

B.Tech. (Sem.III) (Main/Back) Examination, 2015
Electrical Engineering
3EE2 Circuit Analysis-I

Time : 3 Hours]

[Total Marks : 80
 [Min. Passing Marks : 26

Instructions to Candidates :

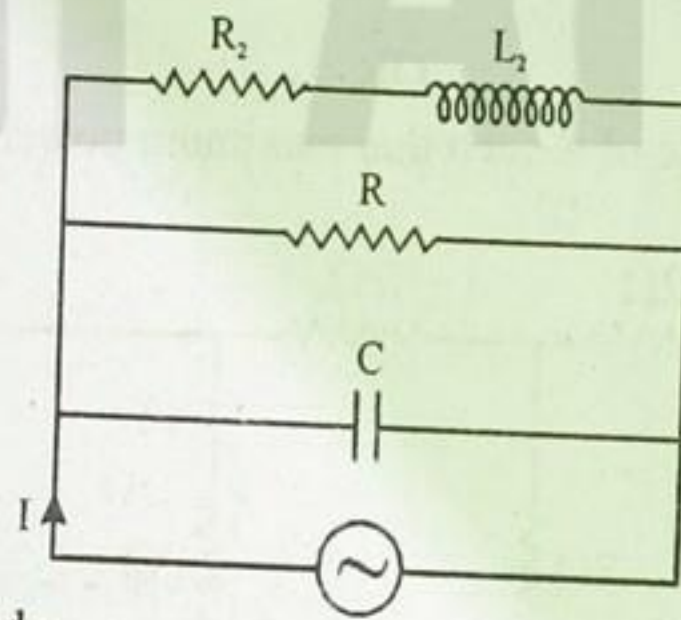
Attempt any five questions, selecting one question from each unit. All questions carry equal marks. Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used/calculated must be stated clearly.

UNIT-I

1. (a) Prove that the resonance frequency of a given circuit is given by

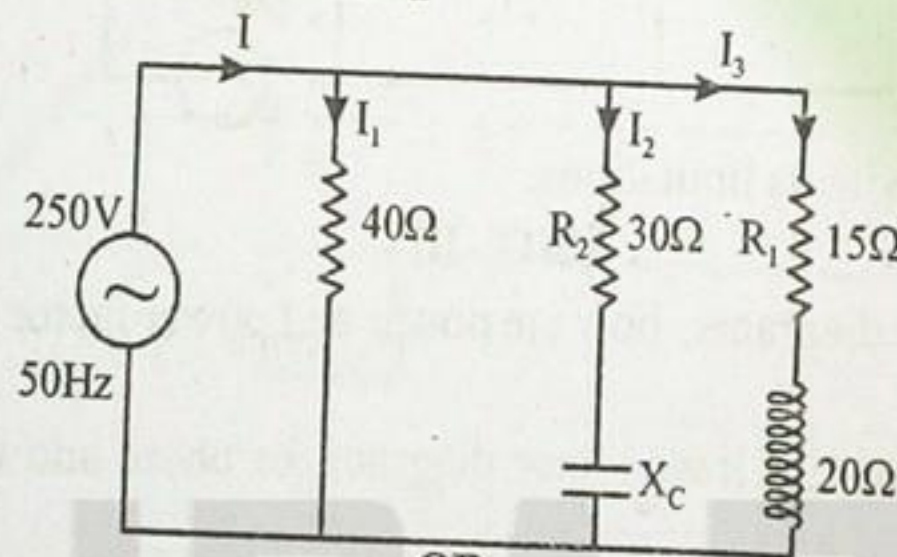
$$\omega_0 = \frac{1}{L_2} \sqrt{\frac{L_2}{C} - R_2^2}$$

(8)



- (b) In the parallel circuit shown in fig., find :
 (i) Total admittance (ii) Line current
 (iii) Power factor of the circuit (iv) Power consumed

