Code No: RT21021 **R13** SET - 1

II B. Tech I Semester Regular Examinations, Dec - 2014
ELECTRICAL CIRCUIT ANALYSIS - II
(Electrical and Electronics Engineering)

Time: 3 hours Max. Marks: 70

Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B)**
2. Answer **ALL** the question in **Part-A**
3. Answer any **THREE** Questions from **Part-B**

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PART-A

1. a) Given that voltage $V_{bn} = 110 \angle 30^0$ in a balanced 3-phase system. Find V_{an} and V_{cn} assuming a positive phase sequence (ABC).
   b) State the two ways in which phases of a three phase supply can be interconnected to reduce the number of conductors used compared with three single-phase systems .
   c) A circuit consists of a resistor connected in series with a 0.5 μF capacitor and has a time constant of 12 milli-sec. Determine the value of the resistor and capacitor voltage at 7 milli-sec after connecting the circuit to a 10 V supply.
   d) Find the admittance parameters for the network shown below Figure 1.
   e) Write the condition for symmetry and reciprocity with reference to h-parameters?
   f) The voltage and current at the terminals of a circuit are $v(t) = 80 + 120 \cos 120\pi t + 60 \cos (360\pi t - 300)$ and $i(t) = 5 \cos(120\pi t - 10^0) + 2 \cos(360\pi t - 60^0)$. Find the average power absorbed by the circuit.
   g) For the circuit shown below Figure 2, find $i_L(\infty)$, $v_C(\infty)$ and $v_R(\infty)$.
   h) List any three properties of Fourier Transform? (3M+3M+3M+2M+2M+3M+3M+3M)

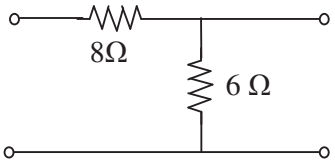

Figure 1

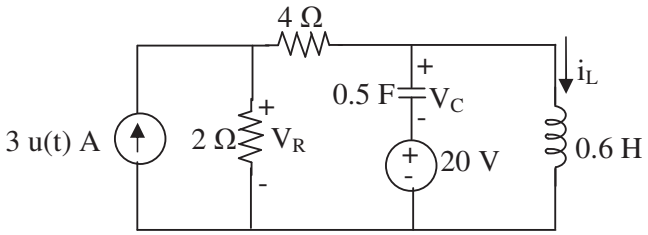

Figure 2

PART-B

2. a) A three-phase, three-wire, ABC system, with an effective line voltage of 120 V, has three impedances of $5\angle 45^0 \Omega$ in a delta connection. Determine the line currents and draw the voltage and current phasor diagram.
   b) Explain, with a neat sketch, how a three phase power is measured in delta connected load using two watt meters? (8M+8M)

3. a) A three-phase, three-wire, ABC system, with line voltage $V_{BC} = 311.1\angle 0^0$ V has line currents $I_A = 61.5 \angle 116.6^0$ A, $I_B = 61.2 \angle -48^0$ A and $I_C = 16.1\angle 218^0$ A. Find the readings of watt meters in lines i) A and B, ii) B and C, and iii) A and C
   b) A balanced three-phase star-connected generator with Vp = 220 V supplies an unbalanced star-connected load with $Z_{AN} = 60 + j80\ \Omega$, $Z_{BN} = 100 - j120\ \Omega$, and $Z_{CN} = 30 + j40\Omega$. Find the total complex power absorbed by the load. (8M+8M)

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4. a) An un-charged 80 μF capacitor is connected in series with a 1 kΩ resistor and is switched across a 110V supply. Determine the time constant of the circuit and the initial value of current flowing. Also, determine the value of current flowing after i) 40 ms and ii) 80 ms.
   b) Referring to the circuit shown in Figure 3, the switch is closed at t = 0. i) Determine equations for i_L and v_L. ii) At t = 300 ms, open the switch and determine equations for i_L and v_L during the decay phase. iii) Determine voltage and current at t = 100 ms and at t =350 ms. iv) Sketch i_L and v_L (7M+9M)

