ROLL NO. _____

Code: DE107 Subject: NETWORKS AND TRANSMISSION LINES

DipIETE – ET (NEW SCHEME)

Time: 3 Hours **June 2018** **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. According to the time-shifting property of Laplace Transform, shifting the signal in time domain x (t - to) corresponds to the _____
(A) Multiplication by e^{-st0} in the time domain
(B) Multiplication by e^{-st0} in the frequency domain
(C) Multiplication by e^{st0} in the time domain
(D) Multiplication by e^{st0} in the frequency domain

b. The Laplace transform of e^{-5t} u(t-1) is
(A) $e^{-(5s)}$/ s+5 **(B)** e^{-s}/ s+5
(C) $e^{-(s+5)}$/ s+5 **(D)** $e^{-(5s+1)}$/ s+5

c. The initial value for the function $x(t) = 4\text{-}2e^{3t}$ is
(A) 0 **(B)** 2
(C) 1 **(D)** ∞

d. Which operation is likely to get executed or performed by Millman's theorem in terms of converting the voltage or current sources into a single equivalent voltage or current source?
(A) Subtraction **(B)** Combination
(C) Differentiation **(D)** Integration

e. Superposition theorem is not applicable in
(A) voltage responses **(B)** power responses
(C) current responses **(D)** All of these

f. A constant current source of 5mA with shunted internal resistance of 500Ω is equivalent to a voltage source of
(A) 2.5 volts in parallel with 500 Ω
(B) 5 volts in series with 500 Ω
(C) 2.5 volts in series with 500 Ω
(D) 25 volts in series with 500 Ω

g. Which among the following is regarded as short circuit forward transfer admittance?
(A) Y_{11} **(B)** Y_{12}
(C) Y_{22} **(D)** Y_{21}

h. If the two ports are connected in cascade configuration, then which arithmetic operation should be performed between the individual transmission parameters in order to determine overall transmission parameters?
(A) addition **(B)** subtraction
(C) multiplication **(D)** division

i. A two-port network is reciprocal if and only if
(A) AD - BC = 1 **(B)** $Z_{11} = Z_{22}$
(C) $Y_{12} = Y_{21}$ **(D)** $h_{12} = h_{21}$

j. The dynamic impedance Z_T of a parallel resonance circuit is given by
(A) L / RC **(B)** LRC
(C) R / LC **(D)** C / LR

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

Q.2 a. Find the inverse Laplace transform of the following function:
$F(s) = (S+ 4) / (2S^2+5S + 3)$ **(8)**

b. In the circuit shown in Fig. 1, the switch K is moved from position 1 to position 2 at a time t=0, the steady state current having previously established in the circuit. Find i(t) after switching. **(8)**

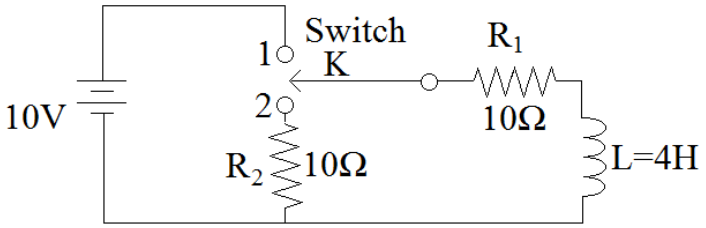

Fig.1

Q.3 a. Apply the superposition theorem to the network shown in Fig. 2 and obtain the current in the (3+j4) ohm impedance **(8)**

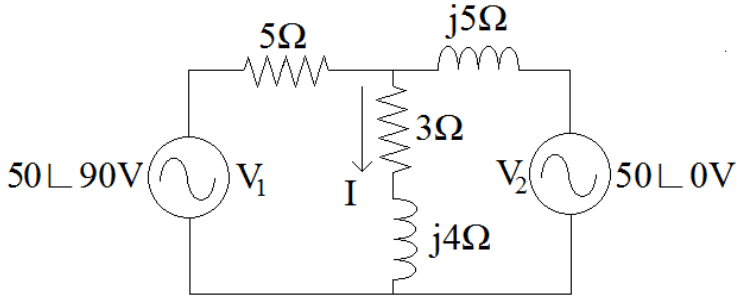

Fig.2

b. State and prove Maximum Power Transfer Theorem. **(2+6)**

Q.4 a. Find the Z and Y parameters of a symmetrical T-network having 200Ω, 200Ω and 500Ω resistances. **(4+4)**

b. Derive the condition of reciprocity and symmetry in ABCD parameters. **(4+4)**

Q 5 a. A resistor and capacitor are in series with a variable inductor when the circuit is connected to 220V , 50Hz supply. The maximum current obtained by varying inductance is 0.314A. The voltage across the capacitor is 300V. Find the circuit values in this condition. **(2+3+3)**

b. Find the value of 'L' for which the circuit shown in Fig. 3 is resonant at a frequency of ω=5000 rad/sec. **(8)**

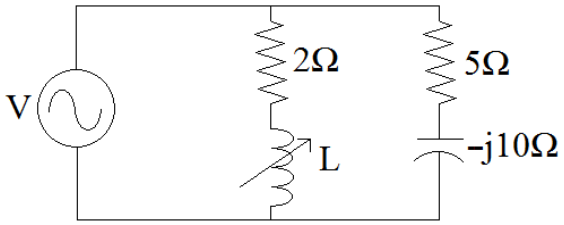

Fig.3

Q.6 a. A generator of 1 Volt, 1000 Hz, supplies power to 1000km long open wire line terminated in Z_o (characteristic impedance) and having following parameters: R=10.4 ohms, L=0.0037H, G=0.8 micromhos, C=0.00835mf.
Calculate the characteristic impedance, propagation constant and phase velocity. **(3+3+2)**

b. Prove that a line of a finite length and terminated by its characteristic impedance Z_o is equivalent to a line of an infinite length. **(8)**

Q.7 a. Draw and explain the voltage and current distribution along an open circuited and a short-circuited line. **(4+4)**

b. A certain low loss line has a characteristic impedance of 400Ω. Determine the standing wave ratio with the following receiving and impedances. **(4+4)**
(i) $Z_R = 70 + j0\ \Omega$
(ii) $Z_R = 650 + j475\ \Omega$

Q.8 a. Define Voltage Standing Wave ratio. Derive the relationship between VSWR and reflection coefficient. **(3+5)**

b. A UHF lossless transmission line working at 1GHz is connected to an unmatched line producing a voltage reflection coefficient of $0.5\angle 30$. Calculate after deriving necessary relations the length and the position of the stub to match the line **(8)**

Q.9 a. Design a Composite filter (H.P.) to operate into a load of 600 ohms and have a cut-off frequency of 1.2 kHz. The filter is to have one constant-K section, one m-derived section with f_∞ = 1.1 kHz and suitable terminating half section. **(3+3+2)**

b. What is an Attenuator? Derive the design equations for a Symmetrical T-type Attenuator. **(2+6)**