem.	[1]
g)	What do you mean by 3-phase balance circuits?	[1]
h)	What is phase sequence?	[1]
i)	What is meant by coefficient of coupling?	[1]
j)	Define incidence matrix.	[1]

PART - B

(50 Marks)

2.a) Find the current through 20 Ω resistor using Kirchhoff's laws(Figure 1).

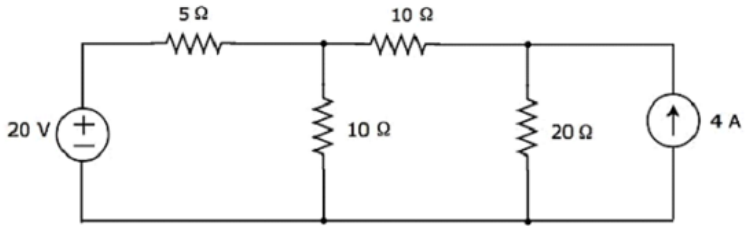

Figure 1

b) Find the current through 10 Ω resistor using Kirchhoff's laws(Figure 2). [5+5]

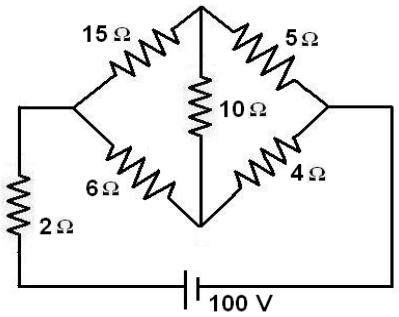

Figure 2

OR

3.a) Obtain the delta-star conversion equations with examples.

b) By using the nodal analysis, determine various node voltages in the following circuit(Figure 3). [4+6]

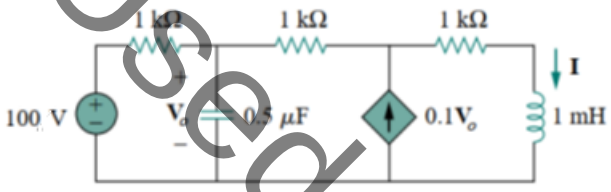

Figure 3

4.a) Draw and discuss phasor diagram and impedance triangle of a series RLC circuit. Also find out the circuit impedance, current and powers with various cases.

b) A resistance of 50 ohms is connected in series with a capacitor of 50 micro farad to a supply at 220 V, 50 Hz. Find i) impedance ii) current iii) power factor and iv) power. [6+4]

OR

5.a) For the circuit shown in figure 4, find the current I drawn from the source, I_1 and I_2.

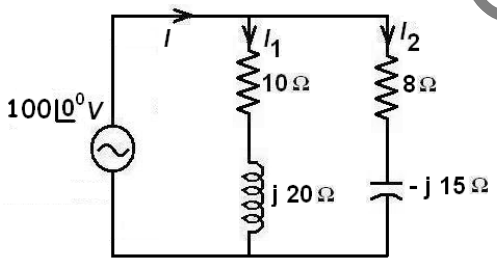

Figure 4

b) Find the resonant frequency and Q factor for series RLC circuit consists of a resistance of 1000Ω, inductance of 100mH and a capacitance of 10pF. If the voltage of 100V is applied across the circuit. [6+4]

6.a) Using Superposition theorem, find the current in 2 Ω(Figure 5).

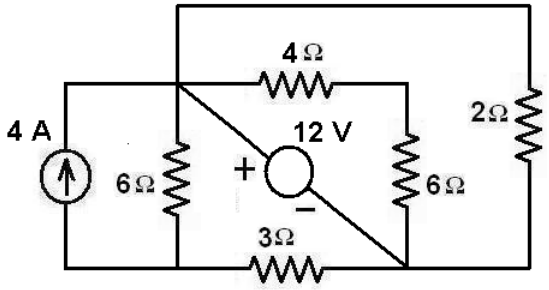

Figure 5

b) Determine maximum power transfer to (4 – j3) Ω branch(Figure 6). [5+5]

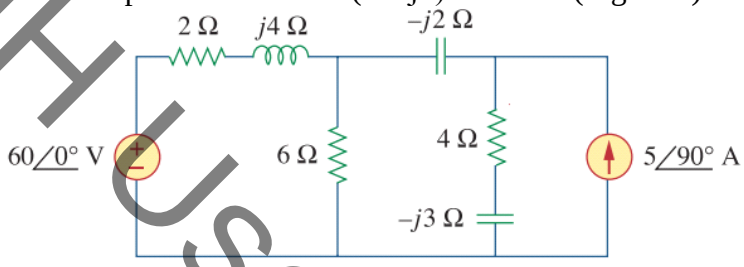

Figure 6

OR

7. State and explain reciprocity and compensation theorems with examples. [10]

8. Derive the relationship between phase quantities and line quantities in a 3-phase balanced star connected system and Draw phasor diagram showing voltages and currents. [10]

OR

9.a) The two-watt meter readings in a 3 - phase power measurement are 800 W and 400 W. The latter reading is being obtained after the reversal of current coil. Calculate the total power and power factor of the load.

b) Three identical impedances of (3+j4) ohm are connected in delta. Find an equivalent star network such that the line current is the same when connected to the same supply. [5+5]

10.a) Two coils A and B having turns 100 and 1000 respectively are wound side by side on closed circuit coil of cross-section 8 cm^2 and mean length 80 cm. The relative permeability of iron is 900. Calculate the mutual inductance between the coils.

b) Two coupled coils with L_1=0.01 H and L_2=0.04 H and K=0.6 are connected in four different ways. Find the equivalent inductance if coils are connected in (i) series aiding (ii) series opposing (iii) parallel aiding (iv) parallel opposing. [5+5]

OR

11.a) Draw the graph of the network shown in below figure 7 below

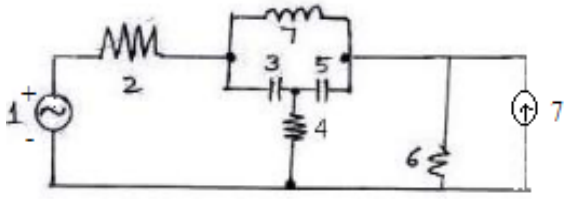

Figure 7

b) Explain the procedure for obtaining fundamental tie-set matrix of given network. [5+5]

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