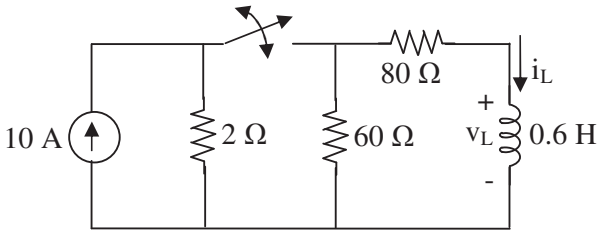

Figure 3

5. a) Obtain the y-parameters for the network shown in Figure 4.
   b) Derive relationship between hybrid and Z-parameters of two port network? (8M+8M)

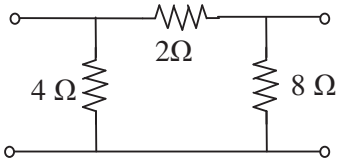

Figure 4

6. a) List the properties of positive real function and test whether the following function is positive real or not? $F(s) = \dfrac{s^2+4}{s^3+3s^2+3s+1}$
   b) Determine the Foster I form of realization of the RC impedance function. (8M+8M)

$$Z(s) = \frac{(s+1)(s+3)}{s(s+2)(s+4)}$$

7. a) Find the Fourier series of the square wave shown in Figure 5. Plot the amplitude and phase spectra.
   b) Using the Fourier transform method in Figure 6, find $i_o(t)$,when $i_s(t) = 10 \sin 2t$ A. (8M+8M)

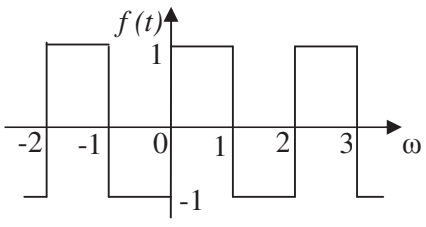

Figure 5

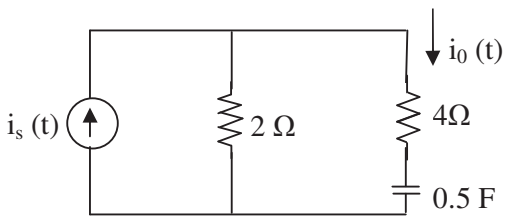

Figure 6

Code No: RT21021 **R13** SET - 2

II B. Tech I Semester Regular Examinations, Dec - 2014
ELECTRICAL CIRCUIT ANALYSIS - II
(Electrical and Electronics Engineering)

Time: 3 hours Max. Marks: 70

Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B)**
2. Answer **ALL** the question in **Part-A**
3. Answer any **THREE** Questions from **Part-B**

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PART-A

1. a) Write the relationships between line and phase currents and line and phase voltages for a star and delta connected system.
   b) Write the differences between balanced and unbalanced 3-phase systems.
   c) A capacitor of capacitance C farads is connected in series with a resistor of R ohms and is switched across a constant voltage DC supply of V volts. After a time of t seconds, the current flowing is *i* amperes. Write the expression for voltage drop across the resistor at time *t* seconds? What is the expression for final value of capacitor voltage?
   d) Find the impedance parameters for the network shown below Figure 1.
   e) Write the condition for symmetry and reciprocity with reference to ***y*** and ***h***-parameters?
   f) The voltage and current at the terminals of a circuit are $v(t) = 80 + 120 \cos 120\pi t + 60 \cos(360\pi t - 30^0)$ & $i(t) = 5 \cos(120\pi t - 10^0) + 2 \cos(360\pi t - 60^0)$ Find the average power absorbed by the circuit.
   g) For the circuit shown above Figure 2, find $i_L(0^+)$, $v_C(0^+)$ and $v_R(0^+)$.
   h) List any three properties of Fourier Transform? (3M+2M+3M+3M+3M+3M+2M+3M)

