

AMIETE – ET

Time: 3 Hours

DECEMBER 2013

Max. Marks: 100

PLEASE WRITE YOUR ROLL NO. AT THE SPACE PROVIDED ON EACH PAGE IMMEDIATELY AFTER RECEIVING THE QUESTION PAPER.

NOTE: There are 9 Questions in all.

- Question 1 is compulsory and carries 20 marks. Answer to Q.1 must be written in the space provided for it in the answer book supplied and nowhere else.
- The answer sheet for the Q.1 will be collected by the invigilator after 45 minutes of the commencement of the examination.
- Out of the remaining EIGHT Questions answer any FIVE Questions. Each question carries 16 marks.
- Any required data not explicitly given, may be suitably assumed and stated.

Q.1 Choose the correct or the best alternative in the following: (2×10)

a. Ideal voltage source should have

- | | |
|------------------------------|----------------------------------|
| (A) Zero internal resistance | (B) Infinite internal resistance |
| (C) Large value of EMF | (D) Low value of current |

b. One of the following laws of electrical network is used in the node voltage analysis of networks

- | | |
|---------------|------------------|
| (A) KVL | (B) KCL |
| (C) Ohms Laws | (D) Faraday laws |

c. In nodal analysis, if there are N nodes in the circuit, then how many equations will be written to solve the network?

- | | |
|---------|---------|
| (A) N | (B) N-1 |
| (C) N+1 | (D) N-2 |

d. The Laplace transform of $e^{-at} \cos \omega t$ is

- | | |
|--------------------------------------|--------------------------------------|
| (A) $\frac{s+a}{(s-a)^2 + \omega^2}$ | (B) $\frac{s+a}{(s+a)^2 + \omega^2}$ |
| (C) $\frac{s}{(s+a)^2 + \omega^2}$ | (D) $\frac{a}{(s-a)^2 + \omega^2}$ |

e. Superposition theorem is not applicable for

- | | |
|-------------------------|------------------------|
| (A) Voltage calculation | (B) Bilateral elements |
| (C) Power calculation | (D) Passive elements |

f. In a two port network , the condition for reciprocity in terms of 'h' parameters is

- (A) $h_{12} = h_{21}$ (B) $h_{11} = h_{12}$
 (C) $h_{11} = -h_{22}$ (D) $h_{12} = -h_{21}$

g. A pole of driving point admittance function implies.

- (A) Zero current for a finite value of driving voltage
 (B) Zero voltage for a finite value of driving current
 (C) An open circuit condition
 (D) None of these

h. A Hurwitz's polynomial has

- (A) Only zeros in the left-half of s-plane
 (B) Poles on 'j ω ' axis
 (C) Only poles in the left-half of s-plane
 (D) None of these

i. The Laplace transform of V(t) shown in Fig.1 is

- (A) $\frac{1}{s}e^{-s} - \frac{3}{s}e^{-2s}$
 (B) $\frac{2}{s} - \frac{3}{s}e^{-2s}$
 (C) $\frac{2}{s} + \frac{1}{s}e^{-s}$
 (D) $\frac{2}{s} + \frac{1}{s}e^{-s} - \frac{3}{s}e^{-2s}$

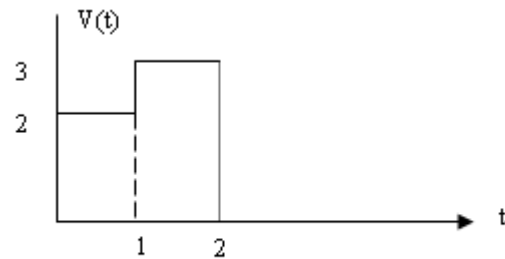


Fig.1

j. Poles and zeros of a driving point function of a network are simple and interlace on the 'j ω ' axis. The network consists of elements

- (A) R and C (B) L and C
 (C) R and L (D) R, L and C

Answer any FIVE Questions out of EIGHT Questions.
Each question carries 16 marks.

