3E1483

Roll No. : _____ Total Printed Pages : 4

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B.Tech. (Sem. III) (Main/Back) Examination, February - 2010
Electrical Engineering
(3EE3 Circuit Analysis - I)

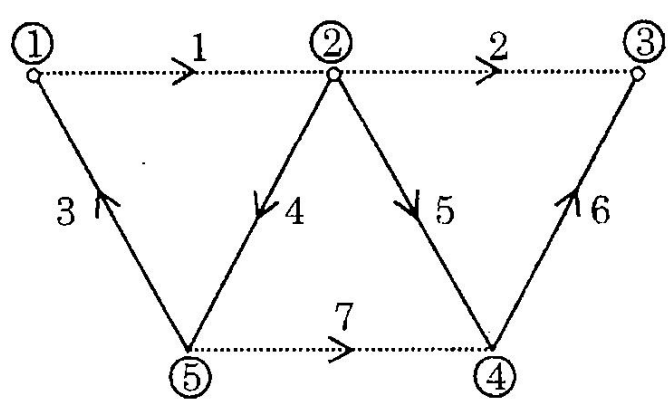
Time : **3** Hours] [Total Marks : **80**
[Min. Passing Marks : **24**

*Attempt overall **five** questions in all. Schematic diagrams must be shown wherever necessary. Any data you feel missing may suitably be assumed and stated clearly.*

Use of following supporting material is permitted during examination.
(Mentioned in form No. 205)

1. Nil 2. Nil

1 (a) A graph is shown in Fig. below. Find the tie-set and cut set matrices and obtain the KCL and KVL equations.



8

(b) Deduce the expression for quality factor of a coil L with effective internal resistance R, connected to a sinusoidal voltage source $V_m \sin wt$.

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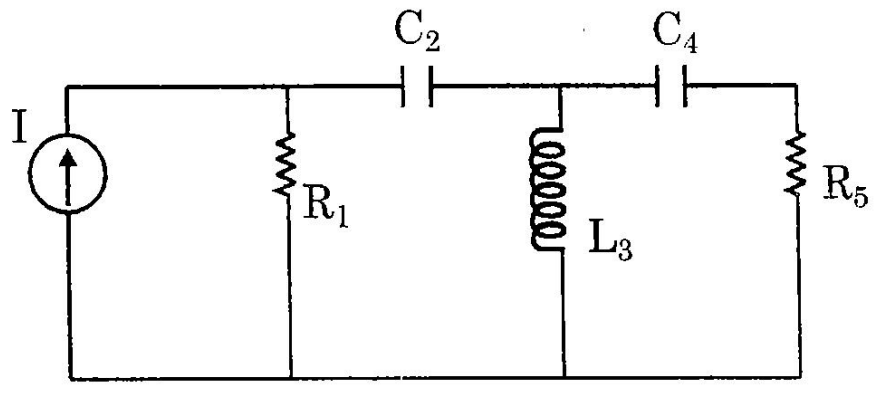
OR

1 (a) Draw the dual of the network shown below.



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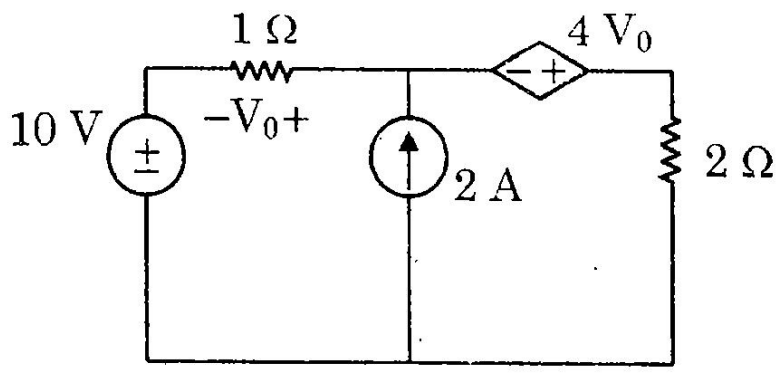
(b) A 220 V, 100 Hz a.c. source supplies a series RLC circuit with a capacitor and a coil. If the coil has 50 mΩ resistance and 5 mH inductance, find at a resonance frequency of 100 Hz, what is the value of capacitor ? Also calculate the Q factor and half power frequencies of the circuit. 8

2 (a) Find the power loss in 2Ω resistor using Thevenin's theorem in Fig. below.



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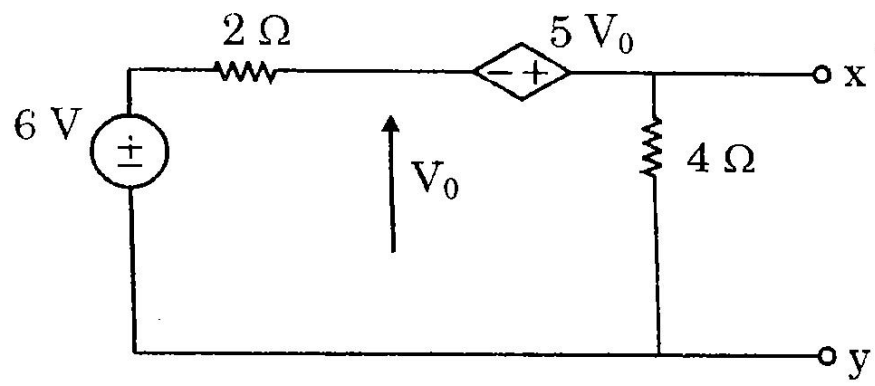
(b) State and explain for maximum power transfer theorem that power transfer from a d.c. source network to a resistive network is maximum when the internal resistance of the d.c. source network is equal to the load resistance. 8

