B.Tech. Ist Semester
BASIC ELECTRICAL ENGINEERING
(EE 101 C)

Time : 3 Hours]   [Max. Marks : 75

Instructions :

(i)   *It is compulsory to answer all the questions (1.5 marks each) of Part-A in short.*

(ii) *Answer any four questions from Part-B in detail.*

(iii) *Different sub-parts of a question are to be attempted adjacent to each other.*

PART–A

1. (a) Differentiate dependent and independent sources.

   (1.5)

   (b) Define hysteresis and eddy current losses.   (1.5)

   (c) State maximum power transfer theorem.   (1.5)

   (d) Define the terms: Q-factor and Bandwidth.   (1.5)

   (e) What is the significance of power factor in AC system?

   (1.5)

   (f) Differentiate between phase and line voltages in three-phase system.   (1.5)

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(g) Define the term 'phase sequence'. (1.5)

(h) Why the efficiency of transformer is higher as compared to other electrical machines? (1.5)

(i) Why brushes are made of carbon for dc machine? (1.5)

(j) Which type of synchronous generator is suitable for hydro power generation and why? (1.5)
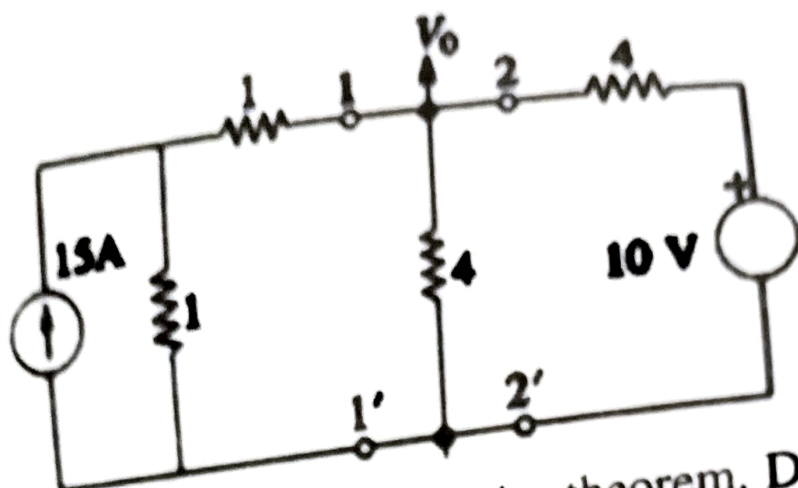
PART-B

2. (a) In the given circuit, find the value of supply voltage V so that 20-Ω resistor can dissipate 180 W. (8)
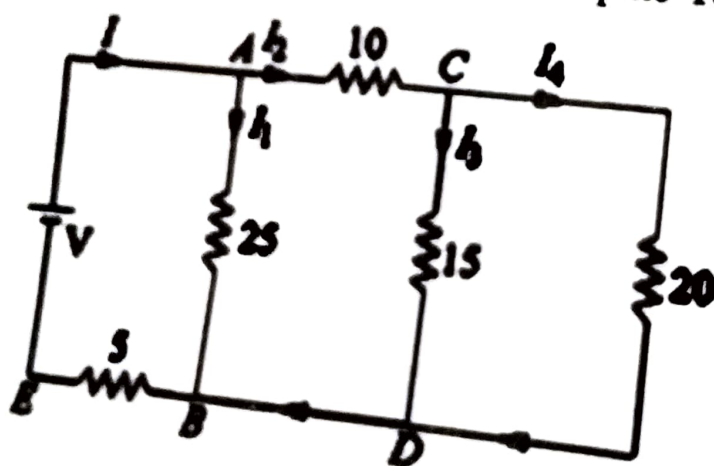
(b) Determine current in each branch of the network shown in figure using Nodal Analysis. (7)
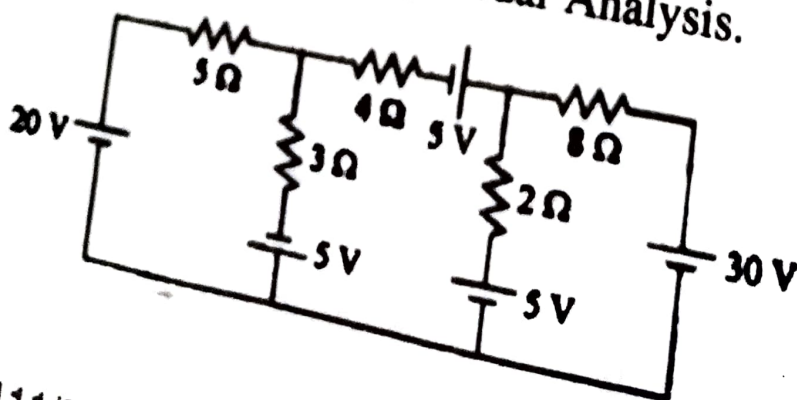
(a) With the help of Norton Theorem, find V_0 in the circuit shown in figure. All resistances are in ohms.