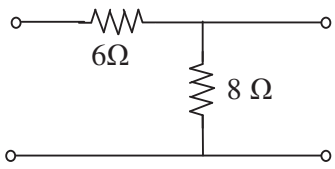

Figure 1

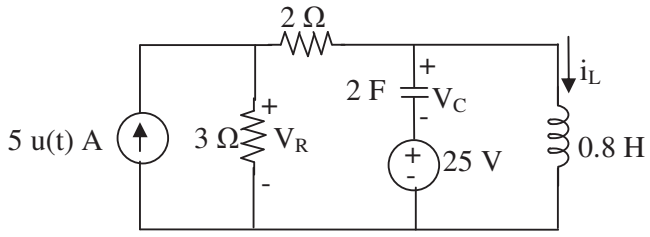

Figure 2

PART-B

2. a) In a three phase balanced load, each arm consists of a resistor of 10 ohms, an inductance of 0.6 H and a capacitor of 130 μF connected in series. The supply is a balanced 3-phase 400 V, 50 Hz. Calculate the line current, total power consumed in the load when the three arms are connected in star and delta.
   b) Three identical coils, each of resistance 10 Ω and inductance 42 mH are connected (i) in star and (ii) in delta to a 415V, 50 Hz, 3-phase supply. Determine the total power dissipated in each case. (8M+8M)

3. a) A four-wire star-star circuit has $V_{an} = 120\angle 120^0$, $V_{bn} = 120 \angle 0^0$ $V_{cn} = 120 \angle -120^0$ V. If the impedances are $Z_{an} = 20\angle 60^0$, $Z_{bn} = 30\angle 0^0$ and $Z_{cn} = 40 \angle 30^0$ Ω, find the current in the neutral line.

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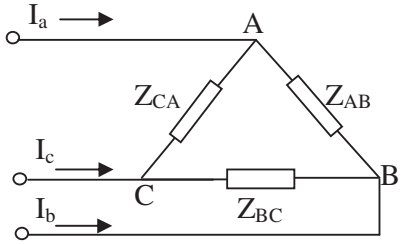
b) For the circuit shown in figure 3, the line voltage is 240 V. Take V_{ab} as reference and determine following: i) phase currents, ii) line currents, iii) total power absorbed in the load. Also draw phasor diagram. (8M+8M)



$Z_{AB} = 25\Omega$

$Z_{BC} = 12\angle 60^0\,\Omega$

$Z_{CA} = 16\angle -30^0\,\Omega$

Figure 3

4. a) Derive an expression for the current in an RL circuit when it is excited by a unit step voltage.
   b) In a series RLC circuit L=0.5 H, and C=2 F. A DC voltage of 20 V is applied at t=0. Obtain an expression for current *i* (t) in the circuit, when (i) R= 3 Ω, (ii) R= 4 Ω, (iii) R=6 Ω. (8M+8M)

5. a) Obtain the y-parameters for the network shown in Figure 4.
   b) Find the hybrid parameters of the network shown in Figure 5. (8M+8M)

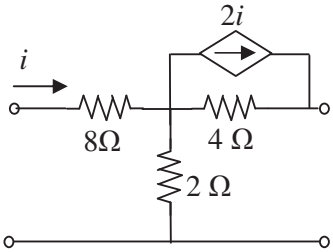


Figure 4

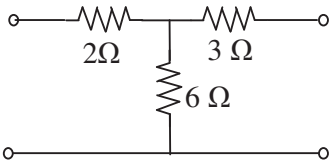


Figure 5

6. a) Find the first Foster form of LC network for the impedance function $Z(s) = \dfrac{s(s^2+2)}{(s^2+1)(s^2+3)}$

   b) Obtain the Cauer form I realization of $F(s) = \dfrac{2(s+1)(s+3)}{s(s+2)}$ (8M+8M)

7. a) A series RLC circuit has R = 10 Ω, L = 2 mH, and C = 40 μF. Determine the effective current and average power absorbed when the applied voltage is v(t) = 100 cos 1000t + 50 cos 2000t + 25 cos 3000t V.
   b) Using the Fourier transform method, Find the current $i_o(t)$ in the circuit shown in Figure 6. Given that i_s (t) = 20 cos 4t A. (8M+8M)

