ROLL NO. ________________

Code: DE57 Subject: NETWORKS AND TRANSMISSION LINES

DipIETE – ET (Current Scheme)

Time: 3 Hours **JUNE 2015** 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. Which one of the following is a passive element?

(A) BJT **(B)** Inductor
(C) FET **(D)** Op-Amp

b. The Laplace Transform of e^{-2t} is ________

(A) 1/2S **(B)** S+2
(C) 1/(S+2) **(D)** 2S

c. Consider the circuit shown in Fig.1 under maximum power transfer condition current in circuit is I, what is the value of R_L to make this current 2I.

(A) $R_L = R_S$
(B) $R_L = 0$
(C) $R_L = \frac{R_S}{2}$
(D) $R_L = \infty$

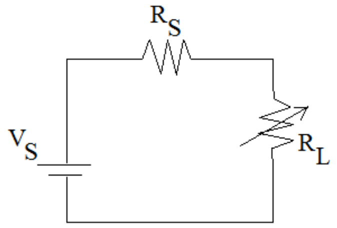

Fig.1

d. For a linear passive bilateral network

(A) $h_{21} = h_{12}$ **(B)** $h_{21} = -h_{12}$
(C) $h_{12} = g_{12}$ **(D)** $h_{12} = -g_{12}$

e. A parallel RLC network has R=4 ohm, L = 4H and C=0.25F, then at resonance Q is

(A) 1 **(B)** 10
(C) 20 **(D)** 40

f. The characteristic impedance of a distortion less line is:

(A) Real **(B)** Inductive
(C) Capacitive **(D)** Complex

g. For a transmission line, open circuit and short circuit impedances are 20 ohm and 5 ohm. The characteristic impedance of the line is

(A) 100 ohm **(B)** 50 ohm
(C) 10 ohm **(D)** 25 ohms

h. For a prototype low pass filter, the phase constant β in the attenuation band is

(A) π **(B)** π/2
(C) Zero **(D)** Infinity

i. For a coil with inductance L and resistance R in series with a capacitor C has

(A) Resonance impedance as zero **(B)** Resonance impedance R
(C) Resonance impedance L/CR **(D)** Resonance impedance as infinity

j. Double stub matching eliminates standing waves on the

(A) Source side of the left stub **(B)** Load side of the right stub
(C) Both sides of the stub **(D)** In between the two stubs

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

Q.2 a. Differentiate between:
(i) Unilateral and Bilateral elements (ii) Distributed and lumped elements. **(8)**

b. A current I = 10t A flows in a condenser C of value 10 μF. Calculate the voltage, charge and energy stored in the capacitor at time t= 1 sec. **(8)**

Q.3 a. Find Laplace transform of the following:
(i) t^n (ii) $\sin at$ **(2+2)**

b. Explain shifting theorem of Laplace transform. **(4)**

c. State and prove initial and final value theorems of Laplace transform. **(8)**

Q.4 a. Find the power dissipated in 8 ohm resistors in the circuit shown below if Fig.2 using Thevenin's theorem. **(8)**

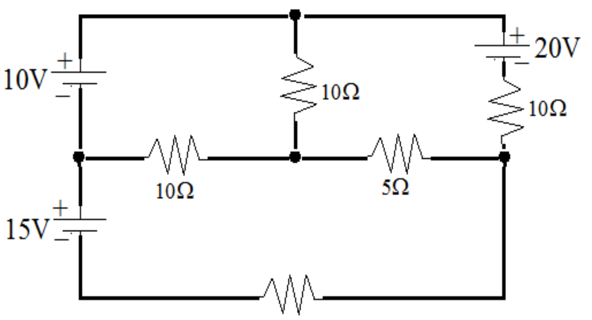

Fig.2

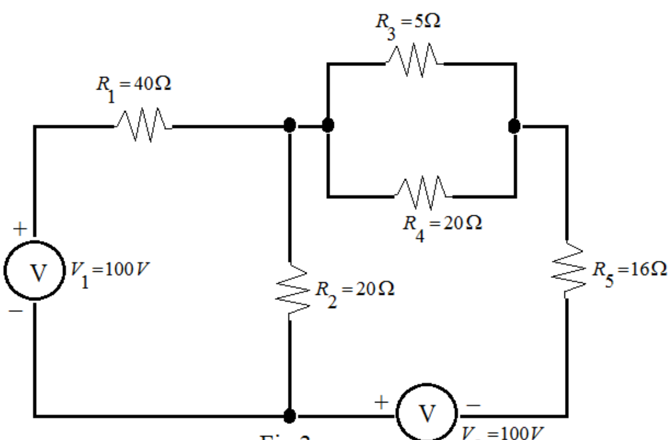

Fig.3

b. State the superposition theorem. Using this theorem find the voltage across the 16 ohm resistor shown in Fig.3. **(8)**

Q.5 a. Find out the Z parameters and hence the ABCD parameters of the network shown in Fig.4. Check if the network is symmetrical or reciprocal. **(10)**

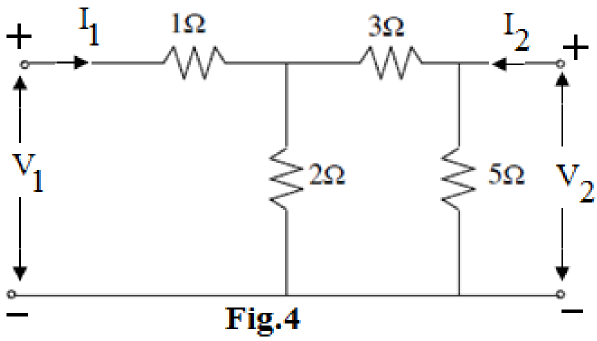

Fig.4

b. Derive the relationship between Y and ABCD parameter. **(6)**

Q.6 a. Derive the expression of resonant frequency for a parallel R-L-C circuit in terms of Q, R, L and C. **(8)**

b. For a series resonant circuit, $R = 5\Omega$, L=1H and C=0.25µf. Find the resonance frequency and band width. **(8)**

Q.7 a. State the types of distortions in a transmission line. Derive the conditions to eliminate the two types of distortions. **(8)**

b. A generator of 1V, 1000Hz supplies power to 1000 Km long open wire line terminated in its characteristic impedance Z_0 and having the following parameters. R = 15 ohm, L=0.004H, C = 0.008µF, G = 0.5µmhos. Calculate the characteristic impedance, propagation constant and the phase velocity. **(8)**

Q.8 a. Explain single stub impedance matching of lines. **(8)**

b. Explain the basis for construction of Smith chart. Illustrate as to how it can be used as an admittance chart. **(8)**

Q.9 a. Design a constant K band pass filter section having cut off frequencies of 2 KHz and 5 KHz and a nominal impedance of 600 ohm. Draw the configuration of the filter. **(8)**

b. Write short notes on:
(i) Low-pass filter and its approximation/design
(ii) Symmetrical Lattice attenuator **(4+4)**