ROLL NO. _______________

Code: DE107 **Subject: NETWORKS AND TRANSMISSION LINES**

DipIETE – ET (NEW 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 best alternative in the following: (2×10)

a. Laplace transform of the signal $\left[u(t)-u(t-5)\right]$ is

(A) $\frac{1}{s}$ **(B)** $\frac{1}{s-5}$

(C) $\frac{1}{s}-\frac{1}{s-5}$ **(D)** $\frac{1}{s}\left(1-e^{-5s}\right)$

b. The number of terms in the Inverse Laplace transform of $\frac{2s+3}{(s+1)^2(s+2)}$ are

(A) 2 **(B)** 3

(C) 4 **(D)** 1

c. When 2 two port networks are connected in cascade the overall transmission parameters are

(A) Addition of transmission matrix of individual.

(B) Subtraction of transmission matrix of individual.

(C) Multiplication of transmission matrix of individual

(D) Division of transmission matrix of individual

d. The condition to transfer maximum power to the load impedance with only resistive part of the load varying is

(A) $Z_L = Zs$ **(B)** $Z_L = Zs^*$

(C) $R_L = |Z_L|$ **(D)** $R_L = R_S$

e. In determining the various h parameters which one of the following condition to be satisfied

(A) either input or output port must be short circuited

(B) either input or output port must be open circuited

(C) either input port must be short circuited or output port must be open circuited

(D) either input port must be open circuited or output port must be short circuited

f. In series resonant circuit the reactance of inductance is greater than the reactance of capacitance under the condition

(A) $f > f_0$ **(B)** $f < f_0$
(C) $f = f_0$ **(D)** $f = 0$

g. The characteristic impedance of transmission line is

(A) $\sqrt{Z_{SC}Z_{OC}}$ **(B)** $\sqrt{Z_{SC}/Z_{OC}}$
(C) $\sqrt{Z_{OC}/Z_{SC}}$ **(D)** $Z_{SC}Z_{OC}$

h. Stub is

(A) waveguide **(B)** Antenna
(C) Transmission line **(D)** A parallel plate

i. The characteristic impedance of lossless line for which L=2mH/km and C=0.2 μF /km is

(A) 50Ω **(B)** 100Ω
(C) 200Ω **(D)** 75Ω

j. If VSWR=1 then magnitude of Reflection coefficient is

(A) Infinity **(B)** 1
(C) –1 **(D)** Zero

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

Q.2 a. From the definition of Laplace transform find the Laplace transform of $x(t) = t$. **(4)**

b. Using Laplace transform obtain the step response of series RL circuit. **(6)**

c. Determine the Laplace transform of the signal as shown in Fig.1 **(6)**

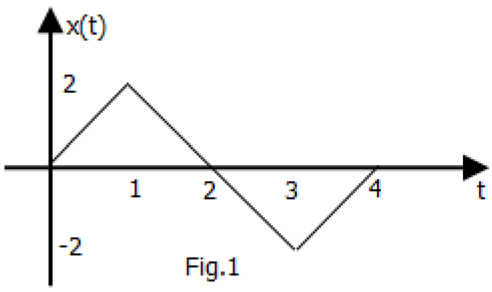

Fig.1

Q.3 a. Find the current flowing through $R_L = 7.5\Omega$ resistor, using Superposition theorem in the network as shown in Fig.2 **(8)**

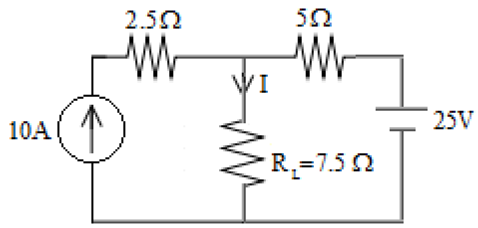

Fig.2

b. State and explain the following theorems
(i) Norton's and (ii) Maximum power transfer. **(8)**

Q.4 a. State and explain symmetry and reciprocity in two port representation **(6)**

b. For the two port network as shown in Fig.3 find the Y and Z-parameters. **(10)**

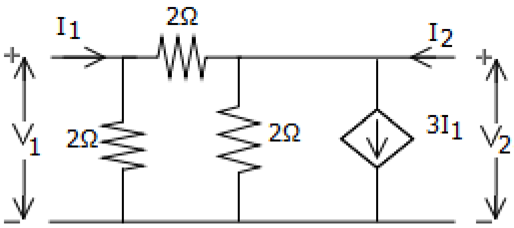

Fig.3

Q.5 a. An RLC series circuit has $R = 5\Omega,\ L = 100mH\ and\ C = 150\mu F$ and is connected to a 230V, variable frequency supply.
Find
(i) resonant frequency (ii) impedance at resonance
(iii) voltage drop across inductor and capacitor at resonance
(iv) Q-factor (v) band width. **(8)**

b. Derive the expressions for resonant frequency and impedance at resonance for parallel resonant circuit. **(8)**

Q.6 a. Draw the lumped element equivalent of transmission line and explain the series and shunt components of the line. Also define secondary constants of the line. **(8)**

b. A generator of 1V, 1000Hz, supplies power to a 100Km open wire line terminated in Zo have the following parameters R=10Ω/Km, G=0.8μ mhos/Km, L=0.004 H/Km and C=0.008 μF/Km.
Calculate
(i) Characteristic impedance (ii) Propagation constant
(iii) Attenuation constant (iv) Phase constant
(v) Phase velocity (vi) Wave length of the line **(8)**

Q.7 a. Define the reflection coefficient and voltage standing wave ratio. Derive the expression for input impedance in terms of reflection coefficient of the line. **(8)**

b. A lossless transmission line with Characteristic impedance 60Ω is 400meters long. It is terminated with load $Z_L = (40 + j80)\Omega$ and operated at frequency 1MHz. The velocity of the wave is 2.4×10^8 m/sec. Find: **(8)**

(i) Reflection coefficient (ii) VSWR
(iii) Input impedance

Q.8 a. Mention the properties of smith chart. **(4)**

b. Explain the quarter wave impedance matching circuit. **(4)**

c. A load impedance of $Z_L= (60 – j\ 80)\Omega$ is required to be matched to a 50Ω line by using a short circuited Stub of length 'L' located at distance 'd' from the load. The wave length of operation is 1meter. Use smith chart to find L and d. **(8)**

Q.9 a. With neat circuit diagram and graphs explain the variation of attenuation and phase constant with respect to frequency in a constant K, T-Section low pass filter. **(8)**

b. Design a T-pad attenuator to give an attenuation of 20dB and to work in line of 600Ω impedance. **(8)**