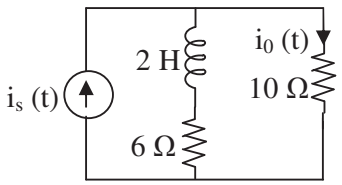


Figure 6

Code No: RT21021 **R13** SET - 3

II B. Tech I Semester Regular Examinations, Dec - 2014
ELECTRICAL CIRCUIT ANALYSIS - II
(Electrical and Electronics Engineering)

Time: 3 hours Max. Marks: 70

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2. Answer **ALL** the question in **Part-A**
3. Answer any **THREE** Questions from **Part-B**

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PART-A

1. a) Write the formulae for determining the active and reactive power dissipated in the load of a three-phase balanced system .
   b) What are the reasons for unbalance of phases in a 3-phase system?
   c) For the circuit shown below Figure 1, if $v = 15e^{-3t}$ V and $i = 0.5e^{-3t}$ A, t>0, find R &C.
   d) Write the set of equations which describe the admittance parameters and explain each term?
   e) Write the condition for symmetry and reciprocity with reference to transmission and Z-parameters?
   f) List any three properties of Fourier Transform?
   g) The voltage and current at the terminals of a circuit are $v(t) = 80 + 120 \cos 120\pi t + 60 \cos(360\pi t - 30^0)$ and $i(t) = 5 \cos(120\pi t - 10^0) + 2 \cos(360\pi t - 60^0)$ Find the rms value of the current and average power absorbed by the circuit.
   h) For the circuit shown Figure 2, find $i_L(0^-)$, $v_C(0^-)$ and $v_R(0^-)$.

(2M+3M+2M+3M+3M+3M+3M+3M)

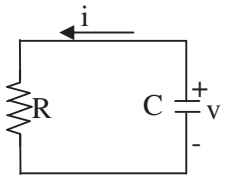

Figure 1

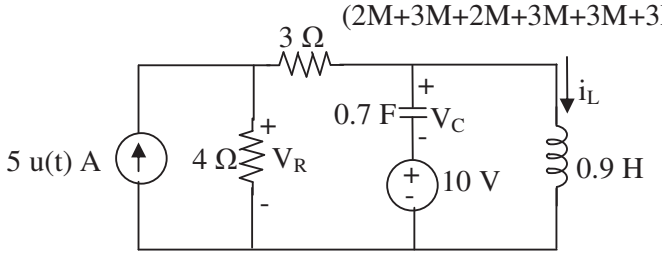

Figure 2

PART-B

2. a) Show that the total power in a 3-phase, 3-wire system using the two-wattmeter method of measurement is given by the sum of the wattmeter readings. Draw a connection diagram and phasor diagram. Also derive the expression for power factor in terms of two wattmeter readings
   b) Each phase of a delta-connected load comprises a resistance of 30Ω and an 80 μF capacitor in series. The load is connected to a 400V, 50 Hz, 3-phase supply. Calculate (i) the phase current, (ii) the line current, (iii) the total power dissipated and (iv) the kVA rating of the load. Draw the complete phasor diagram for the load. (8M+8M)

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3. A three phase 400 V star connected balanced supply is connected to star connected three load of $15\angle 0^0\ \Omega$, $12\angle -20^0\ \Omega$, and $18\angle 10^0\ \Omega$, Find line current, power and current in neutral of the (i) four wire system (ii) three wire system. Assume zero neutral impedance. (16M)

4. a) Derive an expression for voltage across 'R' in a series R-C circuit excited by a unit step voltage. Assume zero initial conditions.
   b) i) If the switch in Figure 3, has been open for a long time and is closed at t = 0, find $V_o(t)$.
   ii) In Figure 3, suppose that the switch has been closed for a long time and is opened at t= 0. Find $V_o(t)$. (8M+8M)

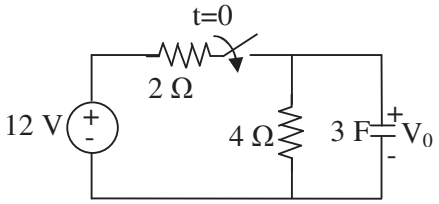

Figure 3

5. a) Find the transmission parameters of the network shown Figure 4.
   b) Determine h-parameters of a two-port network whose z parameters are $Z_{11}= Z_{22}=6$ ohms and $Z_{12}=Z_{21}=4$ ohms. (8M+8M)

