ROLL NO. _____

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

DipIETE – ET *{NEW SCHEME}*

Time: 3 Hours **DECEMBER 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. $\frac{1}{s+a}$ is the Laplace transform of _____

(A) e^{at} **(B)** e^{-at}

(C) se^{at} **(D)** se^{-at}

b. The reversal due to interchange of the dependent and independent variables is called _____

(A) Thevenin's theorem **(B)** Norton's theorem

(C) Superposition theorem **(D)** Principle of duality

c. Condition for reciprocity in y- parameters is _____

(A) $Y_{21} = Y_{12}$ **(B)** $Y_{11} = Y_{22}$

(C) $Y_{11} = Y_{12}$ **(D)** $Y_{21} = Y_{22}$

d. A series RLC circuit draws current at leading power factor at _____

(A) resonant frequency **(B)** more than resonant frequency

(C) less than resonant frequency **(D)** none of these

e. In coaxial cables, radiation loss in comparison to open wire line is _____

(A) lower **(B)** higher

(C) same **(D)** none of these

f. A transmission line is terminated by its characteristic impedance. The reflection coefficient is _____

(A) $+1$ **(B)** -1

(C) infinity **(D)** zero

g. Characteristic impedance of transmission lines is given by the expression _____

(A) $Z_0 = \frac{R + jwL}{G + jwC}$ **(B)** $Z_0 = \sqrt{\frac{R + jwL}{G + jwC}}$

(C) $Z_0 = \sqrt{(R + jwL)(G + jwC)}$ **(D)** $Z_0 = (R + jwL)(G + jwC)$

h. Distortion less condition of a transmission line is given by the relation _____

(A) $Z_0 = \sqrt{\frac{L}{C}}$ **(B)** $RG = LC$

(C) $\frac{R}{G} = \frac{L}{C}$ **(D)** All of these

i. Attenuator always consist of _____
(A) resistors only **(B)** inductors only
(C) capacitors only **(D)** All of these

j. A passive filter which passes all low frequencies up to a cut off frequency and attenuates all high frequencies above the cut off frequency is called _____
(A) BPF **(B)** HPF
(C) both BPF and HPF **(D)** LPF

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

Q.2 a. Write the advantages of Laplace transformation. **(4)**

b. Find the convolution integral when $f_1(t) = e^{-t}$ and $f_2(t) = e^{-2t}$ **(4)**

c. Voltage $V(s) = \frac{1 - 2e^{-s} + e^{-2s}}{s^2}$ is applied as input to a series RL circuit with R = 2Ω, L = 2 H. Calculate $i(t)$ using Laplace transform through the circuit. (Assume $i(0^+) = 0$) **(8)**

Q.3 a. State and prove maximum power transfer theorem. **(8)**

b. A black box consisting of generators and impedances where only two output terminals are available gives the following data:

(i) Open circuit voltage = 120 volts

(ii) Short circuit current = 10 Amp

(iii) When output terminals are connected to a resistance of 8Ω, current flowing = 6Amp., determine Thevenin's equivalent generator. **(8)**

Q.4 a. What are h- parameters? Draw equivalent circuit using h-parameters and derive equation for calculating h-parameters. **(8)**

b. Find the equivalent π-network for the T-network shown in Fig.1. **(8)**

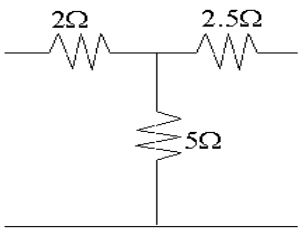

Fig.1

Q.5 a. Determine the relationship between the resonant frequency f_0 and the half-power frequencies f_1 and f_2 in a series resonating circuit. **(8)**

b. A coil with resistance of 20 ohms and induction of 0.2 H is connected in parallel with a 100 μF capacitor. Calculate the frequency at resonance (f_0) and Q factor. **(8)**

Q.6 a. Define and explain the term characteristic impedance and propagation constant of a transmission line. **(8)**

b. An open wire transmission line terminated in its characteristic impedance has the following primary constant at 1 KHz. R = 6 Ω / km ; L = 2 mH / km; G = 0.5 μΩ / loop km and C = 0.005 μF / loop km. Calculate (i) characteristic impedance (ii) phase velocity and (iii) the attenuation suffered by a signal in a length of 100 km. **(8)**

Q.7 a. Define VSWR for transmission line. **(3)**

b. Open and short circuit of a transmission line at 1.6 kHz are $900\angle -30^o$ ohms and $400\angle -10^o$ ohms respectively. Calculate its characteristic impedance. **(6)**

c. Derive an expression for the input impedance of a lossless transmission line when line is terminated with any impedance Z_R. **(7)**

Q.8 a. Describe double stub matching of a transmission line. What are the advantages of this method over single stub matching? **(8)**

b. A low loss transmission line has characteristic impedance of 70 Ω and is terminated by another impedance of $(115 - j80)$ Ω. Find (i) reflection co-efficient and (ii) standing wave ratio. **(8)**

Q.9 a. Draw T and π sections of a constant - K high pass filter. Derive an expression for cut-off frequency. **(4+4)**

b. Design a symmetrical Bridged-T network with an attenuation of 40 dB and an impedance of 600 ohms. **(8)**