

**B.E. DEGREE EXAMINATIONS: JUNE 2010**

Second Semester

**ELECTRICAL AND ELECTRONICS ENGINEERING**

EEE101: Electric Circuit Analysis

**Time: Three Hours****Maximum Marks: 100****Answer ALL Questions:-****PART A (10 x 1 = 10 Marks)**

1. According to Kirchhoff's voltage law, the algebraic sum of all IR drops and e.m.fs. in any closed loop of a network is always
  - a) Negative
  - b) positive
  - c) determined by battery e.m.fs
  - d) zero.
2. Form factor for a sine wave is
  - a) 1.414
  - b) 0.707
  - c) 1.11
  - d) 0.637
3. The concept on which superposition theorem is based is
  - a) reciprocity
  - b) duality
  - c) non-linearity
  - d) linearity
4. Thevenin resistance  $R_{th}$  is found
  - a) by removing voltage sources along with their internal resistances
  - b) by short-circuiting the given two terminals
  - c) between any two 'open' terminals
  - d) between same open terminals as for  $E_{th}$
5. The difference between the half-power frequencies is called the:
  - (a) quality factor
  - (b) resonant frequency
  - (c) bandwidth
  - (d) cutoff frequency
6. The coefficient of coupling for two coils having  $L_1 = 2$  H,  $L_2 = 8$  H,  $M = 3$  H is:
  - (a) 0.1875
  - (b) 0.75
  - (c) 1.333
  - (d) 5.333
7. When port 1 of a two-port circuit is short-circuited,  $\mathbf{I}_1 = 4\mathbf{I}_2$  and  $\mathbf{V}_2 = 0.25\mathbf{I}_2$ . Which of the following is true?
  - (a)  $y_{11} = 4$
  - (b)  $y_{12} = 16$
  - (c)  $y_{21} = 16$
  - (d)  $y_{22} = 0.25$
8. If a two-port is reciprocal, which of the following is *not* true?
  - (a)  $\mathbf{z}_{21} = \mathbf{z}_{12}$
  - (b)  $\mathbf{y}_{21} = \mathbf{y}_{12}$
  - (c)  $\mathbf{h}_{21} = \mathbf{h}_{12}$
  - (d)  $AD = BC + 1$
9. The relationship between the line and phase voltages of a delta-connected circuit is given by
  - (a)  $V_L = V_P$
  - (b)  $V_L = \sqrt{3} V_P$
  - (c)  $V_L = V_P / \sqrt{2}$
  - (d)  $V_L = 2V_P / \pi$
10. While measuring power in a three phase load by two-wattmeters method, the readings of two wattmeters will be equal and opposite when

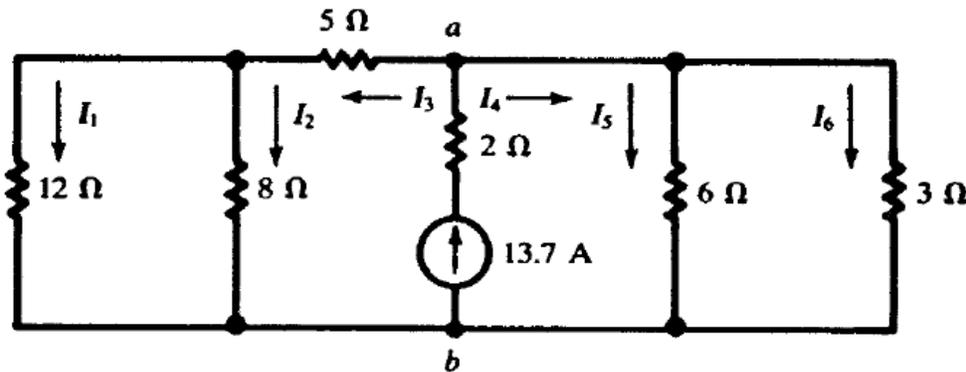
- (a) pf is unity (b) load is balanced  
 (c) phase angle is between  $60^\circ$  and  $90^\circ$  (d) the load is purely inductive.

**PART B (10 x 2 = 20 Marks)**

11. State Kirchhoff's current law.
12. Define Peak factor.
13. Distinguish between mesh and nodal analysis.
14. State Thevenin's Theorem.
15. What is meant by Q-factor of a series circuit?
16. What is meant by coefficient of coupling?
17. What is meant by a driving-point impedance?
18. What are the six parameters used to model a two port network?
19. Mention the possible situations causing an unbalanced system.
20. Draw the circuit for two watt meter method of measurement of three - phase power.

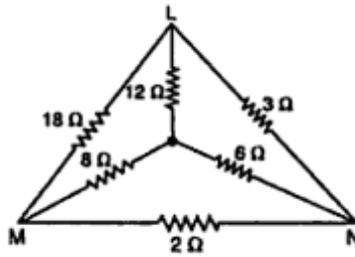
**PART C (5 x 14 = 70 Marks)**

21. a) Find all branch currents in the network shown in Figure.



