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SAINTGITS COLLEGE OF ENGINEERING (AUTONOMOUS)

(AFFILIATED TO APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY, THIRUVANANTHAPURAM)

THIRD SEMESTERB.TECH DEGREE EXAMINATION (S), MAY 2022

ELECTRICAL AND ELECTRONICS ENGINEERING

(2020 SCHEME)

Course Code: **20EET201**

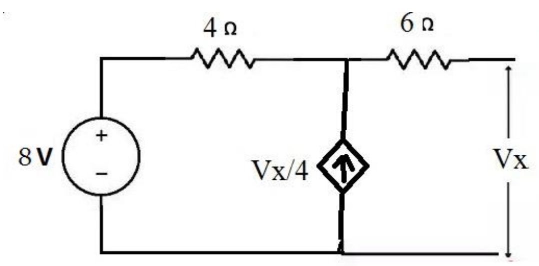
Course Name: **Circuits and Networks**

Max. Marks: **100** **Duration: 3 Hours**

PART A

(Answer all questions. Each question carries 3 marks)

1. Explain reciprocity theorem with example
2. Obtain the Thevenin's equivalent of the circuit shown below



3. Find the response i(t) in a series RC circuit when a step input of V volts is applied across it at time t=0. Assume all initial conditions as zero.
4. Explain underdamped, over damped and critically damped systems with respect to an RLC circuit
5. Explain the dot convention used in coupled circuits
6. Derive the expression for induced emf of a linear transformer
7. Derive the expression of resonant frequency in a series RLC circuit
8. Explain neutral shift in a three-phase unbalanced star connected system
9. Derive the condition for symmetry and reciprocity in terms of Z parameters
10. Explain the cascade and parallel connection of 2-port networks

PART B

(Answer one full question from each module, each question carries 14 marks)

MODULE I

11. a) Explain Norton's theorem for DC and AC circuits. (6)

b) Find the Power developed by 2 Ω resistor connected between the terminals AB by Norton's Theorem as shown in Fig .1 (8)

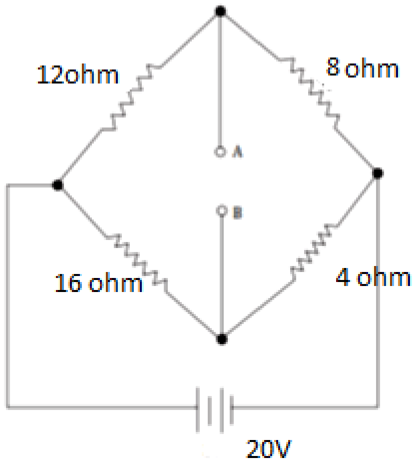


Fig.1

OR

12. a) Find the value of load impedance Z_L in Fig.2 so that maximum power can be transferred to it in the network. Obtain the value of maximum power. (7)

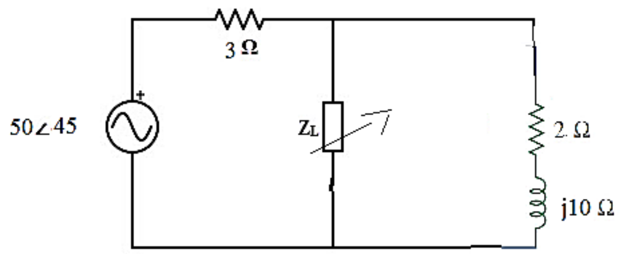


Fig.2

b) Using superposition theorem, find the current through 6Ω resistor in the circuit shown in fig 3. Also obtain the power absorbed by the 6Ω resistor. (7)

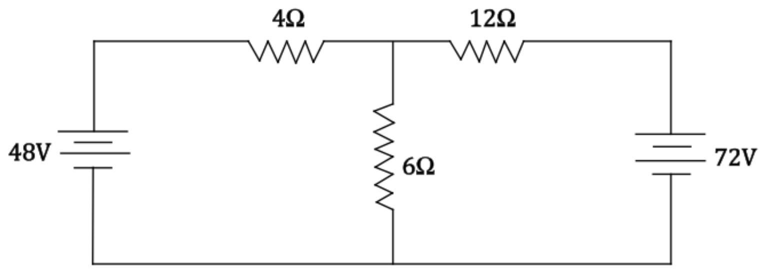


Fig.3

MODULE II

13. a) In the network shown in Fig 4, the switch is moved from position 'a' to 'b' at t=0.Steady state conditions has been established in position 'a'. Determine i(t) (7)

for t>0.

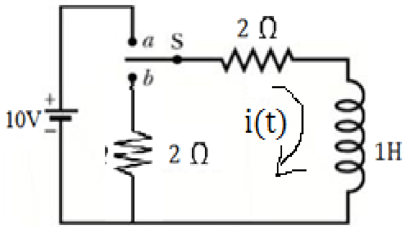


Fig.4

b) In the circuit shown in Fig.5, find the value of current 'i' at t=50μs if switch is closed at t=0 and Vc (0)=0. (7)

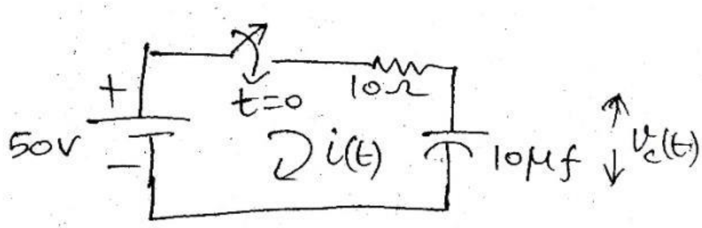


Fig.5

OR

14. a) A Series RLC circuit with R=50Ω, L=0.1H and C=50μF as a voltage of 100V applied to it at t=0 through a switch. Evaluate the expression for a current transient. Assume initially relaxed circuit conditions. (6)

b) A 200 V is applied to a series RC Circuit with R=100 Ω and C=25μFarads at t=0 through switch. Find the transient current. Assume initial relaxed circuit conditions. (8)

