

## DipIETE – ET (NEW SCHEME) – Code: DE57

Subject: NETWORKS AND TRANSMISSION LINES

Time: 3 Hours

JUNE 2010

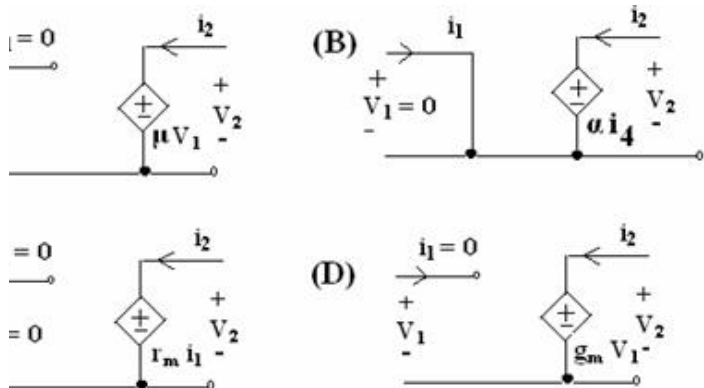
Max. Marks: 100

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.
- 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 current controlled voltage source can be represented as:



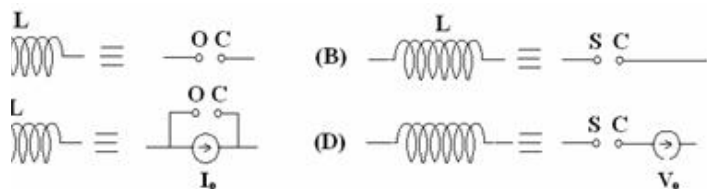
b. Time invariant Network produces\_\_\_\_\_.

- (A) Different response at different time.
- (B) Different response at same time.
- (C) Same response at different time.
- (D) Same response at same time.

c. The period required by the currents & voltages to adjust themselves to steady state is termed as\_\_\_\_\_.

- (A) steady state period
- (B) transient period
- (C) varying period
- (D) periodic

d. Match the element with its equivalent at  $t = 0 +$



e. The characterise impedance of an open wire live is \_\_\_\_\_.

(A)  $Z_0 = 276 \log_{10} \frac{s}{r} \Omega$       (B)  $Z_0 = \sqrt{\frac{R + j\omega L}{G + j\omega C}}$

(C)  $Z_0 = 138 \log_{10} \frac{D}{d} \Omega$       (D)  $Z_0 = \sqrt{zxy}$

f. The C value of a constant k- high pass filter is \_\_\_\_\_.

(A)  $\frac{1}{4\pi f_c R_k}$       (B)  $\frac{\pi}{4\pi f_c R_k}$

(C)  $\frac{4\pi}{f_c R_k}$       (D)  $\frac{R_k}{4\pi f_c}$

g. The voltage reflection coefficient is given by \_\_\_\_\_.

(A)  $|k| = \frac{S-1}{S+1}$       (B)  $|k| = \frac{S+1}{S-1}$

(C)  $|k| = |S-1|$       (D)  $|k| = |S+1|$

h. A 2-port Network is symmetrical if \_\_\_\_\_.

(A)  $Z_{12} = Z_{21}$       (B)  $AD - BC = 1$

(C)  $A = D$       (D)  $Y_{11} = Y_{22}$

i. For a distortion less line, the attenuation constant  $\alpha$  is given by \_\_\_\_\_.

(A)  $\sqrt{RG}$       (B)  $\sqrt{\frac{R}{G}}$

(C)  $\sqrt{LC}$       (D)  $\sqrt{\frac{L}{C}}$

j. Open circuit impedance  $Z_{oc}$  of an OC line is \_\_\_\_\_.

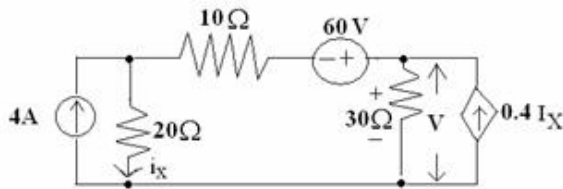
(A)  $\sqrt{\frac{Z_{sc}}{Z_c}}$       (B)  $\frac{Z_o}{\coth \gamma d}$

(C)  $\frac{Z_o}{\coth \gamma d}$       (D)  $Z_o \coth \gamma l$

Answer any FIVE Questions out of EIGHT Questions.

