3E1483

Roll No. : ______________ Total Printed Pages : 7

3E1483

B.Tech. (Sem. III) (Main/Back) Examination, January - 2012
Electrical Engg.
3EE3 Circuit Analysis - I

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

Instructions to Candidates :

*Attempt any **five questions** selecting **one question** from **each unit**. All questions carry **equal** marks. Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used/calculated must be stated clearly.*

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

1. Nil 2. Nil

UNIT - I

1 (a) Draw the dual of the network as shown in **Fig. 1**.

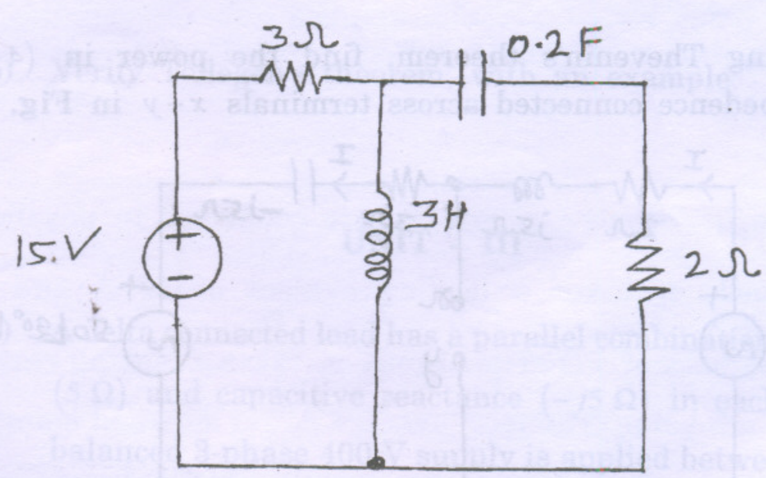


Fig. 1

8

(b) Obtain the fundamental loop and fundamental cut-set matrices for the graph shown in **Fig. 2**.

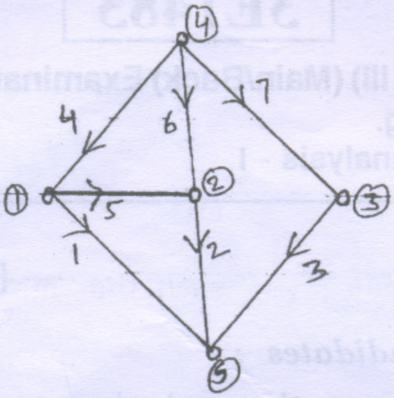


Fig. 2

8

OR

1 (a) Define Q-factor in an AC circuit. Deduce the relation between bandwidth, resonant frequency and Q-factor.

2+6

(b) A series RLC circuit has $R = 2\ \Omega$, $L = 2.0$ mH and $C = 10\ \mu F$. Calculate : (i) Q-factor of circuit (ii) the bandwidth (iii) Resonant frequency (iv) Half wave frequency f_1 and f_2.

2×4=8

UNIT - II

2 (a) Using Thevenin's theorem, find the power in $(4 + j6)\Omega$ impedence connected across terminals $x - y$ in **Fig. 3**.

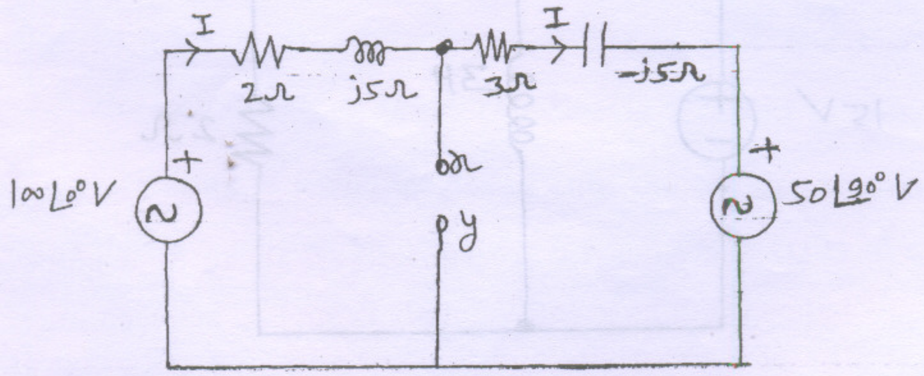


Fig. 3

8

(b) Prove that for a linear network containing generators and impedances, the ratio of a voltage V introduced in one loop to the current I produced in any other loop is same as the ratio of voltage and current obtained if the position of voltage source V and the current (I) measured are interchanged. 8

OR

2 (a) Find the value of Z_L such that maximum power transfer takes place from source to Z_L in **Fig. 4**.