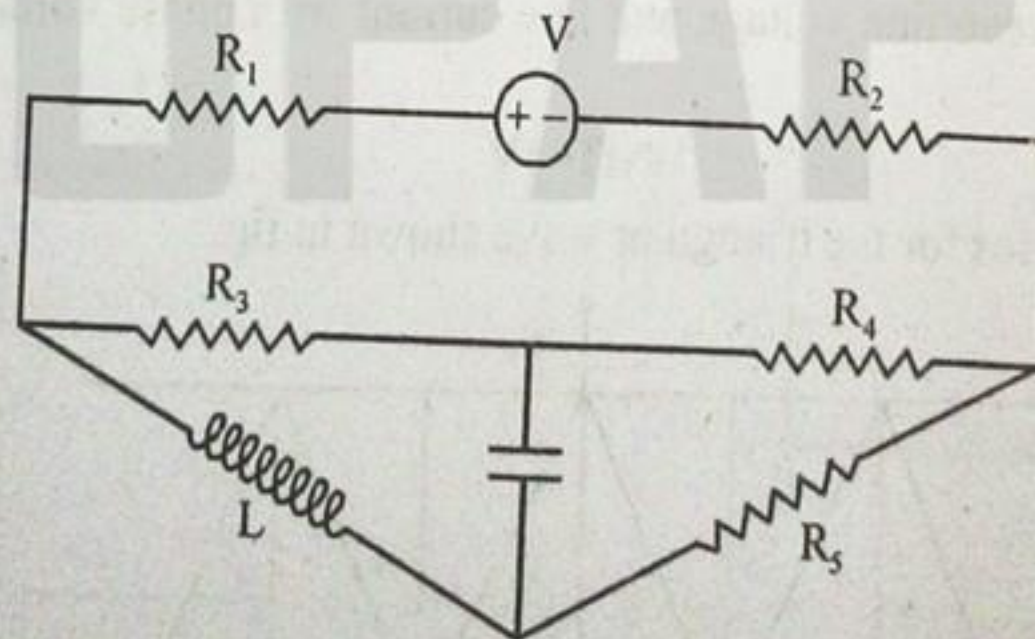
(4 × 2 = 8)



OR

- (a) Explain the principle of duality and make the conversion table for electrical circuits. Draw the dual of the network in fig. shown below :

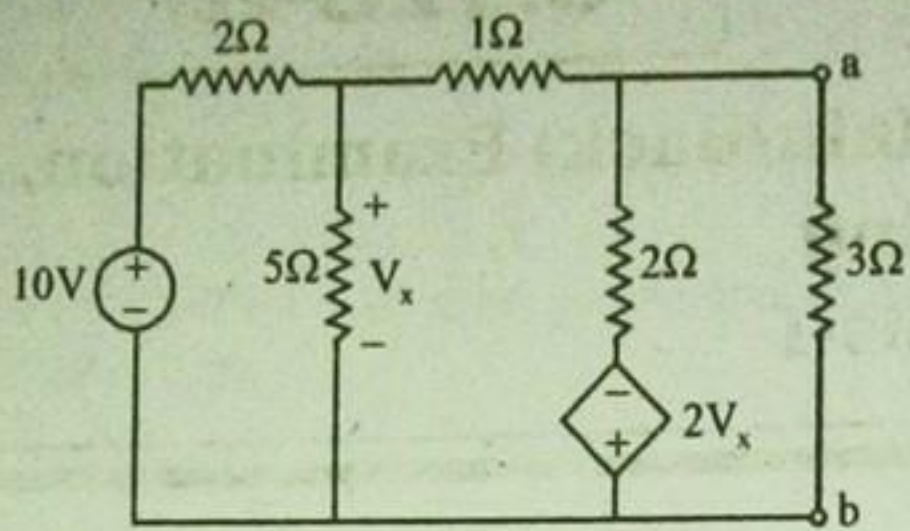
(6 × 2 = 12)



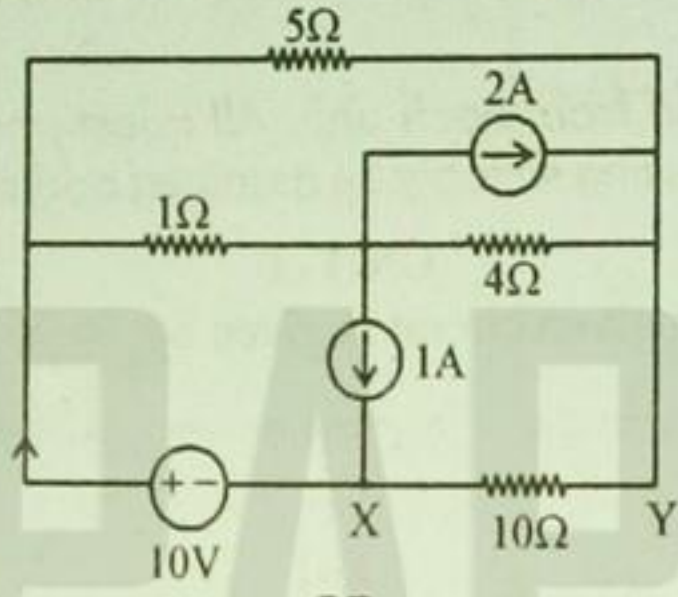
- (b) Define the terms:
 (i) Twig
 (ii) Tie set
 (iii) Cut set
 (iv) Incidence matrix.