Q.2 a. Explain dependent and independent, voltage and current source with an example. (8)

b. Find I_1 and I_2 in Fig.2. (4)

c. Obtain a single current source for the network shown in Fig.3. (4)

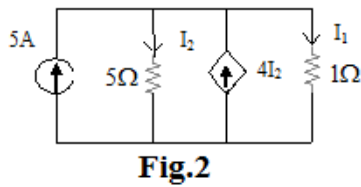


Fig.2

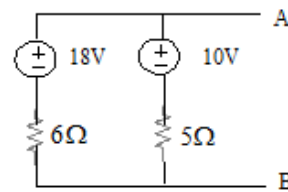


Fig.3

- Q.3** a. A D.C voltage of 100V is applied in the circuit as shown in Fig.4 with the switch K as open. Find the complete expression for the current $i(t)$ after the switch k is closed at $t = 0$. (8)

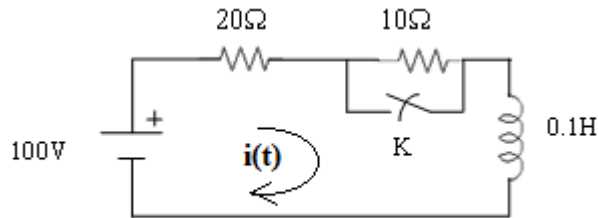


Fig.4

- b. Explain the single tuned circuits and double tuned circuits. (8)

- Q.4** a. Find the inverse Laplace transform of $I(s) = \frac{s+1}{s(s^2+4s+4)}$ (8)

- b. A series RL circuit is energized by D.C voltage of 1.0V by switching it at $t=0$. If $R=1\Omega$ and $L=1H$. Find the expression for the current in the circuit. (8)

- Q.5** a. Explain the superposition theorem with the help of a suitable example. (8)

- b. Find the Thevenin's equivalent to the left of terminals x-y in the network of Fig.5. (8)

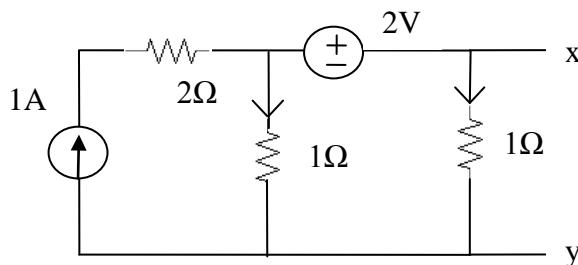


Fig.5

- Q.6** a. Test the following polynomial for the Hurwitz property. (8)

$$P(s) = s^4 + 2s^3 + 4s^2 + 12s + 10$$

- b. Find the pole zero locations of the current transfer ratio I_2/I_1 in S- domain for circuit shown in Fig.6. (8)

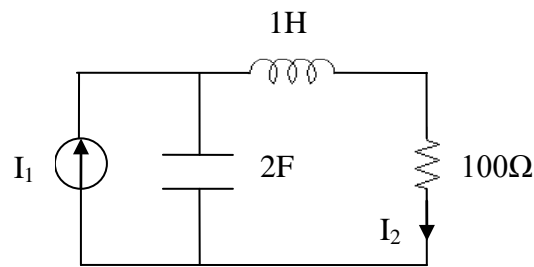


Fig.6

- Q.7 a. Draw the parallel connection of a two port network and find the y- parameters of parallel connection of a two port network. (8)
- b. Find the open circuit parameters of the two port network shown in Fig.7. (8)

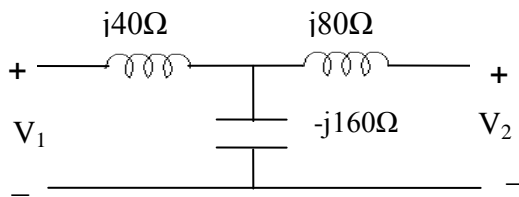


Fig.7

- Q.8 a. Write the properties of RL impedances. (6)
- b. The driving point impedance of a one port LC network is given by
- $$Z(s) = \frac{8(s^2 + 4)(s^2 + 25)}{s(s^2 + 16)}$$
- Obtain the foster form of equivalent network (10)

- Q.9 a. Define the Transfer Function and write the properties of the Transfer Function. (8)
- b. Explain the following:
- (i) Magnitude and frequency normalization
 - (ii) The approximation problem in network theory (8)