(5)

(b) State and explain reciprocity theorem. Derive results for it.

(5)

(c) Define: (i) Self inductance, and (ii) Mutual inductance. Mention their units and formula to calculate each of them. Derive an expression for the energy stored in an inductor of self inductance 'L' henry carrying the current of 'I' amperes.

(5)

4. (a) What is the significance of the r.m.s. and average values of a wave? Determine the r.m.s. and average value of the waveform shown in figure.

(7)
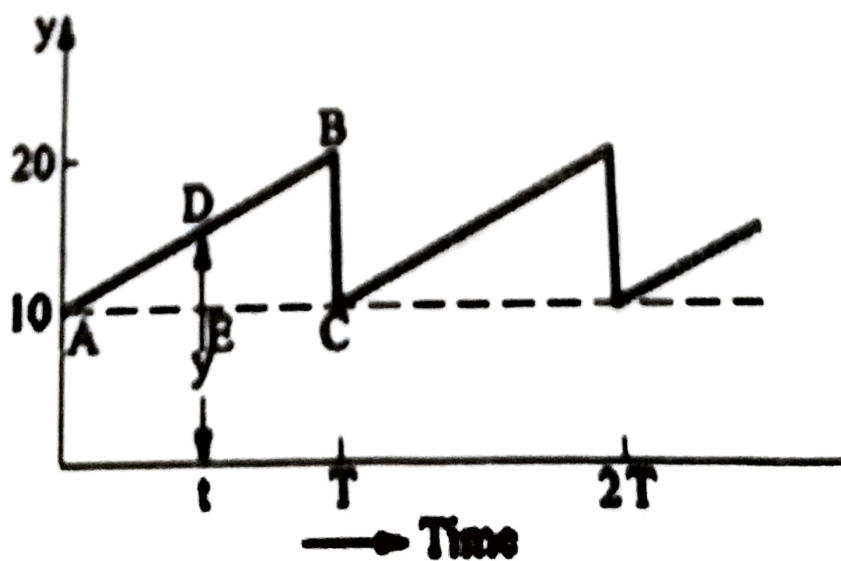
(b) Two impedances consist of (resistance of 15 ohms and series-connected inductance of 0.04 H) and (resistance of 10 ohms, inductance of 0.1 H and a capacitance of 100 μF, all in series) are connected in series and are connected to a 230 V, 50 Hz a.c. source. Find: (i) Current drawn, (ii) Voltage across each impedance, (iii) Individual and total power factor. Draw the phasor diagram. (8)

5. (a) Derive an expression for the resonant frequency of the parallel circuit shown in Fig. (8)
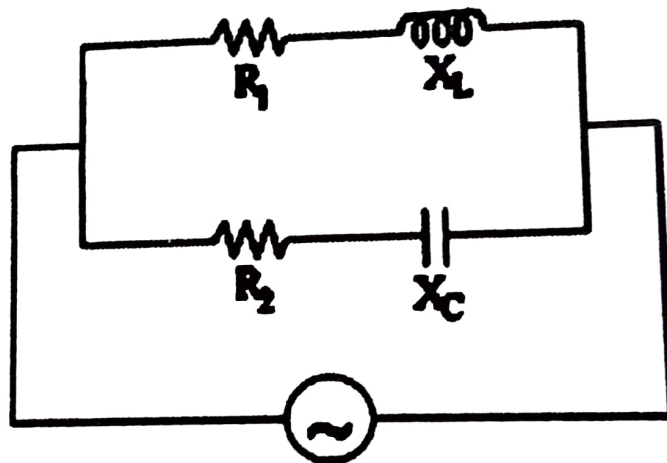
(b) Describe advantages and disadvantages of three-phase system over single-phase system. (7)

6. (a) A balanced 3-phase star-connected load of 8 + j 6 ohms per phase is connected to a three-phase 230 V supply. Find the line-current, power-factor, active-power, reactive-power, and total volt-amperes. (5)

(b) Explain two wattmeter method of power measurement in three-phase AC system at balanced load. What are the effects of power factor on wattmeter reading?

(10)

7. (a) Derive emf equation of single-phase transformer.

(5)

(b) Explain how the revolving flux is produced in stator of 3-phase induction motor.

(5)

(c) With neat sketches explain the construction of three-phase salient pole synchronous generator.

(5)

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