MODULE III

15. a) Find the equivalent inductance of the network shown in Fig.6 (4)

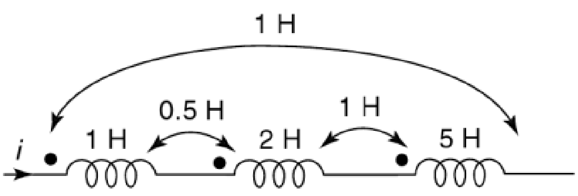


Fig.6

b) Using mesh analysis obtain the voltage across 5 Ωresistor in the circuit shown in fig7 below. (10)

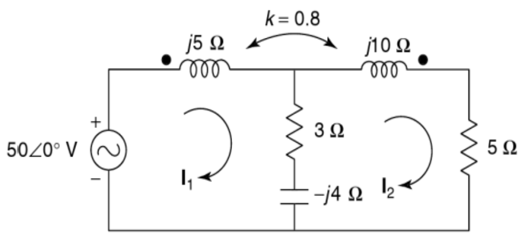


Fig.7

OR

16. a) Determine the poles and zeros of the impedance function Z(s) in the network shown in Fig.8 (6)

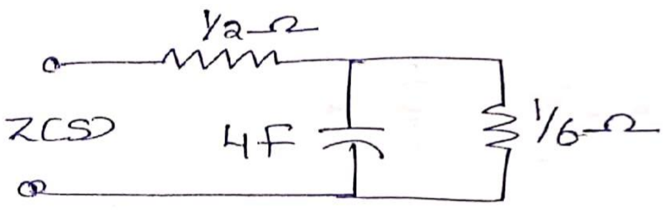


Fig.8

b) Obtain the dotted equivalent and inductance of the circuit shown in Fig.9 (8)

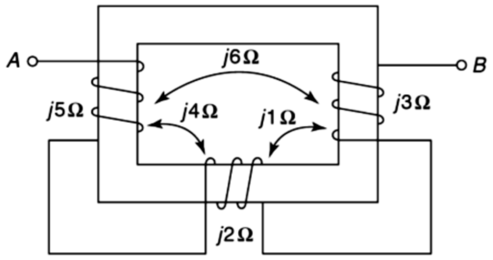


Fig.9

MODULE IV

17. a) An unbalanced 4 wire star connected load is connected to a balanced voltage of 400V

The loads are Z1= (3+j6)Ω ,Z2= (2+2j)Ω , Z3= (14+18j)Ω (6)
Calculate (a) Line currents (b)Current in Neutral

b) A series RLC circuit has R=30Ω, L=80mH and C=80µF.Find the resonant frequency. Under resonant condition obtain (i) Current (ii) Power (iii) Voltage drop across various elements if the applied voltage is 150 Volts. (8)

OR

18. a) Three impedances Z1=20<30^0 Ω ,Z2= 40<60^0 Ω, Z3=10<-90^0 Ω are delta connected to a 400V three phase system as shown in Fig. 10. Determine
(a) Line currents (b) Phase currents (6)

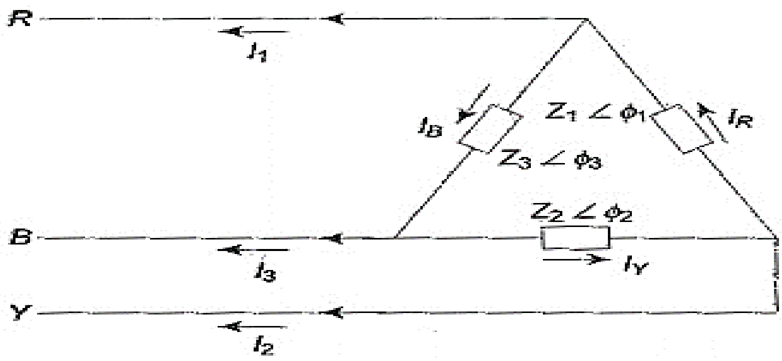


Fig. 10

b) A Series RLC Series Circuit has R=5Ω, L=40 mH and C=1μF. Find (i) Q factor of the circuit (ii) Separation between half power frequency (iii) Resonant Frequency (iv) Half Power frequencies f1 and f2. (8)

MODULE V

19. a) Derive the interrelationship between ABCD and Y parameters (5)

b) Obtain the Z parameters for the network shown in Fig. 11. (9)

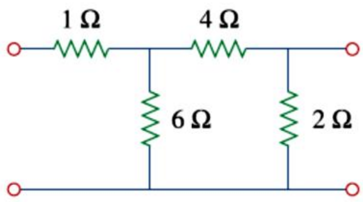


Fig.11

OR

20. a) Obtain h-parameters for the 2-port network shown in Fig.12 (8)

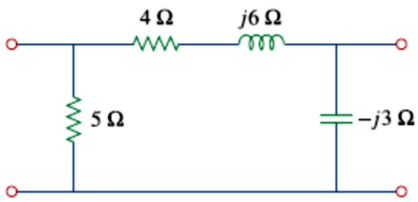


Fig.12

b) For a two-port, let **A** = 4, **B** = 30 Ω , **C** = 0.1 S, and **D** = 1.5. Calculate the input impedance, **Z11** = **V** / **I** in when:
(a) the output terminals are short-circuited, (6)
(b) the output port is open-circuited,
(c) the output port is connected to a 10 - Ω load.

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