**Code: DE57**     **Subject: NETWORKS AND TRANSMISSION**

## DipIETE – ET

**Time: 3 Hours**     **JUNE 2013**     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:     $(2 \times 10)$

   a. An ideal voltage source is that which has an internal resistance _____ ohms.

   **(A)** zero                    **(B)** one
   **(C)** 1 Mega                  **(D)** Infinite

   b. The Inverse Laplace Transform of $\dfrac{2}{(s+1)}$ is _____

   **(A)** $2(t+1)$               **(B)** $2e^{-2t}$
   **(C)** $e^{-2t}$              **(D)** $2e^{-t}$

   c. _____ parameters are widely used in transmission line

   **(A)** Z-parameter            **(B)** Y-parameter
   **(C)** ABCD-parameter         **(D)** h-parameter

   d. VSWR on short circuited loss less device is _____

   **(A)** 0                      **(B)** $\infty$
   **(C)** 1                      **(D)** -1

   e. A parallel resonant circuit can be used _____

   **(A)** as a high impedance    **(B)** to reject small band of frequencies
   **(C)** both **(A)** & **(B)**   **(D)** to amplify certain frequencies

   f. A transmission line is terminated in a load equal to its characteristic impedance. The reflection co-efficient is _____

   **(A)** 1                      **(B)** $-1$
   **(C)** 0                      **(D)** $\infty$

g.  Double stub matching eliminates standing waves on the _____

(**A**) source side of the left stub        (**B**)  load side of the right stub
(**C**)  both sides of the stub             (**D**)  in between the two stubs

h.   One Neper is equal to

(**A**) 0.8686 dB                           (**B**) 8.686 dB
(**C**) 0.6930 dB                           (**D**) 3 dB

i.  A Smith Chart is used for solving problems in _____

(**A**) radio wave propagation              (**B**) transmission line
(**C**) antenna systems                     (**D**) power transfer problems

j.  The attenuator where series arm $R_A$ is usually made equal to characteristic impedance is a _____

(**A**) symmetrical T attenuator            (**B**) symmetrical $\pi$ attenuator
(**C**) bridged T attenuator                (**D**) lattice T attenuator

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

**Q.2**   a.  Classify the various types of network elements and explain each of them with examples.                                                                    (**8**)

b.  To a $2\mu F$ condenser is applied a voltage v(t) as shown in Fig.1.  Find:
(i)    the current during time t = 0 to t = 1 second.
(ii)   charge accumulated across the condenser at t = 1 second.
(iii)  power in the condenser at t = 1 second
(iv)  energy stored in the condenser at t = 1 second.                      (**8**)



Fig.1
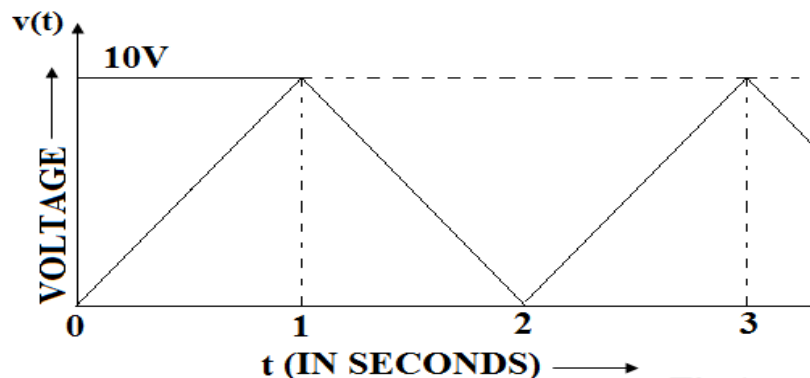
**Q.3**   a.  Discuss the advantages of Laplace Transform method over classical method?                                                                                (**5**)

b.  Find Laplace Transform of:
(i)  Unit Impulse function          (ii)  Unit ramp function                (**6**)

c. Find the convolution integral when $f_1(t) = e^{-at} u(t)$ and $f_2(t) = t\, u(t)$, using Laplace transform. **(5)**

**Q.4** a. Apply Routh-Hurwitz criterion to check the stability of system whose characteristic equation is given by $s^5 + s^4 + 4s^3 + 24s^2 + 3s + 63 = 0$. Also determine the number of roots
(i) with positive real parts
(ii) with zero real parts
(iii) with negative real parts **(9)**

b. Obtain the ABCD Parameters of the network shown in Fig.2 and verify that the circuit is symmetrical and reciprocal. **(7)**
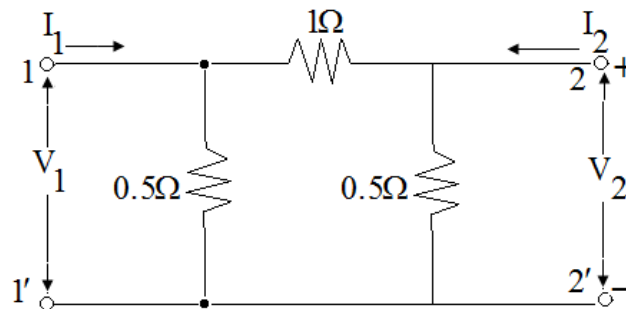

