Reg. No.

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.

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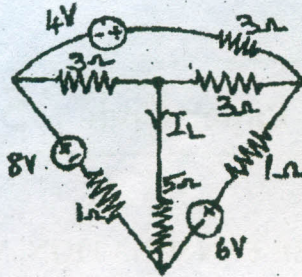

Fig. 11 (a) (i)

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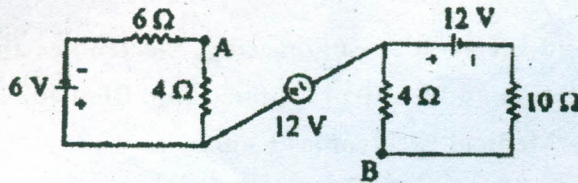

Fig. 11 (a) (ii)

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)

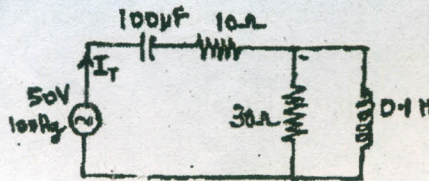(ii)   For the circuit shown in Fig. 11 (b) (ii), determine the total current and power factor.   (8)

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)
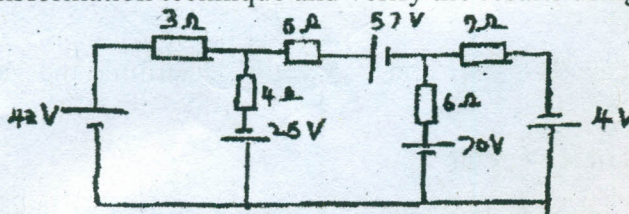

Fig. 12 (a)

OR

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(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)
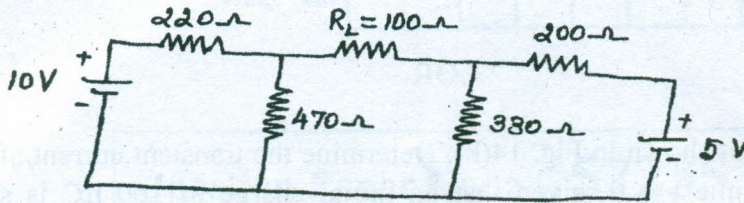

Fig. 12 (b)

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)
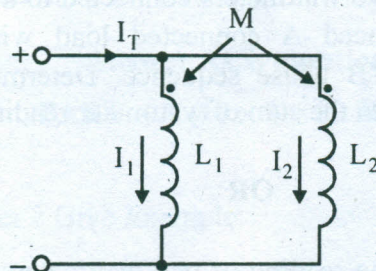

Fig. 13 (b) (i)

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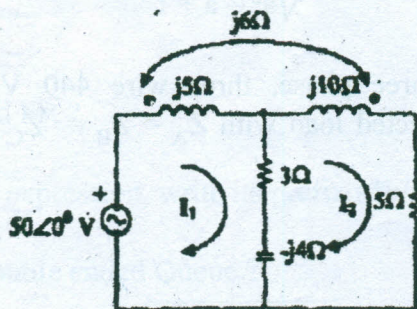

Fig. 13 (b) (ii)

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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)**

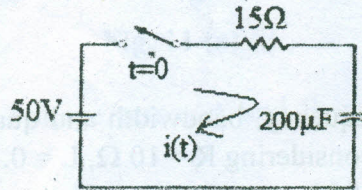**Fig. 14(b)**

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)**

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