ROLL NO. _____

Code: DE57 **Subject: NETWORKS & TRANSMISSION LINES**

DipIETE – ET (Current 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. Transmission will be distortionless if
(A) LG = CR **(B)** LG = 1/CR
(C) LC = GR **(D)** LR = GC

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

c. For the symmetrical two-port network $Z_1 = 30\Omega$ and $Z_2 = 10\Omega$, then the values of A and D
(A) A=1/4 D=4 **(B)** A=4 D=1/4
(C) A=1/4 D=1/4 **(D)** A=4 D=4

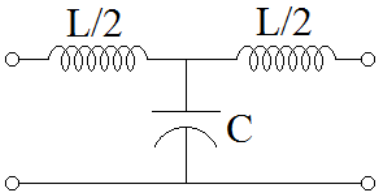
d. A Series RLC circuit resonates at 3MHz and has a 3dB bandwidth of 10kHz. The Q of the circuit at resonance is
(A) 300 **(B)** 30
(C) $300\sqrt{2}$ **(D)** $\frac{300}{\sqrt{2}}$

e. Which one of the following is a passive element?
(A) BJT **(B)** FET
(C) Inductor **(D)** Op-Amp

f. In a series resonant circuit, the impedance of the circuit at resonance is:
(A) maximum **(B)** minimum
(C) infinite **(D)** zero

g. A circuit has Thevenin's voltage of 10V, Thevenin's resistance of 2Ω and load resistance of 3Ω, then its load voltage is _____.
(A) 3V **(B)** 5V
(C) 10 **(D)** 6V

h. The filter shown below is:



(A) LPF **(B)** HPF
(C) BPF **(D)** None of these

i. Calculate half power frequencies f_1 & f_2 of a series resonating circuit where the resonance frequency is 150 kHz and the bandwidth is 75 kHz.
(A) f_1= 117.5 kHz & f_2 = 127.5 kHz **(B)** f_1 & f_2 =10 KHz
(C) f_1= 180 kHz & f_2 = 120 kHz **(D)** f_1= 117.5 kHz & f_2=192.5 kHz

j. The h parameters h_{11} and h_{21} are obtained
(A) by shorting output terminals **(B)** by opening output terminals
(C) by shorting input terminals **(D)** by opening input terminals

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

Q.2 a. A series RLC circuit consists of resistance R=25 Ω, inductance L=0.01H and Capacitance C=0.04 µF. Calculate **(2+3+3)**
(i) The frequency of resonance
(ii) If a 10V voltage of frequency equal to the frequency of resonance is applied to this circuit, calculate the values of V_L and V_C across L and C.
(iii) Find the frequencies at which these voltages V_L and V_C are maximum

b. Explain in detail different types of network elements. **(8)**

Q.3 a. Find the Initial and Final values for the following: **(4+4)**

$$X(s) = \frac{s+4}{s^2+3s+5}$$

b. Discuss the advantages of Laplace Transform method over classical method. **(4)**

c. Find the convolution integral when $f_1(t) = e^{-at}u(t)$ and $f_2(t) = t\,u(t)$, using Laplace transform. **(4)**

Q.4 **a**. Determine the current through the resistor of 2Ω connected across AB for the network as shown in Fig.1 using Thevenin's theorem. **(8)**

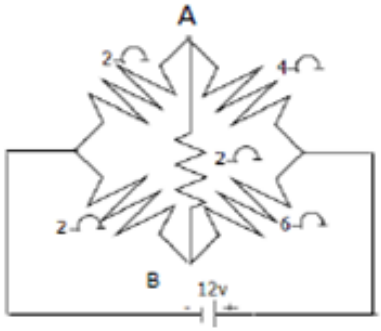

Fig.1

b. State and prove Thevenin's theorem. **(8)**

Q.5 a. Find out the Z parameters and hence the ABCD parameters of the network shown in Fig.2. Check if the network is symmetrical or reciprocal. **(10)**

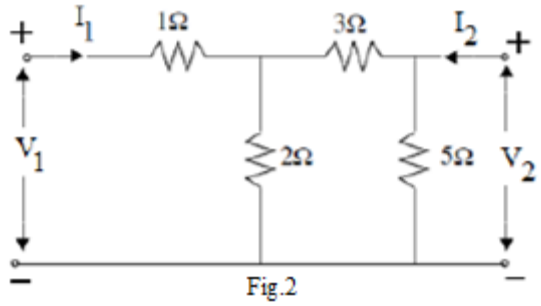

Fig.2

b. Derive the equations for the elements of an m derived T & π sections**.** **(6)**

Q.6 a. Derive the relationship between the resonance frequency f_n and half power frequencies f_1 and f_2 in series resonant circuit. **(8)**

b. The primary constants of a line per loop km are R = 196 Ω; C = 0.09 μF; L = 7.1mH and leakage conductance is negligible. Calculate the characteristic impedance and the propagation constant at angular frequency of 5000 radians/sec. **(8)**

Q.7 a. Define Frequency and Delay distortions in a transmission line. Explain the methods to minimize the distortions in a transmission line. **(3+5)**

b. Explain primary constants of a transmission line and draw the equivalent circuit of transmission line using these constants. **(8)**

Q.8 a. What is stub? Explain the different type of stub matching used in transmission lines. **(8)**

b. Write short notes on the following: **(4x2)**
(i) Quarter wave short circuit line (ii) Half wave open circuited line

Q.9 a. Design a Constant-K Low pass filter to have a cut-off frequency of 2kHz and terminating impedance of 600Ω. Design for both T and π sections. **(8)**

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