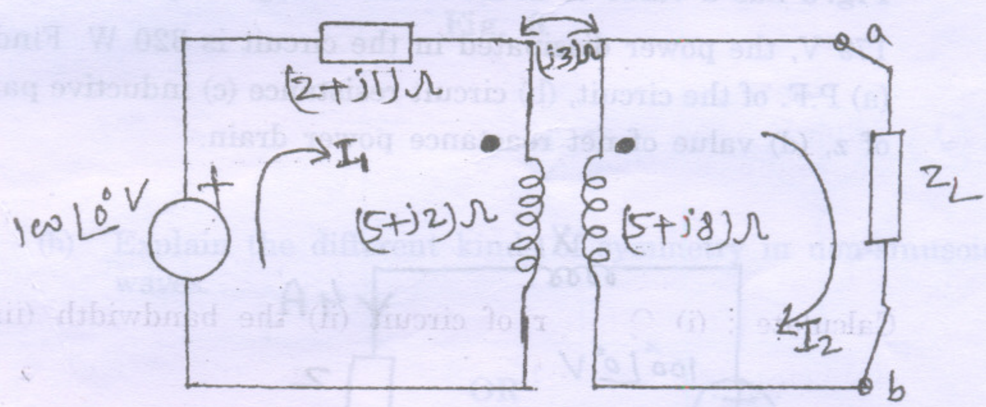


Fig. 4

8

(b) Verify Tellegen's theorem, with an example. 8

UNIT - III

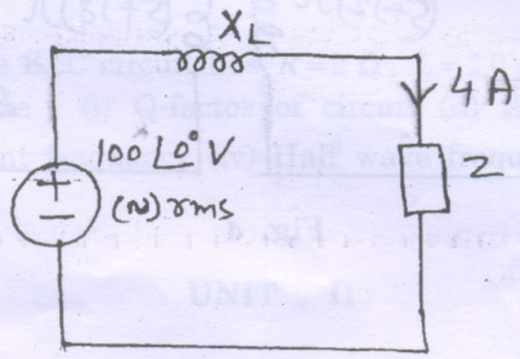
3 (a) A delta connected load has a parallel combination of resistance (5 Ω) and capacitive reactance (– j5 Ω) in each phase. If a balanced 3-phase 400 V supply is applied between lines, find the phase currents and line currents and draw the phasor diagram. 8

(b) Three identical resistances are connected in a star fashion against a balanced $3-\phi$ voltage supply. If one of the resistance be removed, by how much the power be reduced ? 4

(c) Explain "neutral shifting" in unbalanced leading system of 3-phase. 4

OR

3 (a) The inductive reactance in series with Z in the circuit of **Fig. 5** has a value of $25\,\Omega$. If the voltage drop across Z is 179 V, the power dissipated in the circuit is 320 W. Find : (a) P.F. of the circuit, (b) circuit resistance (c) inductive part of z, (d) value of net reactance power drain.



2×4=8

(b) Two impedances z_1 and z_2 are connected in parallel. The branch z_1 takes a leading current of 16 A and has a resistance of $5\,\Omega$. The branch z_2 takes a lagging current of 0.8 p.f. value. The total average power supplied being 5 kW, applied voltage being $(100+j200)V$, obtain the values of z_1 and z_2 and the total circuit current. 8

UNIT - IV

4 (a) Obtain Fourier series of the given waveform in **Fig. 6**.

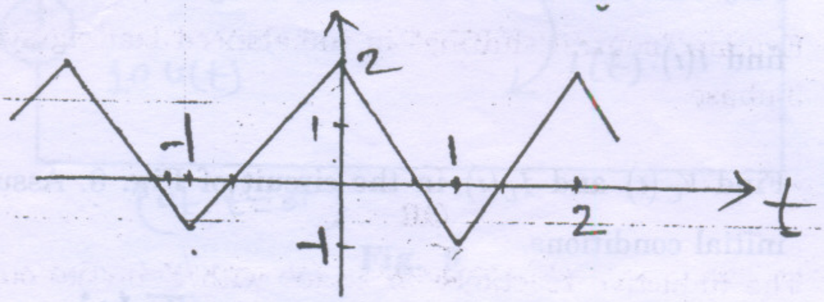


Fig. 6

8

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

OR

4 (a) Derive the expression of power with Non-sinusoidal voltage and current. 8

(b) Obtain the Fourier coefficients of the waveforms shown in **Fig. 7**.

