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Question Paper Code : Q 2712

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2009.

Annual Pattern – First Year

Electrical and Electronics Engineering

EE 1 X 01 — ELECTRIC CIRCUIT ANALYSIS

(Common to B.E. – Electronics and Instrumentation Engineering and B.E.– Instrumentation and Control Engineering)

(Regulation 2004)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Define ideal Voltage Source and ideal Current Source.

2. A circuit has three identical resistances connected in series. The power dissipated in the circuit is 100 W. What will be the power dissipated if the three resistances are Connected in parallel, supply voltage remaining same?

3. Give the Laplace transform of

   (a) $\sin \omega t$ and

   (b) $\cos \omega t$.

4. What are poles and zeros of a Network function?

5. An inductance of 1 H is in series with a capacitance of 1 μF. If the frequency is 50 Hz, find the impedance of the circuit.

6. What is admittance? What are its components?

7. Find the maximum power that can be delivered by a circuit whose Open circuit voltage is 100 V and the equivalent resistance as seen across its terminals is 10 Ω.

8. State Superposition theorem.

9. In three phase power measurement using two wattmeters if one wattmeter reads zero what will be the power factor of the circuit?

10. Define coefficient of coupling.

PART B — (5 × 16 = 80 marks)

11. (a) (i) State and explain Kirchoff's Laws. (8)

(ii) Two resistors are connected in parallel and a voltage of 200 V is applied to its terminals. The total current taken is 25 A and the power dissipated in one of the resistors is 1500 W. What is the resistance of each resistor? (8)

Or

(b) (i) A circuit has 'n' resistance connected in parallel. Derive the relationship between the current through each resistor and the circuit current. (8)

(ii) Two resistors $R_1 = 2500\,\Omega$ and $R_2 = 4500\,\Omega$ are joined in series and connected to a 100 V supply. The voltage drop across R_1 and R_2 are measured successively by a voltmeter having a resistance of 50,000 Ω. Find the sum of the two readings. (8)

12. (a) (i) Derive an expression for transient current of an RL series circuit subjected to a step increase in voltage at t = 0. Define time constant and derive equation for time constant for this circuit. (8)

(ii) A direct voltage applied to a coil of L = 1 H and R = 10 Ω is suddenly changed from V_1 to V_2. Calculate the current for t = 0.05 secs, if

(1) $V_1 = 100$ V and $V_2 = 200$ V;

(2) $V_1 = 200$ V and $V_2 = 100$ V. (8)

Or

(b) (i) A circuit of resistance 20 Ω and inductance 0.2 H in series has a direct voltage of 250 V suddenly applied to it. Find the voltage drop across the inductor at the instant of switching and at 0.01 secs later. (8)

(ii) Express the impedance z(s) of the parallel combination of L= 4H and $C = 1\,\mu F$. At what frequencies the impedance becomes infinite ? (8)

13. (a) (i) A resistor of 100 Ω is connected in series with a 50 μF capacitor to a supply at 200 V, 50 Hz. Find the circuit current and power factor. Draw the phasor diagram. (8)

(ii) Obtain the power and power factor of the circuit shown in fig 13 (a) (ii). (8)

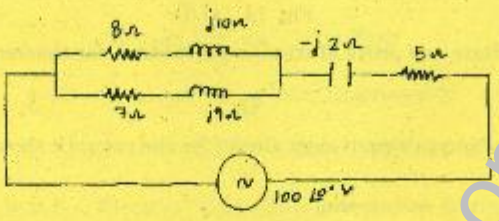

Fig. 13 (a) (ii)

Or

(b) (i) Obtain the expression for resonant frequency for the circuit shown in fig 13.(b) (i). (8)

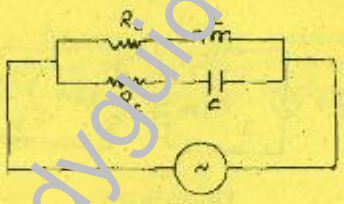

Fig. 13. (b) (i)

(ii) A coil having a resistance of 5 Ω and an inductance of 0.1 H is connected in series with a 50 μF Capacitor and a supply voltage of 200 V is applied across the circuit. What will be frequency of supply voltage at which current is maximum? Calculate the current and voltage magnification at resonance? (8)

14. (a) (i) Calculate V_A and V_B in the circuit shown in fig. 14 (a) (i), using Nodal Analysis. (8)

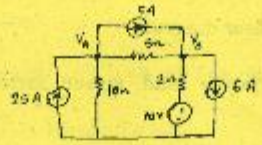

Fig. 14. (a) (i)

(ii) State and prove Maximum Power transfer theorem for A.C Circuits. (8)

Or

(b) Obtain Norton's equivalent circuit for the network shown in fig. 14. (b). (16)

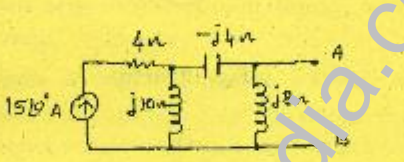

Fig. 14 (b)

15. (a) (i) In the coupled circuit shown in fig. 15.(a)(i), find V_2 for which $I_1 = 0$. (8)

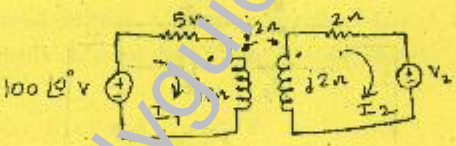

Fig. 15 (a) (i)

(ii) What are symmetrical components. Derive equation for symmetrical components in terms of three phase voltage. (8)

Or

(b) Determine the line currents and their phase angles in an unbalanced star connected load supplied from a symmetrical three phase 440 V supply. The branch impedances of load are $Z_R = 5\angle 30^\circ\ \Omega, Z_Y = 5\angle 30^\circ\ \Omega$ and $Z_B = -5\angle 30^\circ\ \Omega$; The phase sequence is RYB. (16)