**Fig.2**

**Q.5** a. The voltage applied to a series RLC circuit is 0.85V. The Q of the inductor coil is 50 and the value of the capacitor is 320 pF. The resonant frequency of the circuit is 175 KHz. Find:
(i) the value of inductance
(ii) the value of resistance
(iii) the voltage across capacitor **(6)**

b. Compare the frequency response curve of an amplifier with single and double tuned circuits and discuss the use of double tuned circuits in Radio Receivers. **(10)**

**Q.6** a. State Thevenin's Theorem and find the current flowing through the load resistor $22\Omega$ in the circuit shown in Fig.3 by applying Thevenin's theorem. **(8)**
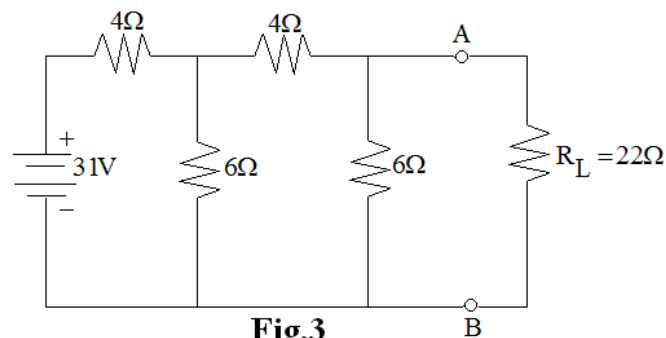

**Fig.3**

b. In the network shown in Fig.4, the load connected across terminals AB consists of a variable resistance, $R_L$ and a capacitive reactance $X_L$ which may vary from $2\Omega$ to $8\Omega$. Determine:

(i)   the value of $R_L$ and $X_L$ which result in maximum power transfer
(ii)  the maximum power delivered to the load.                              **(8)**
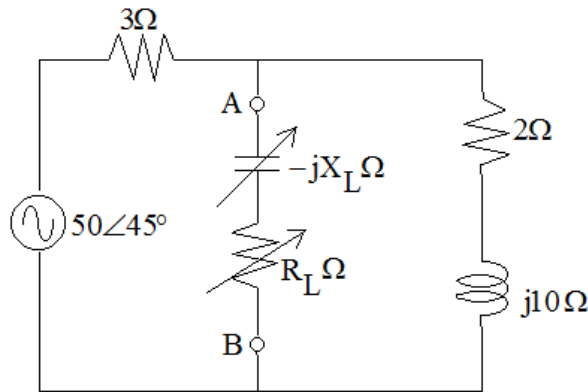

Fig. 4

**Q.7**   a.   The primary constants of a transmission line per loop kilometre are $R = 196\Omega, C = 0.09\mu F, L = 0.71mH$ and leakage conductance is negligible. Calculate the secondary constants at a frequency of $\left(\dfrac{5,000}{2\pi}\right) Hz$ .          **(6)**

b.   An underground cable has $Z_o = 400\angle - 40^\circ, \alpha = 0.079 neper / Km$ and $\beta = 0.084$ radians/Km. If the receiving end current $I_R = 0.005\angle -190^\circ$ and the line is terminated by an impedance $Z_R = 600\angle - 20^\circ$, calculate:
(i)    the reflection coefficient
(ii)   voltage in the line at a distance of 10 Km from the receiving end
(iii)  current in the line at a distance of 10 Km from the receiving end     **(10)**

**Q.8**   a.   What is meant by quarter wave transformer?  Why is it also called as impedance inverter?  Discuss its applications in transmission lines.     **(10)**

b.   The VSWR measured on UHF transmission line working at a frequency of 300 MHz is found to be 2.  If the distance between load and voltage minimum is 0.8 metre, calculate the value of load impedance.     **(6)**

**Q.9**   a.   Design an m-derived T-section low pass filter having cut-off frequency $f_c = 1000Hz,$ design impedance $R_K = 600\Omega$ and frequency of infinite attenuation $f_\infty = 1050Hz$ .     **(8)**

b.   Write short notes on:

(i)   Asymmetrical T-attenuator
(ii)  Asymmetrical L-attenuator     **(8)**