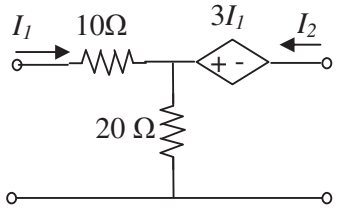

Figure 4

6. a) List the properties of positive real function and test whether the following function is positive real or not? $F(s)=\frac{s(s^2+6)}{(s^2+3)^2}$

   b) Realize the driving point impedance function $Z(s)=\frac{(s+2)(s+5)}{(s+1)(s+3)}$ in Foster form – II.

(8M+8M)

7. a) The full-wave rectified sinusoidal voltage in Figure 5 is applied to the low-pass filter in Figure 6. Obtain the output voltage $V_o(t)$ of the filter.
   b) Calculate the Fourier series for the function shown Figure 7. (8M+8M)

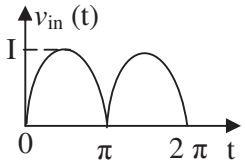

Figure 5

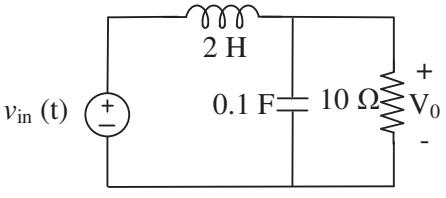

Figure 6

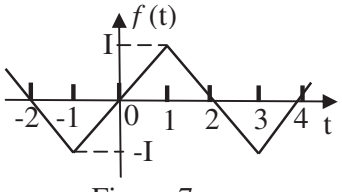

Figure 7

Code No: RT21021 **R13** SET - 4

II B. Tech I Semester Regular Examinations, Dec - 2014
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Time: 3 hours Max. Marks: 70

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2. Answer **ALL** the question in **Part-A**
3. Answer any **THREE** Questions from **Part-B**

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PART-A

1. a) Name three advantages of three-phase systems over single-phase systems
   b) Write a formula for a power factor in a balanced system 3-phase system when the power is measured by two-wattmeter method.
   c) For the circuit shown below Figure 1, if $v = 20e^{-4t}$ V and $i = 0.5e^{-4t}$ A, $t>0$, find time constant of the circuit
   d) What is meant by time constant of a R-L circuit? What are its applications in power system.
   e) Write the conditions for symmetry and reciprocity with reference to h-parameters?
   f) The voltage and current at the terminals of a circuit are $v(t) = 80 + 120 \cos 120\pi t + 60 \cos (360\pi t - 30^0)$ and $i(t) = 5 \cos(120\pi t - 10^0) + 2 \cos(360\pi t - 60^0)$. Find the r.m.s value of the current and average power absorbed by the circuit.
   g) For the circuit shown below Figure 2, find $i_L(0^+)$, $v_C(0^+)$ and $v_R(0^+)$.
   h) List any three properties of Fourier Transform? (3M+2M+2M+3M+3M+3M+3M+3M)

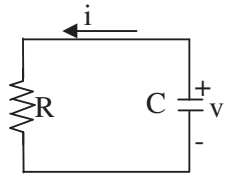

Figure 1

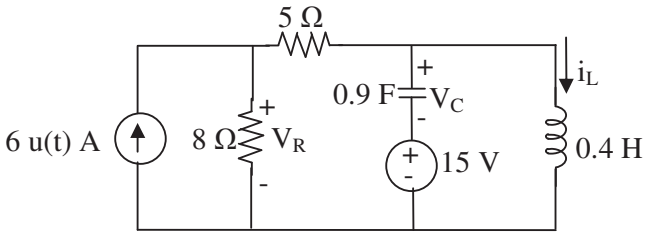

Figure 2

PART-B

2. a) Explain the method of measuring reactive power in a 3-phase balanced system using a single watt meter method.
   b) The two-wattmeter method gives $P_1 = 1200$ W and $P_2 = -400$ W for a three-phase motor running on a 240-V line. Assume that the motor load is star connected and that it draws a line current of 6 A. Calculate the pf of the motor and its phase impedance. (8M+8M)