**Each question carries 16 marks.**

- Q.2** a. Use superposition theorem to find the voltage  $V$  in the network shown, in Fig. 1 **(4+4)**

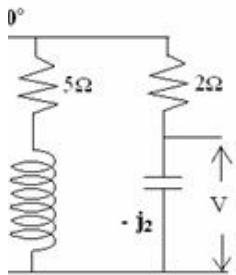


**Fig. 1**

- b. Write the important features of series resonant RLC circuits? A series resonant circuit has a capacitor of  $2.5 \mu\text{F}$  and a resistor of  $8\Omega$ . Its bandwidth is  $400 \text{ rad/s}$ . Determine the value of Inductance. Also find the Quality factor. **(3+5)**

- Q.3** a. Write a short note on (i) Superposition Theorem (ii) Bisection Theorem. **(4+4)**

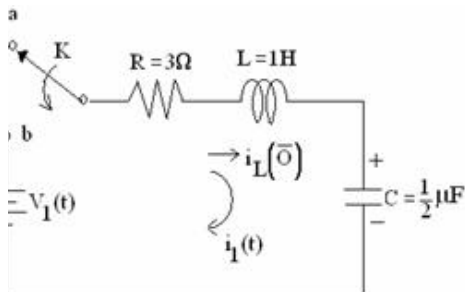
- b. In a single current source circuit as shown in Fig. 2, find the voltage  $V$ . Inter change the current source and the resulting voltage  $V$ , and verify the circuit for reciprocity Theorem. **(8)**



**Fig. 2**

- Q.4** a. Calculate the characteristics impedance, propagation constant and line constants of an open wire loss less line 50 km long  $Z_{oc}$  and  $Z_{sc}$  at 700 Hz were  $286 \angle -40^\circ$  and  $1520 \angle -10^\circ$  and velocity of propagation of the line is assumed to be  $1.86 \times 10^5 \text{ km/sec}$ . **(4×2)**

- b. The switch  $K$  in Fig. 3 is moved from position  $a$  to  $b$  at time  $t=0$ . Just before the switch is thrown, initial conditions are  $i_L(\bar{0}) = 2\text{A}$  and  $V_C(\bar{0}) = 2\text{V}$ . Find the current  $i(t)$  after the switching actions. **(8)**



**Fig. 3**

- Q.5** a. The network consists of 2 star connected circuits in parallel as shown in Fig 4. Obtain the simple delta connected equivalent of the network. **(10)**

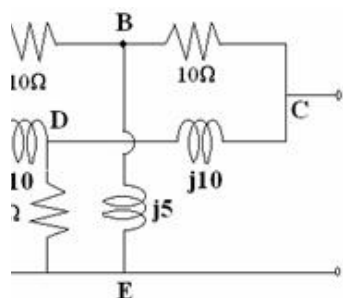


Fig. 4

- b. Calculate the input impedance of the network as shown in Fig.5. **(6)**

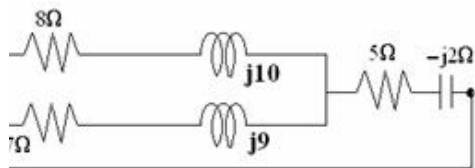


Fig. 5

- Q.6** a. Derive the expressions to write  
 (i) z parameters in terms of A, B, C, D  
 (ii) y parameter in terms of h parameters **(4+4)**
- b. Find the characteristics impedance & propagation constant for a Bridged T Network. **(8)**

- Q.7** a. For a  $\pi$ - network shown in Fig. 6. Calculate the image impedance of the network. **(8)**

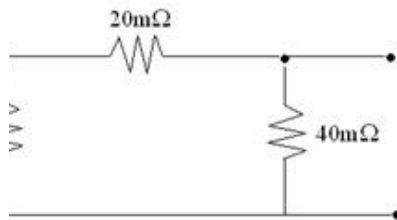


Fig. 6

b. Derive the expressions for OC & SC impedances of a line of length  $L$ . (8)

**Q.8** a. The OC & SC impedance at 1 kHz of a 50 km long uniform transmission line are  $1500\angle 80^\circ$  and  $3000\angle -80^\circ$  respectively. Calculate the values of  $\alpha$  and  $\beta$ . (4+4)

b. Derive the relationship between SWR and Reflection coefficient  $k$ . (8)

**Q.9** a. Design a low pass filter with L and C values. (8)

b. Design the elements for an asymmetrical L attenuator. (8)