(4 × 1 = 4)

2. (a) Find the current through 3Ω resistor of circuit given below using Norton's theorem & verify the result using Thevenin's theorem. (10)

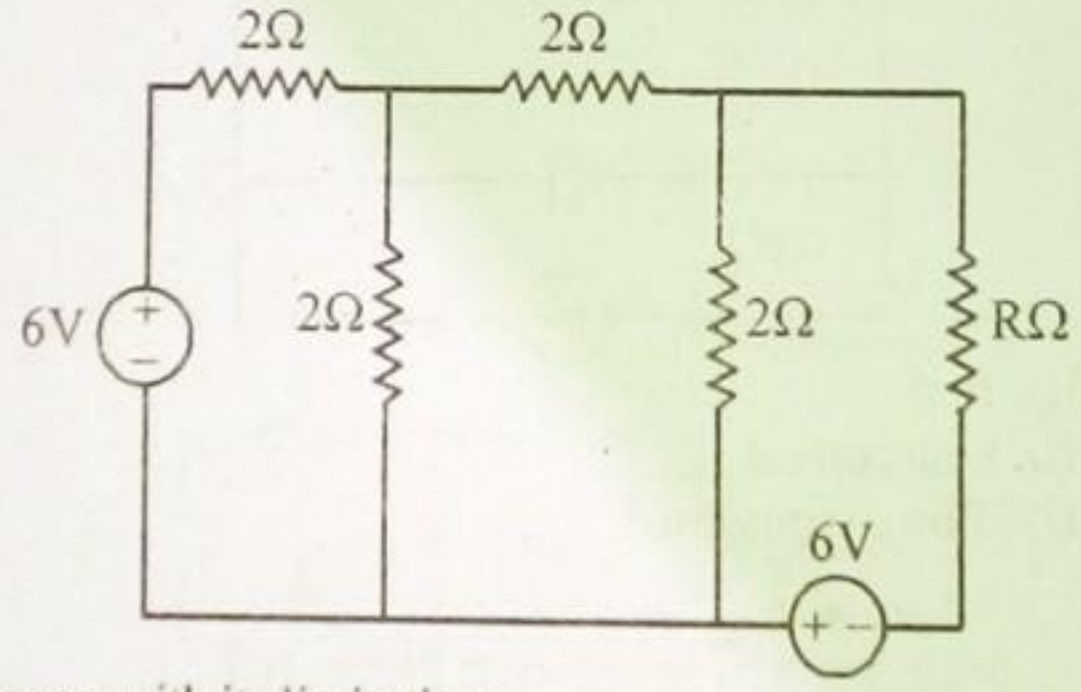


- (b) Using superposition theorem, find the current in the 10Ω resistor.



OR

2. (a) In the circuit shown in fig., find the value of R such that maximum power transfer takes place. What is the amount of this maximum power? (8)



- (b) Explain the compensation theorem with its limitations. (8)

UNIT - III

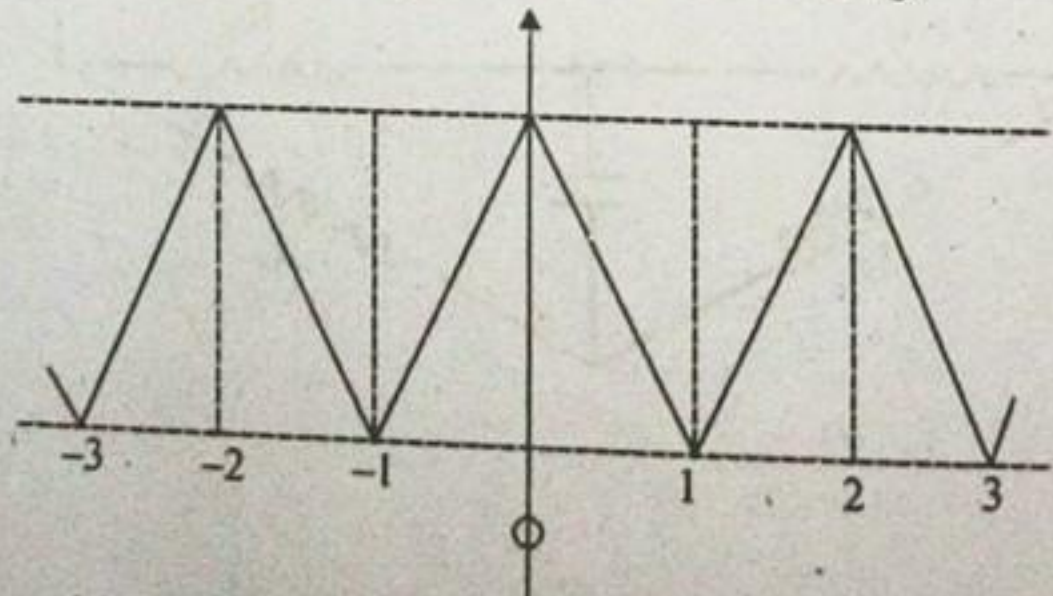
3. (a) Explain with neat circuit and phasor diagrams, how the power and power factor of 3- ϕ system can be measured by means of two wattmeter method. (8)
 (b) What are the advantages of 3- ϕ system? Draw vector diagram for phase and line voltages and currents in star and delta connections. (8)

