ROLL NO. ______________

Code: DE57 Subject: NETWORKS AND TRANSMISSION LINES

DipIETE – ET

Time: 3 Hours **DECEMBER 2012** **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. The dual network of the RC circuit is a

(A) Series RC circuit **(B)** Parallel RC circuit
(C) Series RL circuit **(D)** Parallel GL circuit

b. A two port network is reciprocal ,if and only if

(A) $Z_{11}=Z_{22}$ **(B)** BC – AD = -1
(C) $Y_{12}= - Y_{21}$ **(D)** $h_{12} =h_{21}$

c. The Laplace transform of impulse function is

(A) 0 **(B)** 1
(C) 1/s **(D)** s

d. If I(s) = (s+6)/(s(s+3)) then the value of i(t) at ∞ is

(A) 2 **(B)** 1
(C) 0 **(D)** ∞

e. The maximum power that a 12V DC source with an internal resistance of 2 ohm can supply to a resistive load is

(A) 12 W **(B)** 18 W
(C) 36 W **(D)** 48 W

f. The VSWR can have any value between

(A) 0 and 1 **(B)** -1 and +1
(C) 0 and ∞ **(D)** 1 and ∞

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g. A series resonance circuit has an inductive reactance of 1000 Ω, a capacitive reactance of 1000 Ω and a resistance of 0.1 Ω. If the resonant frequency is 10 MHz, then the bandwidth of the circuit is

(A) 1 KHz **(B)** 10 KHz
(C) 1 MHz **(D)** 0.1 KHz

h. When the VSWR is 3, the magnitude of the reflection coefficient will be

(A) 1/4 **(B)** 1/3
(C) 1/2 **(D)** 1

i. The input impedance of 1/8 wavelength long short circuited lossless transmission line is

(A) zero **(B)** inductive
(C) infinite **(D)** capacitive

j. Inductors and capacitors are

(A) Active elements **(B)** Passive elements
(C) L is Active and C is passive **(D)** C is Active and L is passive

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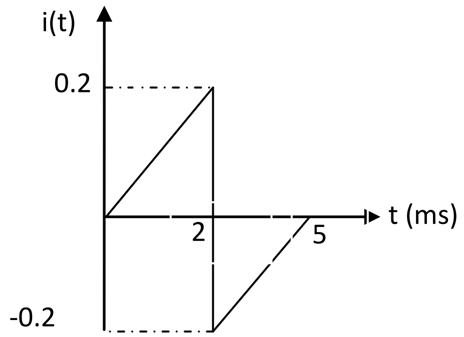
Answer any FIVE Questions out of EIGHT Questions.
Each question carries 16 marks.

Q.2 a. If the current waveform shown in the waveform is applied to a 2 μF capacitor. Find the capacitor value $V_c(t)$. Assume the initial voltage across capacitor zero **(8)**



b. Explain in detail
(i) Active and Passive Networks
(ii) Lumped and Distributed Networks **(8)**

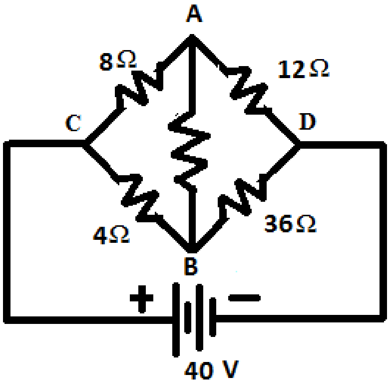
Q.3 a. Derive the expression for current i(t) for the series R-L circuit if the step input is applied. **(8)**

b. Find out the Laplace transform of the given function. **(4)**
(i) unit step function
(ii) sinh at

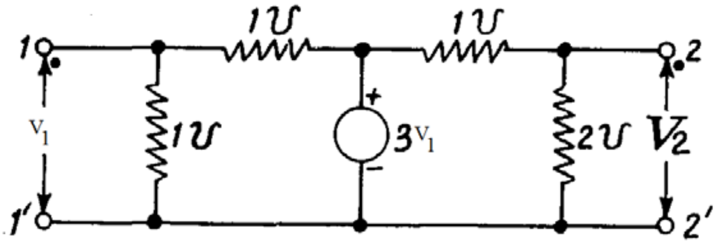
c. State and prove the initial value theorem. **(4)**

Q.4 a. State and prove Thevenin's theorem. **(8)**

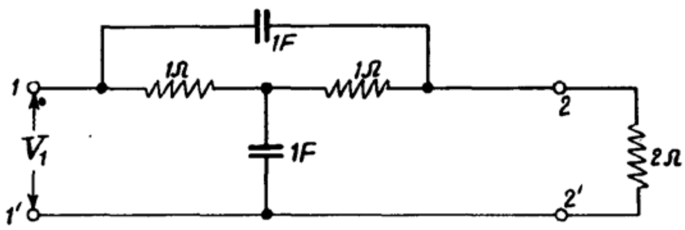
b. Find the current flowing in branch AB in the unbalanced bridge shown in figure. When this branch has a resistance of
(i) 3.6 ohm (ii) 0.36 ohm. **(8)**



Q.5 a. Find the Y parameters for the given resistive network containing a controlled voltage. **(8)**



b. For the given bridged T network, find the Driving point admittance Y_{11} and transfer impedance Y_{21} with 2Ω load resistance connected across port 2. **(8)**



Q.6 a. For a parallel RLC circuit, obtain the expression for anti-resonance frequency and state the condition when the series resonant frequency is equal to anti-resonance frequency. **(8)**

b. A series RLC circuit consists of resistance R = 25 Ω, inductance L = 0.01 H and capacitance C = 0.04 μF. Calculate the frequency of resonance. If a 10 volts voltage of frequency equal to the frequency of resonance is applied to this circuit, calculate the values of voltages V_C and V_L across C and L respectively. Find the frequencies at which these voltages V_C and V_L are maximum. **(8)**

Q.7 a. Explain various types of distortion in a transmission line. Obtain the condition for a distortion less transmission line. **(8)**

b. The values of primary constants of an open wire line per loop kilometre are: R = 10 Ω, L = 3.5 mH, C = 0.008 μF and G = 0.7 μS. For signal frequency of 1000 Hz, calculate the characteristic impedance Z_0, phase constant γ, attenuation constant α, phase shift constant β , wavelength λ and phase velocity V_P. **(8)**

Q.8 a. Explain how Quarter Wavelength (λ/4) line can be considered as a image transformer for impedance matching. **(8)**

b. A lossless line carrying a signal of wavelength 10 metres has R_0 =300 ohms. Load impedance is Z_R = 100 —j60 and the voltage measured across the load impedance is E_R = 10 volts. Calculate maximum and minimum values of voltage and current and also the distances of first maximum and first minimum from the load end terminals. Also determine the value of standing wave ratio. **(8)**

Q.9 a. Design m-derived T and π- sections low pass filters for nominal characteristic impedance R_0 = 600 ohms, cut-off frequency = 1800 Hz and infinite attenuation frequency f_∞ = 2000 Hz. **(8)**

b. Explain and derive the design equations for Symmetrical T- attenuators. **(8)**