DipIETE – ET (NEW SCHEME) – Code: DE57

Subject: NETWORKS AND TRANSMISSION LINES

Time: 3 Hours **DECEMBER 2011** **Max. Marks: 100**

NOTE: There are 9 Questions in all.

- **Please write your Roll No. at the space provided on each page immediately after receiving the Question Paper.**
- **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. A practical current source consists of

(A) An ideal current source in series with an impedance
(B) An ideal current source in parallel with an impedance
(C) Both are correct
(D) None of the above

b. Compensation theorem is applicable to

(A) linear networks only **(B)** non linear networks only
(C) linear and nonlinear networks **(D)** none of the above

c. Peak value of a certain sine wave voltage is 10 V, peak to peak value is

(A) 10 V **(B)** 20 V
(C) 5 V **(D)** 7.07 V

d. The maximum value of the coefficient of coupling is

(A) 100% **(B)** 80%
(C) more than 100% **(D)** 90%

e. The inverse Laplace transform of $\frac{1}{s}\left(1-e^{-as}\right)$ is

(A) u(t)–u(t–a) **(B)** u(t)
(C) u(t–a) **(D)** 0

f. The Transfer function of a system having pole-zero plot as in Fig. 1 is

(A) $\frac{(s-1)}{s(s^2+4)}$ **(B)** $\frac{s}{(s-1)(s^2+4)}$

(C) $\frac{s(s-1)}{s^2+4}$ **(D)** $\frac{s^2+2}{(s+1)(s-1)}$

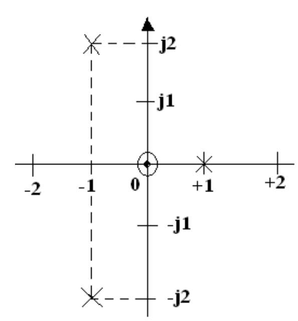

Fig. 1

g. The h parameters h_{11} and h_{12} are obtained

(A) by shorting output terminals **(B)** by opening output terminals
(C) by shorting input terminals **(D)** by opening input terminals

h. If the network short circuit impedance is 16 ohm and open circuit impedance is 25 ohm. Then characteristic impedance of a network is

(A) 4 Ω **(B)** 20 Ω
(C) 5/4 Ω **(D)** infinite

i. The propogation constant of a symmetrical T and Π section

(A) are equal **(B)** not equal
(C) None of the above **(D)** both **(A)** and **(B)**

j. If K is the voltage reflection coefficient then SWR standing wave ratio *s* is

(A) $\frac{1-|K|}{1+|K|}$ **(B)** $\frac{1+|K|}{1-|K|}$
(C) $1+|K|$ **(D)** $1-|K|$

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

Q.2 a. For the circuit shown in Fig.2, find the power absorbed by each of the elements. **(8)**

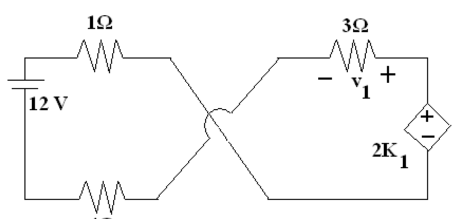

Fig. 2

b. Two inductively coupled coils have self inductance L_1 =50 mH, L_2 =200 mH. If the coefficient of coupling is 0.5 (i) find the value of mutual inductance between the coils (ii) what is the maximum possible mutual inductance? **(4)**

c. Explain the transformation of sources using transformation find the current I in the load of 100 Ω (Fig.3). **(4)**

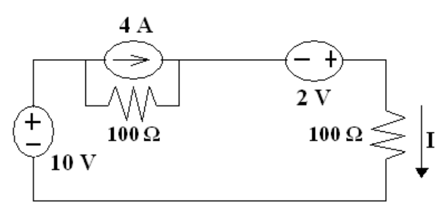

Fig. 3

Q.3 a. Determine the Laplace transform (Fig. 4) **(8)**
of f(t)=t for 0<t<1
=0 for t>1

