ROLL NO. _____

Code: DE57 Subject: NETWORKS AND TRANSMISSION LINES

DipIETE – ET

Time: 3 Hours **JUNE 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. An ideal voltage source is that which has an internal resistance _____ ohms.

(A) zero **(B)** one
(C) 1 Mega **(D)** Infinite

b. The Inverse Laplace Transform of $\frac{2}{(s+1)}$ is _____

(A) $2(t+1)$ **(B)** $2e^{-2t}$
(C) e^{-2t} **(D)** $2e^{-t}$

c. _____ parameters are widely used in transmission line

(A) Z-parameter **(B)** Y-parameter
(C) ABCD-parameter **(D)** h-parameter

d. VSWR on short circuited loss less device is _____

(A) 0 **(B)** ∞
(C) 1 **(D)** -1

e. A parallel resonant circuit can be used _____

(A) as a high impedance **(B)** to reject small band of frequencies
(C) both **(A)** & **(B)** **(D)** to amplify certain frequencies

f. A transmission line is terminated in a load equal to its characteristic impedance. The reflection co-efficient is _____

(A) 1 **(B)** -1
(C) 0 **(D)** ∞

g. 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

h. One Neper is equal to

(A) 0.8686 dB **(B)** 8.686 dB
(C) 0.6930 dB **(D)** 3 dB

i. A Smith Chart is used for solving problems in _____

(A) radio wave propagation **(B)** transmission line
(C) antenna systems **(D)** power transfer problems

j. The attenuator where series arm R_A is usually made equal to characteristic impedance is a _____

(A) symmetrical T attenuator **(B)** symmetrical π attenuator
(C) bridged T attenuator **(D)** lattice T attenuator

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

Q.2 a. Classify the various types of network elements and explain each of them with examples. **(8)**

b. To a 2μF condenser is applied a voltage v(t) as shown in Fig.1. Find:
(i) the current during time t = 0 to t = 1 second.
(ii) charge accumulated across the condenser at t = 1 second.
(iii) power in the condenser at t = 1 second
(iv) energy stored in the condenser at t = 1 second. **(8)**

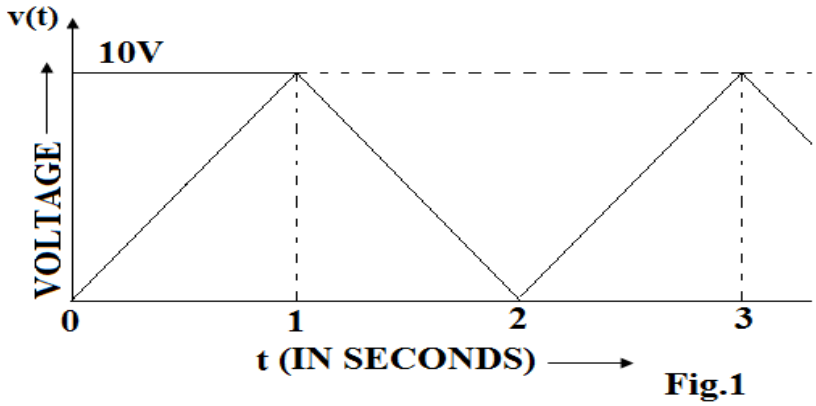

Fig.1

Q.3 a. Discuss the advantages of Laplace Transform method over classical method? **(5)**

b. Find Laplace Transform of:
(i) Unit Impulse function (ii) Unit ramp function **(6)**

c. Find the convolution integral when $f_1(t) = e^{-at}u(t)$ and $f_2(t) = t\,u(t)$, using Laplace transform. **(5)**

Q.4 a. Apply Routh-Hurwitz criterion to check the stability of system whose characteristic equation is given by $s^5 + s^4 + 4s^3 + 24s^2 + 3s + 63 = 0$. Also determine the number of roots
(i) with positive real parts
(ii) with zero real parts
(iii) with negative real parts **(9)**

b. Obtain the ABCD Parameters of the network shown in Fig.2 and verify that the circuit is symmetrical and reciprocal. **(7)**

