# DipIETE – ET (NEW SCHEME) – Code: DE57

## Subject: NETWORKS AND TRANSMISSION LINES

**Time: 3 Hours** **JUNE 2009** **Max. Marks: 100**

**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.**
- **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.**

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**Q.1 Choose the correct or the best alternative in the following:** **(2×10)**

a. An ideal voltage source has

**(A)** Zero internal resistance **(B)** Infinite internal resistance
**(C)** Low internal resistance **(D)** All of above

b. The Laplace transform of shifted unit step function f(t) = u(t-a) is given by:

**(A)** $\frac{a}{(s+a)}$ **(B)** $e^{-as}\left(\frac{1}{s}\right)$
**(C)** $\frac{1}{(s+a)}$ **(D)** None of above.

c. Thevenin's theorem is valid for network containing only

**(A)** Linear elements **(B)** Non linear elements
**(C)** Reactive elements **(D)** None of above.

d. A network function is given by $H(s) = \frac{1}{3+s}$. It would have a zero at:

**(A)** Real axis of s plane **(B)** At infinity
**(C)** Imaginary axis of s plane **(D)** At origin

e. In z-parameter representation if $Z_{21} = Z_{12}$ then the network is:

**(A)** Bi lateral **(B)** Symmetrical
**(C)** Balanced **(D)** Inverse.

f. Higher the Q of series circuit,

**(A)** sharper its resonance **(B)** greater its bandwidth
**(C)** broader its resonated curve **(D)** narrower its passband

g. In a R-L-C circuit the impedance is given by:

**(A)** $Z = R-X_L+X_C$ **(B)** $Z = R+X_L-X_C$

**(C)** $Z = \sqrt{R^2 + (X_L - X_C)^2}$ **(D)** $Z = \sqrt{(R + X_L)^2 + X_C^2}$

h. Propagation constant in a lossless line is given by:

**(A)** L/C **(B)** LC

**(C)** $j\omega\sqrt{LC}$ **(D)** $\frac{1}{\sqrt{LC}}$

i. VSWR on short circuited lossless line is given by:

**(A)** Zero **(B)** Infinity
**(C)** Unity **(D)** None of above

j. Attenuators have

**(A)** gain and phase constant **(B)** attenuation constant
**(C)** gain only **(D)** attenuation and phase constant

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

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**Q.2** a. What are different types of energy sources. Describe each briefly. **(8)**

b. Calculate the equivalent resistance of a given ∏ network (Fig.2(b)) connected with a load of 100 Ω and a supply voltage of 25 volts. Also find out the load current. **(8)**

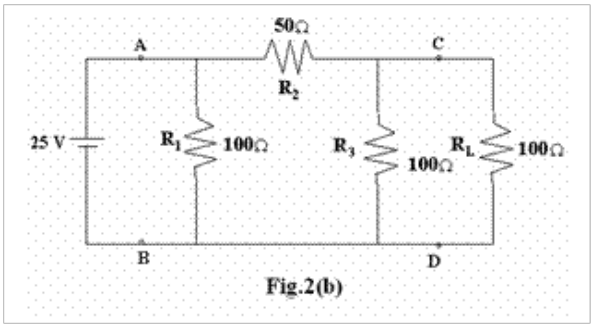

Fig.2(b)

**Q.3** a. State and prove convolution theorem. **(8)**

b. Derive an expression for Laplace transform of unit impulse function. **(8)**

**Q.4** a. State superposition and maximum power transfer theorem. **(8)**

b. Find out the current through the terminal resistance 1 Ω at A and B using Thevenin's theorem (Fig. 4(b)) **(8)**

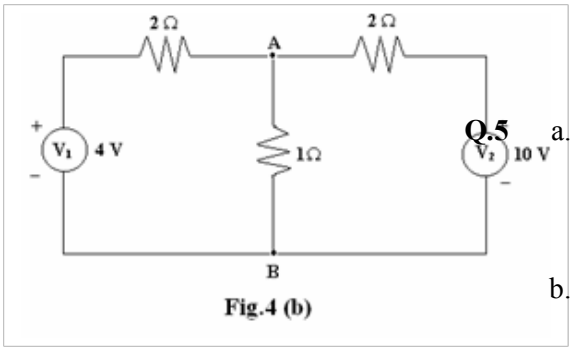

Fig.4 (b)

**Q.5** 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. A tank circuit is supplied by a current source having internal resistance as 50 kΩ. If the constituents of the tank circuit are a 50 nF capacitor and a coil of resistance 30 Ω and inductance 25 mH, find the frequency of resonance and Q factor. **(8)**

**Q.6** a. What are different types of distortions in a transmission line? Discuss each briefly. **(8)**

b. A telephone line has the following primary constant per km loop, R = 20 Ω, L = 10 mH, C = 0.1 μF and G = 10 μmho. Find its characteristic impedance at angular frequency of $5 \times 10^3$ radians/sec. **(8)**

**Q.7** a. A transmission line with a characteristics impedance of 300 Ω is terminated in purely resistive load. The minimum value of voltage is 5 μV and maximum voltage is 7.5 μV. What is the value of the load resistance? **(8)**

b. What is meant by impedance matching in transmission lines? Discuss briefly different impedance matching elements used. **(8)**

**Q.8** a. Design an L-attenuator to operate into a resistance of 500 Ω and to provide an attenuation of 15 dB. **(8)**

b. Design a constant K high pass filter having $f_c$ = 4 kHz and design impedance $R_o$ = 600 Ω (Π section). **(8)**

**Q.9** a. Derive the expression for ABCD parameters in terms of Y parameters. **(8)**

b. Check the stability of the following polynomial by applying Routh-Hurwitz criterion.
$P(s) = s^4+2s^3+4s^2+12s+10$ **(8)**