OR

3. (a) Describe the volt amp reactive power in 3- ϕ system and power relations in A.C. circuits. (8)
 (b) Write down the relationship between line voltage and line current with phase voltage and phase current in star connected and delta connected circuits. (8)

UNIT - IV

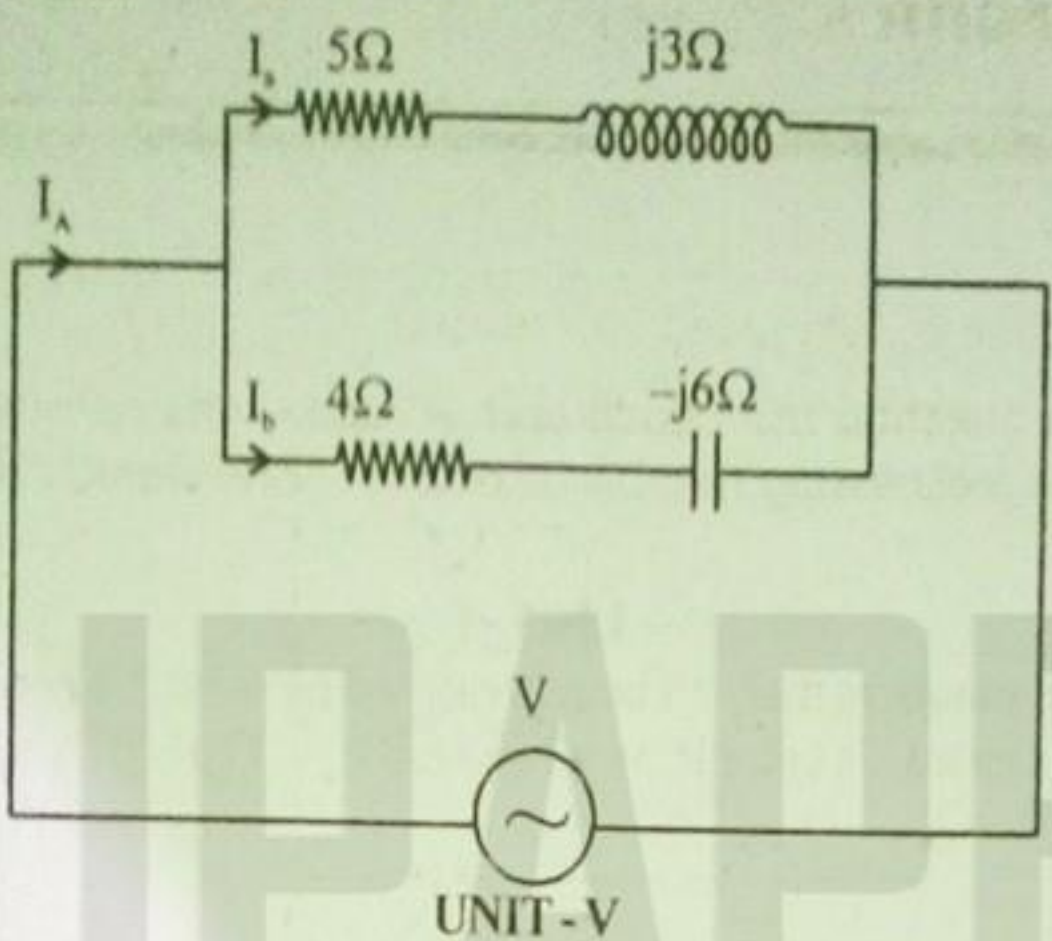
4. (a) Find the trigonometric fourier series for the triangular wave shown in fig. (8)



