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Question Paper Code : 57307

B.E./B.Tech. DEGREE EXAMINATION, MAY/JUNE 2016

Second Semester

Electronics and Communication Engineering

EE 6201 – CIRCUIT THEORY

(Common to Electrical and Electronics Engineering, Electronics and Instrumentation Engineering, Instrumentation and Control Engineering, Biomedical Engineering and Medical Electronics Engineering)

(Regulations 2013)

Time : Three Hours **Maximum : 100 Marks**

Answer ALL questions.

PART – A (10 × 2 = 20 Marks)

1. The resistance of two wires is 25 Ω when connected in series and 6 Ω when connected in parallel. Calculate the resistance of each wire.
2. Distinguish between mesh and loop of a circuit.
3. State reciprocity theorem.
4. What is the condition for maximum power transfer in DC and AC circuits ?
5. Define co-efficient of coupling.
6. In a series RLC circuit, if the value of L and C are 100 mH and 0.1 μF, find the resonance frequency in Hz.
7. In a series RLC circuit, L = 2 H and C = 5 μF. Determine the value of R to give critical damping.
8. Define time constant of RL circuit.
9. A 3 phase 400 V is given to balanced star connected load of impedance 8 + 6j Ω. Calculate line current.
10. List out the advantages of three phase system over single phase system.

PART – B (5 × 16 = 80 Marks)

11. (a) (i) Determine the current I_L in the circuit shown in Fig. 11 (a) (i). **(8)**

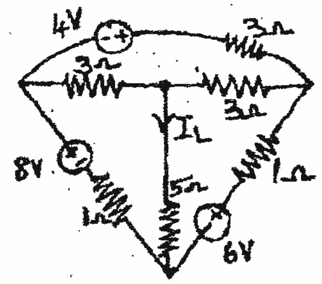

Fig. 11 (a) (i)

(ii) Calculate the voltage across A and B in the circuit shown in Fig. 11 (a) (ii). **(8)**

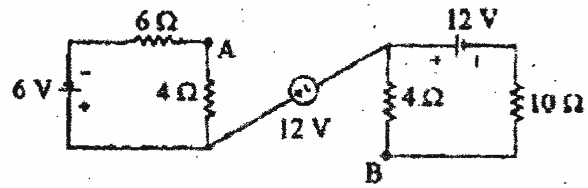

Fig. 11 (a) (ii)

OR

(b) (i) Three loads A, B, C are connected in parallel to a 240 V source. Load A takes 9.6 kW, load B takes 60 A, and load C has a resistance of 4.8 Ω. Calculate R_A and R_B, the total current, total power and equivalent resistance. **(8)**

(ii) For the circuit shown in Fig. 11 (b) (ii), determine the total current and power factor. **(8)**

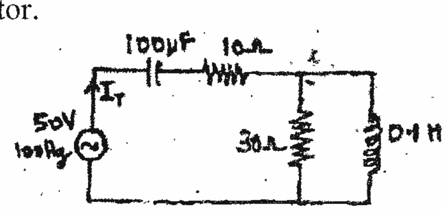

Fig. 11 (b) (ii)

12. (a) Find the voltage across 5 Ω resistor for the circuit shown in Fig. 12 (a) using source transformation technique and verify the results using mesh analysis. **(16)**

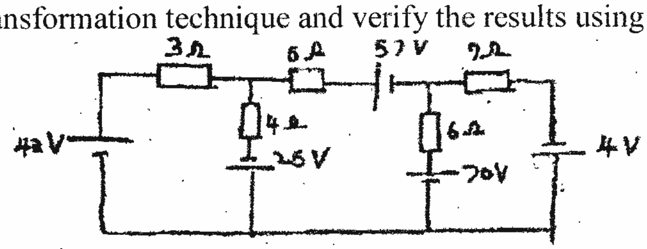

Fig. 12 (a)

OR

(b) Obtain the Norton's model and find the maximum power that can be transferred to the 100 Ω load resistance, in the circuit shown in Fig. 12 (b). **(16)**

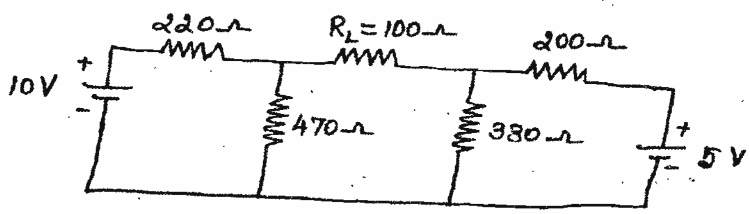

Fig. 12 (b)

13. (a) Determine the resonant frequency, bandwidth and quality factor of the coil for the series resonant circuit considering R = 10 Ω, L = 0.1H and C = 10 μF. Derive the formula used for bandwidth. **(16)**

OR

(b) (i) Derive the expression for equivalent inductance of the parallel resonant circuit as shown in Fig. 13 (b) (i). **(8)**

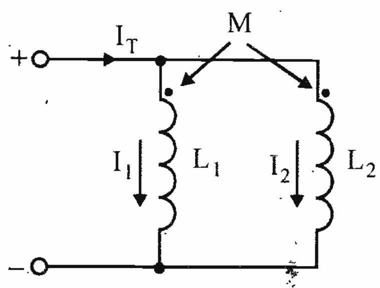

Fig. 13 (b) (i)

(ii) Write the mesh equations and obtain the conductively coupled equivalent circuit for the magnetically coupled circuit shown in Fig. 13 (b) (ii). **(8)**

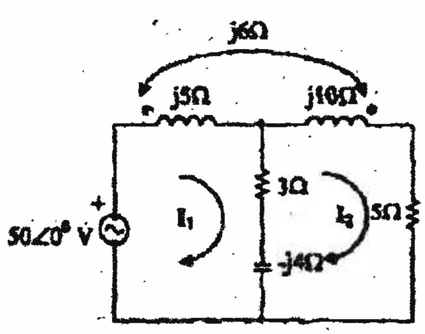

Fig. 13 (b) (ii)

14. (a) A sinusoidal voltage of 10 sin 100 is connected in series with a switch and R = 10 Ω & L = 0.1H. If the switch is closed at t=0, determine the transient current i(t). **(16)**

OR

(b) In the circuit shown in Fig. 14(b). Determine the transient current after switch is closed at time t = 0, given that an initial charge of 100 μC is stored in the capacitor. Derive the necessary equations. **(16)**

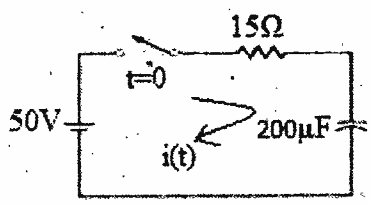

Fig. 14(b)

15. (a) Obtain the readings of two wattmeters connected to a three phase, 3 wire, 120V system feeding a balanced Δ connected load with a load impedance of $12\angle 30°$ Ω. Assume RYB phase sequence. Determine the phase power and compare the total power to the sum of wattmeter readings. **(16)**

OR

(b) (i) If W_1 & W_2 are the reading of two wattmeters which measures power in the three phase balanced system and if $W_1 / W_2 = a$, show that the power factor of the circuit is given by **(8)**

$$\cos\phi = \frac{a+1}{2\sqrt{a^2 - a + 1}}$$

(ii) A symmetrical,three phase, three wire 440 V ABC system feeds a balanced Y-connected load with $Z_A = Z_B = Z_C = 10\angle 30°$ Ω obtain the line currents. **(8)**