OR

2 (a) Find Norton's equivalent of the circuit shown below at the left of *xy* terminals



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(b) State and explain for tellegan's theorem that the sum of power delivered to a closed network is zero. 8

3 (a) A three phase 220 V supply is applied to balance delta connected three phase load. The phase current being $I_{ab} = 10 \angle -30^{\circ} A$, find I_a. Compute the total power received by delta load. Find the value of the resistance portion of the phase impedance. 8

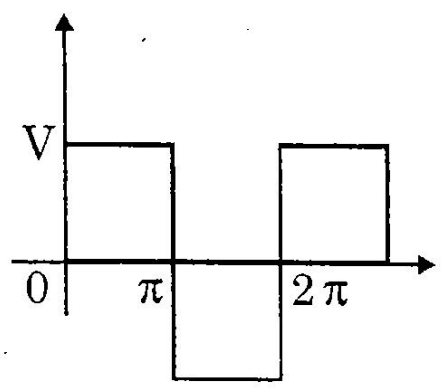
(b) A three phase 400 V load has a power factor of 0.4. Two wattmeters are connected to measure the power. If the input power be 10 kW, find the reading of each instrument. 8

OR

3 (a) A 3 phase star connected system with 400 V (L-L) is connected to a three loads = $25 \angle 0^\circ$, $11\angle -20^\circ$ and $15\angle 10^\circ$ ohm (also connected in star). Find the line current, power and current in the neutral of the system. 8

(b) a 100 kVA, 0.8 P.F. (lag) load runs in parallel to a 150 kW, 0.95 lead power factor load and the combination runs in parallel with 300 kVA, 250 kVar inductive load. Determine the complex power of the three loads. 8

4 (a) A square waveform is shown below. Obtain the Fourier series.



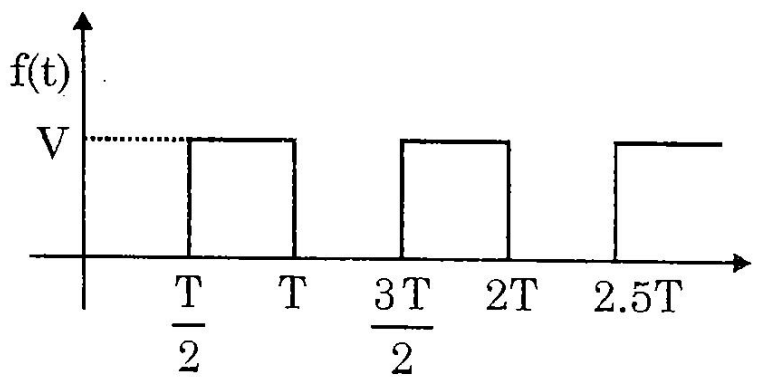
8

(b) Explain the different kinds of symmetry in non-sinusoidal waves. 8

OR

4 (a) Find the Fourier series of the function shown in fig. below and is represented by

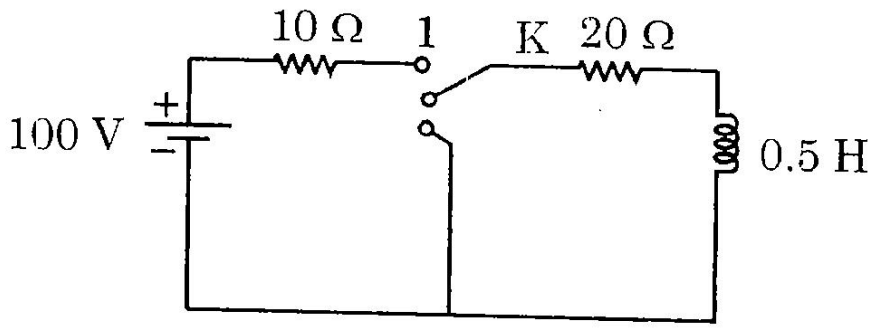
$$f(t) = \begin{cases} 0 & for \ \ 0 < t < \dfrac{T}{2} \\ A & for \ \ \dfrac{T}{2} < t < T \end{cases}$$



8

(b) Explain and derive the power relationship in non-sinusoidal waves with non-sinusoidal voltage and current. 8

5 (a) In fig. below, switch K is kept first at position 1 and steady state condition is reached. At $t=0$, the switch is moved to position 2. Find the current in both the cases. 8



(b) Derive initial and final value theorems. 8

OR

5 (a) A 50 Hz, 400 V (peak value) sinusoidal voltage is applied at $t=0$ to a series R-L circuit having resistance 5 Ω and inductance 0.2 H. Obtain an expression of current at any instant t. Calculate the value of the transient current 0.1 sec. after switching on. 8

(b) An impulse function is given by $s(t-t_1)$. Obtain its Laplace transform. 8