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3. a) For the circuit shown figure 3, $Z_a = 6 - j8\ \Omega$, $Z_b = 12 + j9\Omega$, and $Z_c = 15\ \Omega$. Find the line currents I_a, I_b, and I_c.
   b) A balanced three-phase star-connected generator with $V_p = 220$ V supplies an unbalanced star-connected load with $Z_{AN} = 60 + j80\ \Omega$, $Z_{BN} = 100 - j120\ \Omega$, and $Z_{CN} = 30 + j40\Omega$. Find the total complex power absorbed by the load. (8M+8M)

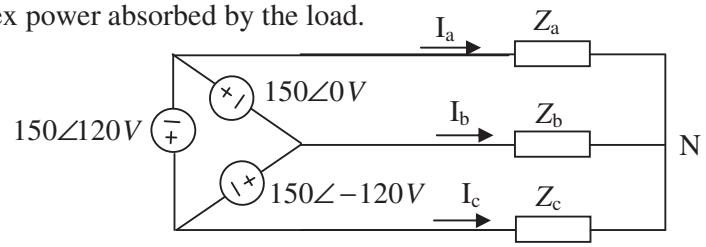

Figure 3

4. a) Find the voltage across the capacitance for t > 0 in the circuit shown in Figure 4.
   b) For the circuit shown in figure 5, calculate (i) $i_L(0+)$, $v_C(0+)$, and $v_R(0+)$, (ii) $i_L(\infty)$, $v_C(\infty)$, and $v_R(\infty)$. (8M+8M)

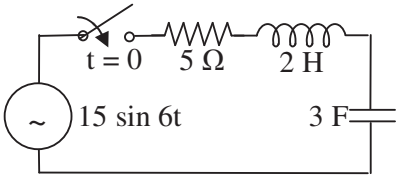

Figure 4

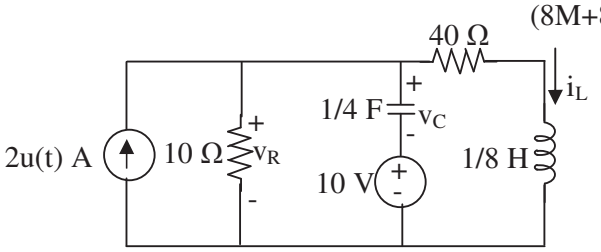

Figure 5

5. a) Determine the z-parameters for the circuit shown below Figure 6.
   b) Determine the y-parameters for the circuit shown Figure 7. (8M+8M)

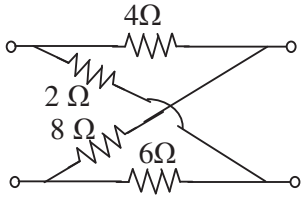

Figure 6

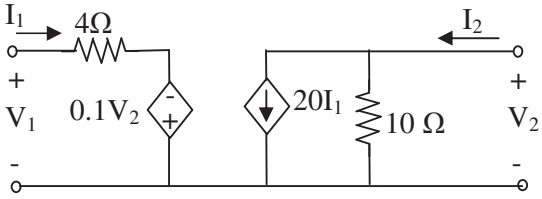

Figure 7

6. a) Synthesize F(s) = 2 (s+1) (s+4) / (s+2) (s+6) in two Cauer forms?
   b) List the properties of positive real function and test whether the following function is positive real or not? $F(s) = \dfrac{s^2 + 4}{s^3 + 6s^2 + 6s + 2}$. (8M+8M)

7. a) A series RL circuit in which R = 5 Ω and L =20 mH has an applied voltage v =100 + 50 sin ωt +25 sin 3ωt (V), with ω= 500 rad/s. Find the current and the average power.
   b) Obtain the Fourier transform of the "switched-on" exponential function shown Figure 8. (8M+8M)

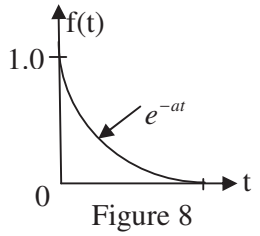

Figure 8