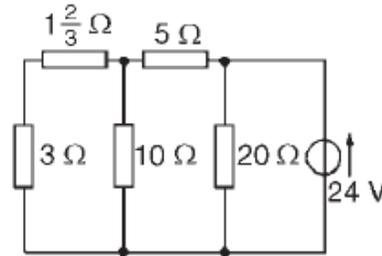
(OR)

- b) The voltage across a load is  $v(t) = 60 \cos(\omega t - 10^\circ)$  V and the current through the element in the direction of the voltage drop is  $i(t) = 1.5 \cos(\omega t + 50^\circ)$  A. Find: (i) the complex and apparent powers, (ii) the real and reactive powers, and (iii) the power factor
22. a) The figure shows a number of resistances connected in delta and star. Using star/delta conversion method complete the network resistance measured between (i) L and M (ii) M and N and (iii) N and L.

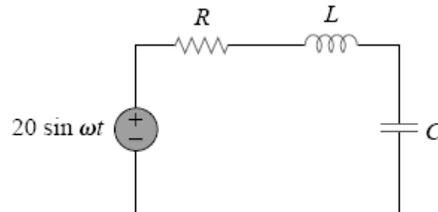


(OR)

b) Use Norton's theorem to determine the current flowing in the 3 resistances of the network shown in Figure. The voltage source has negligible internal resistance.

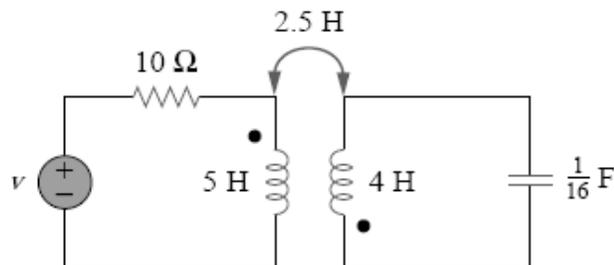


23. a) In the circuit in Figure,  $R = 2 \ \Omega$  &  $L = 1 \text{ mH}$ , and  $C = 0.4 \ \mu\text{F}$ . (i) Find the resonant frequency and the half-power frequencies. (ii) Calculate the quality factor and bandwidth. (iii) Determine the amplitude of the current at  $\omega_0$ ,  $\omega_1$ , and  $\omega_2$ .



(OR)

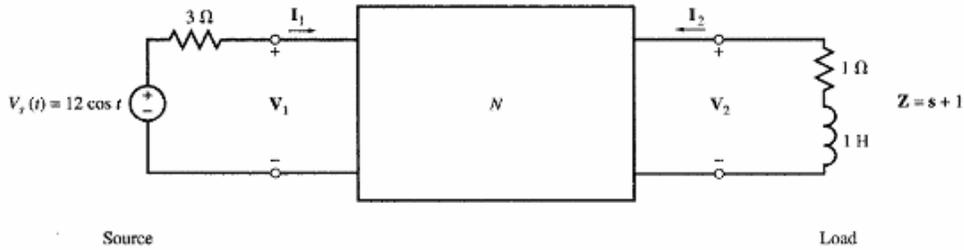
b) Consider the circuit shown in figure. Determine the coupling coefficient. Calculate the energy stored in the coupled inductors at time  $t = 1 \text{ s}$ , if  $v = 60 \cos(4t + 30^\circ) \text{ V}$ .



24. a) The Z-parameters of a two-port network are given by

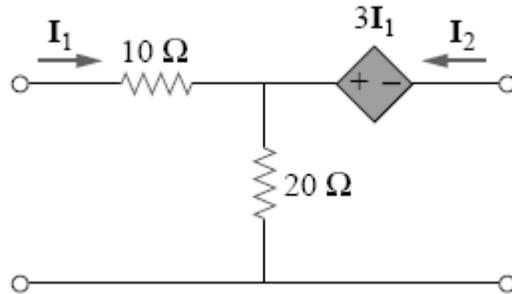
$$Z_{11}=2s+1/s; \quad Z_{12}=Z_{21}=2s; \quad Z_{22}=2s+4$$

The network is connected to a source and a load as shown in figure. Find  $I_1, I_2, V_1, V_2$



(OR)

b) Find the transmission parameters for the two-port network in Figure.



25. a) Three coils each having resistance 3 and inductive reactance 4 are connected (i) in star and (ii) in delta to a 415 V, 3-phase supply. Calculate for each connection (a) the line and phase voltages and (b) the phase and line currents.

(OR)

b) In a three phase circuit, two wattmeters used to measure power indicate 1200 W and 600 W respectively. Find the power factor of the circuit:

- (i) When both wattmeter readings are positive
- (ii) When the latter is obtained by reversing the current coil connections.

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