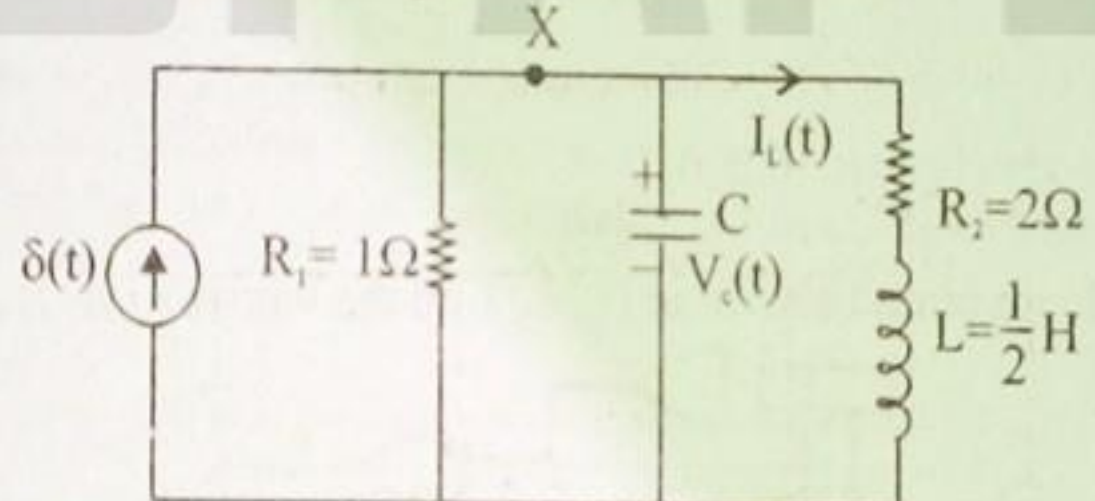
- (b) Derive the expression of power with Non-sinusoidal voltage and current. (8)

OR

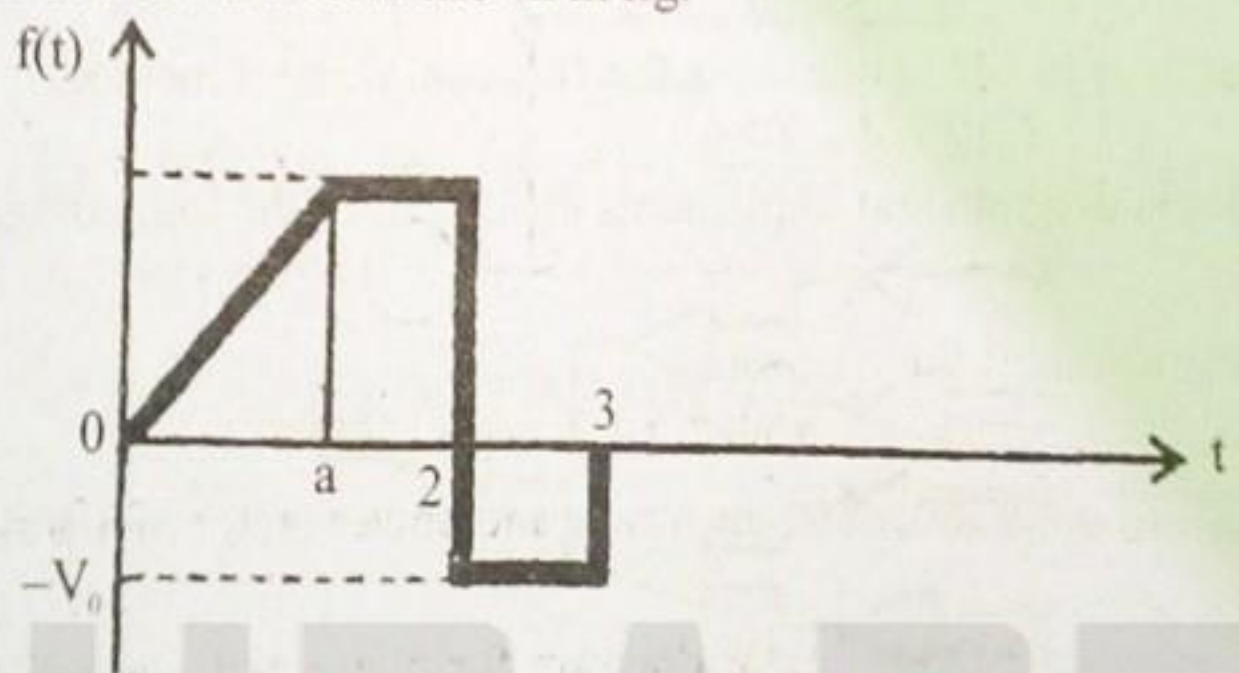
4. A voltage wave $V = 150 \sin \omega t + 50 \sin(3\omega t + 33^\circ) - 20 \sin(5\omega t - 30^\circ)$ is applied to the circuit shown below. Find:
 (a) expression for current wave
 (b) rms value of current, and
 (c) total power consumed in the circuit.



