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Question Paper Code : 53012

B.E./B.Tech. DEGREE EXAMINATION, MAY/JUNE 2013.

Third Semester

Electrical and Electronics Engineering

EE 1151 — ELECTRIC CIRCUIT ANALYSIS

(Common to Electronics and Instrumentation Engineering and Instrumentation and Control Engineering)

(Regulation 2007)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. What are the two types of circuit elements?

2. What is the equivalent resistance value of 'n' resistances connected in parallel?

3. Define time-constant of RC transient circuit.

4. Define driving point impedance.

5. Distinguish between real power and reactive power.

6. What is the role of bandwidth in communication systems?

7. What is the rule to determine the number of independent loops in a given circuit?

8. State Norton's theorem and draw its equivalent circuit.

9. Define self and mutual inductance.

10. In a two wattmeter method when the p.f. is unity, what will be the readings of the two wattmeters?

PART B — (5 × 16 = 80 marks)

11. (a) (i) Explain different types of voltage and current sources. (8)

(ii) State and explain Kirchoff's laws. (8)

Or

(b) (i) Derive an expression for the RMS value of sine wave current. (8)

(ii) Two resistances R_1 and R_2 connected in parallel take a total current of I_t. Obtain expressions for the currents in the individual resistances. If $R_1 = 1.95\Omega$, $R_2 = 0.05\,\Omega$ and $I_t = 50\,A$, find I_1 and I_2. (8)

12. (a) Derive an expression for current response of RLC series circuit with sinusoidal excitation. Assume the circuit is working in critical damping condition. (16)

Or

(b) (i) State and explain initial and final value theorems. (8)

(ii) A series RC circuit has $R = 10\ \Omega$ and $C = 0.1$ F. A constant voltage of 20 V is applied to the circuit at $t = 0$. Determine the voltage across the resistor and the voltage across the capacitor. (8)

13. (a) In an a.c. circuit consisting of two elements in series, the equations for voltage and current are $e = 180 \sin 314\,t$ and $I = 28.4 \sin (314\,t - \pi/3)$. Calculate

(i) The effective voltage and current,

(ii) The frequency,

(iii) The power factor,

(iv) The power and

(v) The values of the circuit constants. (16)

Or

(b) (i) Derive the expressions for Half-power frequencies. (8)

(ii) A series RLC circuit has $R = 5$ Ohms, $L = 40$ mH and $C = 1\ \mu$F. Calculate

(1) The Q of the circuit,

(2) The separation between half power frequencies,

(3) The resonant frequency and

(4) The half power frequencies f_1 and f_2. (8)

14. (a) (i) Write down the rules for constructing nodal admittance matrix. (8)

(ii) Find the currents I_A and I_B for the circuit shown in Fig.14 (a) (ii) by nodal method. (8)

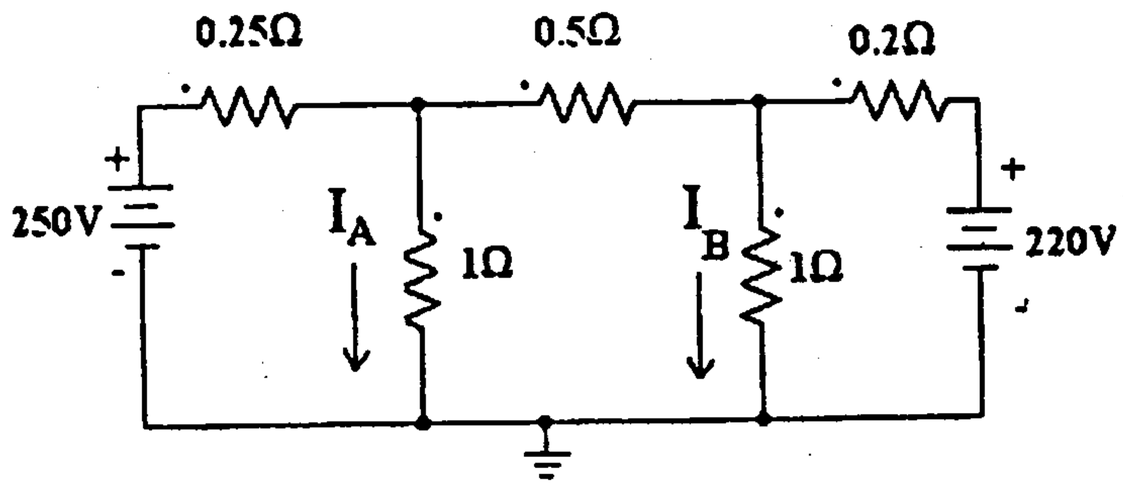

Fig. 14 (a) (ii)

Or

(b) State and prove maximum power transfer theorem in an AC circuit when the load is (i) variable complex impedance and (ii) variable pure resistance. (16)

15. (a) (i) Derive an expression for coefficient of coupling. (6)

(ii) For the coupled circuit shown in Fig. 15. (a) (ii), find the ratio V_2 / V_1 which results in zero current I_1. (10)

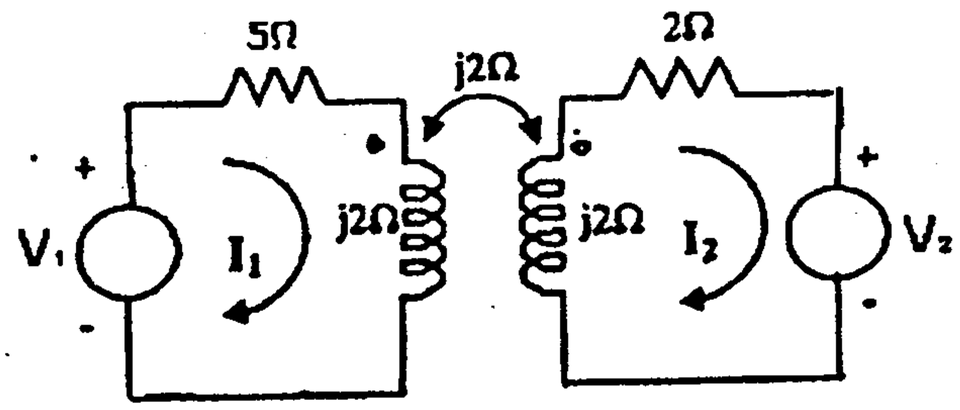

Fig. 15 (a) (ii)

Or

(b) Draw the circuit of 3-phase balanced star-connected load with wattmeters for power measurement and also prove that two wattmeters are sufficient to measure 3-phase power. (16)