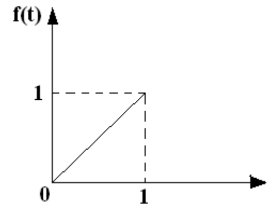

Fig. 4

b. Verify the initial value theorem for (i) $2 - e^{5t}$ (ii) final value theorem for $2 + e^{-3t}\cos 2t$. **(4+4)**

Q.4 a. A 220 V, 100 Hz ac source supplies a series LCR circuit with a capacitor and a coil. If the coil has 50 mΩ resistance and 5 mH inductance, find the quality factor and half power frequencies of the circuit. **(8)**

b. Find the short circuit admittance parameters for the circuit as shown in Fig.5. **(8)**

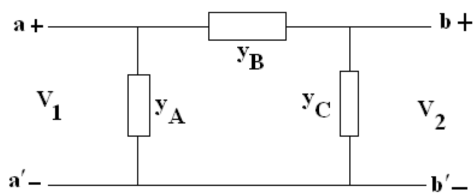

Fig. 5

Q.5 a. Derive the equations for the elements of an m derived T & π sections. **(8)**

b. A 50 Ω resistor is connected in series with an inductor having internal resistance, a capacitor and 100 V variable frequency at a frequency of 200 Hz, a maximum current of 0.7 A flows through the circuit and voltage across the capacitor is 200 V. Determine the circuit constants (Fig.6). **(8)**

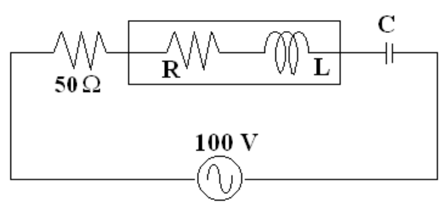

Fig.6

Q.6 a. Determine the primary line constants of a transmission line / km for a 100 km distortion less line having characteristic impedance Z_o = 600 Ω terminated in a pure resistive load of 400Ω. When the line is operated at an angular frequency ω=5000 rad/s, α and β were measured to be 2×10^{-3} neper/km 5×10^{-3} rad/km respectively. **(8)**

b. Derive open circuit and short circuit impedance of infinite length transmission line and hence write the expressions for α and β of the lines. **(8)**

Q.7 a. A certain lossless transmission line has a characteristic impedance of 400 ohms. Determine the standing wave ratio with the following end impedances
(i) Z_L=800 Ω (ii) Z_L=650–j475 Ω. **(8)**

b. Explain the principle behind single stub impedance matching on a line. Discuss its limitations also. **(8)**

Q.8 a. An inductance of 30 mH and two shunt capacitances of value 0.25μF each are used to form a Π section filter. Find
(i) type of filter (ii) cut-off frequency, f_c
(iii) α at 10 kHz (iv) β at 10 kHz (Fig.7) **(8)**

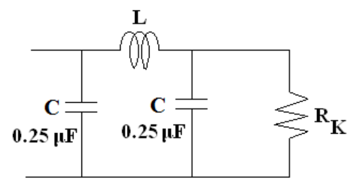

Fig.7

b. Write short notes on: symmetrical (i) T attenuator and (ii) Π attenuator. **(8)**

Q.9 a. State the principle of duality. Obtain the dual of given network (Fig.8). **(8)**

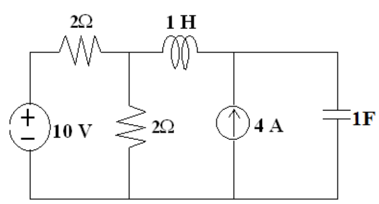

Fig.8

b. State Milliman theorem. Obtain the equivalent voltage source (V_S) and resistance (R_s) (Fig.9). **(8)**

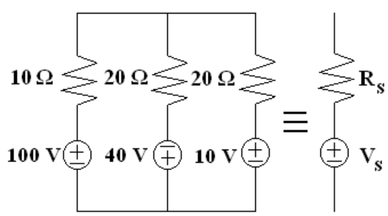

Fig.9