5. (a) Find $V_c(t)$ and $I_L(t)$ in the circuit of fig. assuming zero initial conditions.

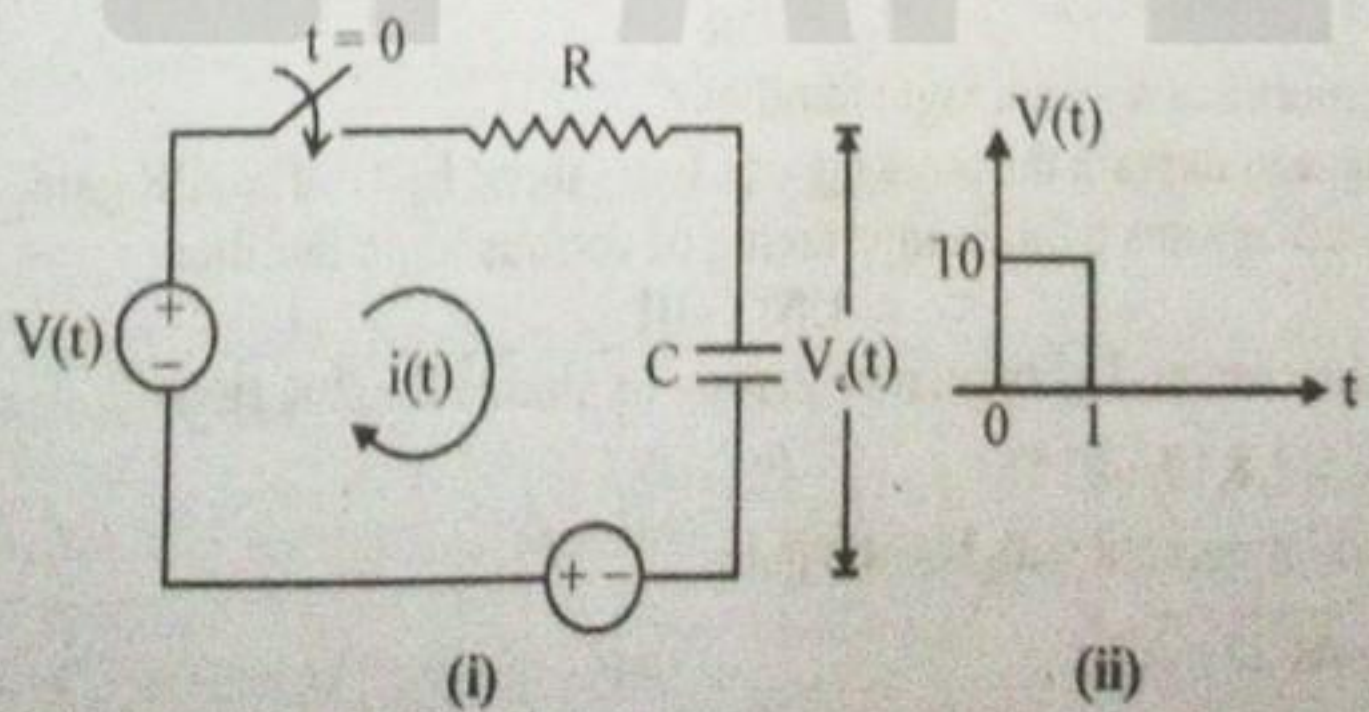


- (b) Find the Laplace transform of the wave form shown in fig.



OR

5. (a) Determine $i(t)$ of the circuit in fig.(i) for the pulse input voltage as shown in fig.(ii) with zero initial conditions. Take $R = 1\Omega$ and $C = 1F$



- (b) State and deduce initial - value and final value theorems.