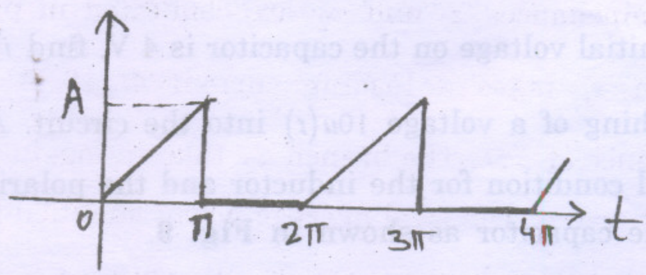


Fig. 7

8

UNIT - V

5 (a) A ramp voltage $2r(t-z)$ is applied in a series RC circuit at $t=0$ where $R = 3\ \Omega$, $C = 1\ F$. Assuming zero initial conditions, find $i(t)$. 8

(b) Find $V_C(t)$ and $I_L(t)$ in the circuit of **Fig. 8**. Assume zero initial conditions.

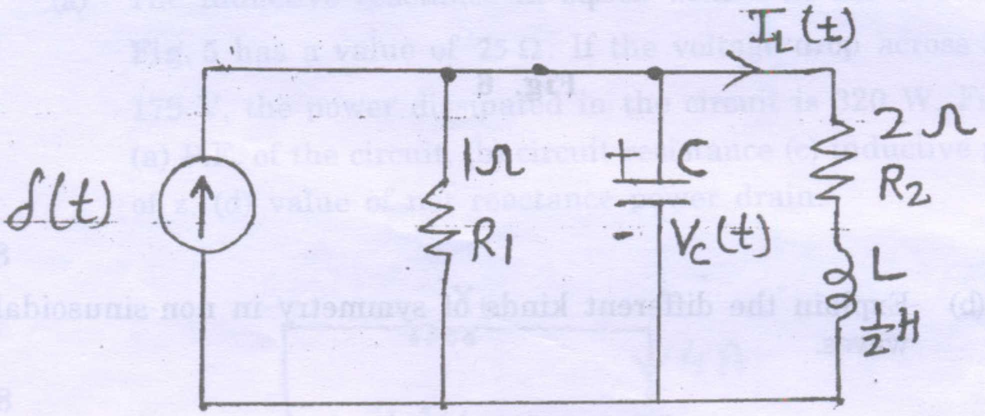


Fig. 8

8

OR

5 (a) Derive the expression for impulse response of series RL and series RC network by using Laplace transform. 8

(b) In a series RLC network, $R = 0.5\ \Omega$, $L = 1\ \text{H}$ and $C = 1\ \text{F}$. If the initial voltage on the capacitor is 4 V, find $i(t)$ following switching of a voltage $10u(t)$ into the circuit. Assume zero initial condition for the inductor and the polarity of charge on the capacitor as shown in **Fig. 9**.

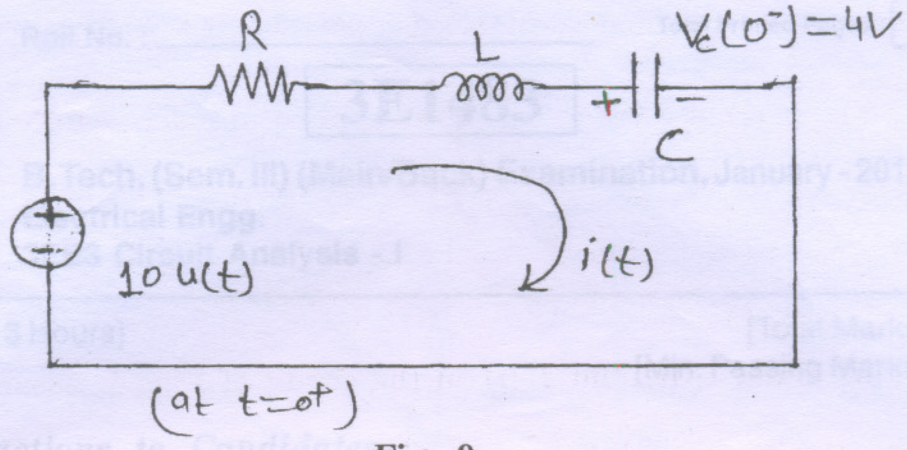


Fig. 9

8