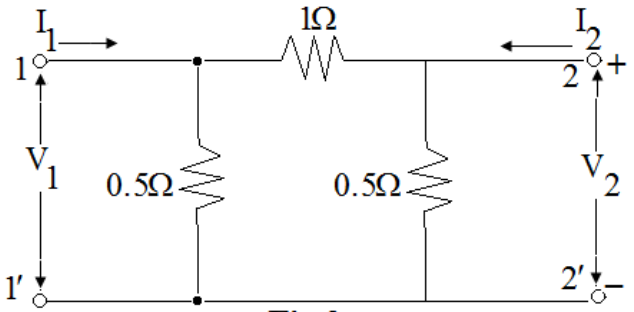

Fig.2

Q.5 a. The voltage applied to a series RLC circuit is 0.85V. The Q of the inductor coil is 50 and the value of the capacitor is 320 pF. The resonant frequency of the circuit is 175 KHz. Find:
(i) the value of inductance
(ii) the value of resistance
(iii) the voltage across capacitor **(6)**

b. Compare the frequency response curve of an amplifier with single and double tuned circuits and discuss the use of double tuned circuits in Radio Receivers. **(10)**

Q.6 a. State Thevenin's Theorem and find the current flowing through the load resistor 22Ω in the circuit shown in Fig.3 by applying Thevenin's theorem. **(8)**

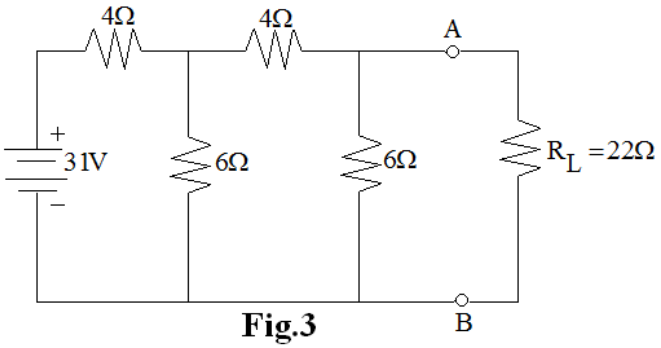

Fig.3

b. In the network shown in Fig.4, the load connected across terminals AB consists of a variable resistance, R_L and a capacitive reactance X_L which may vary from 2Ω to 8Ω. Determine:

(i) the value of R_L and X_L which result in maximum power transfer
(ii) the maximum power delivered to the load. **(8)**

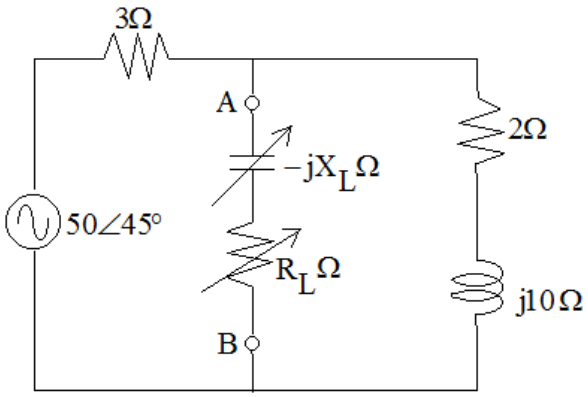

Fig.4

Q.7 a. The primary constants of a transmission line per loop kilometre are $R = 196\Omega, C = 0.09\mu F, L = 0.71mH$ and leakage conductance is negligible. Calculate the secondary constants at a frequency of $\left(\frac{5{,}000}{2\pi}\right)$Hz. **(6)**

b. An underground cable has $Z_o = 400\angle -40^\circ, \alpha = 0.079$neper/Km and $\beta = 0.084$ radians/Km. If the receiving end current $I_R = 0.005\angle -190^\circ$ and the line is terminated by an impedance $Z_R = 600\angle -20^\circ$, calculate:
(i) the reflection coefficient
(ii) voltage in the line at a distance of 10 Km from the receiving end
(iii) current in the line at a distance of 10 Km from the receiving end **(10)**

Q.8 a. What is meant by quarter wave transformer? Why is it also called as impedance inverter? Discuss its applications in transmission lines. **(10)**

b. The VSWR measured on UHF transmission line working at a frequency of 300 MHz is found to be 2. If the distance between load and voltage minimum is 0.8 metre, calculate the value of load impedance. **(6)**

Q.9 a. Design an m-derived T-section low pass filter having cut-off frequency $f_c = 1000Hz$, design impedance $R_K = 600\Omega$ and frequency of infinite attenuation $f_\infty = 1050Hz$. **(8)**

b. Write short notes on:

(i) Asymmetrical T-attenuator
(ii) Asymmetrical L-attenuator **(8)**