ROLL NO. ___________________

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

# DipIETE – ET (Current Scheme)

**Time: 3 Hours** **JUNE 2016** **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:** **($2\times10$)**

a. A practical voltage source of voltage V volts with an internal resistance R ohms is converted into a current source. The value of current source and its internal resistance is

**(A)** V/R, 1/R **(B)** V/R, R
**(C)** R/V, R **(D)** R/V, 1/R

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. Milman's theorem is applicable when
**(A)** ideal voltage sources are connected in parallel
**(B)** practical voltage sources are connected in parallel
**(C)** practical voltage sources are connected in series
**(D)** ideal current sources are connected in series

d. The Laplace transform of a function $f(t)$ is given by $F(s)=\frac{5s+2}{(s+1)(s+3)}$, then $f(0+)$ is equal to

**(A)** 5 **(B)** 5/4
**(C)** 2/3 **(D)** 0

e. The number of sign changes in the first column of Routh's array indicates
**(A)** the number of roots of a polynomial equation with positive imaginary part.
**(B)** the number of roots of a polynomial equation with negative imaginary part.
**(C)** the number of roots of a polynomial equation with positive real part.
**(D)** the number of roots of a polynomial equation with negative real part.

f. The power at cutoff frequencies of resonance circuit is
**(A)** Half of the power at resonance.
**(B)** 0.707 times of the power at resonance.
**(C)** 1.41 times of the power at resonance.
**(D)** None of the above

g. If maximum and minimum voltages on a transmission line are 4V and 2V respectively, VSWR is
**(A)** 0.5 **(B)** 4
**(C)** 1 **(D)** 2

h. A 50Ω transmission line is connected to a load impedance yielding a VSWR of unity. The load impedance is
**(A)** 100Ω **(B)** 50Ω
**(C)** 1Ω **(D)** 0Ω

i. Input impedance is maximum for
**(A)** Short circuit $\lambda/2$ line. **(B)** Open circuit $\lambda/4$ line.
**(C)** Short circuit $\lambda/4$ line. **(D)** None of these

j. If the sending end voltages and currents on a transmission line are 200V and 2A for a given load, the input impedance is
**(A)** 100Ω **(B)** ∞
**(C)** 200Ω **(D)** 400Ω

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

**Q.2** a. Explain various types of network elements. **(8)**

b. For the circuit as shown in Fig. 1, switch k is closed at t=0, the current in the circuit is given by $i = 2\left(1 - e^{-t/2}\right)$amp, $t > 0$. At time t=1 second, calculate: **(8)**
(i) value of current (ii) total flux linkage
(iii) voltage across the inductor (iv) energy stored in the magnetic field.

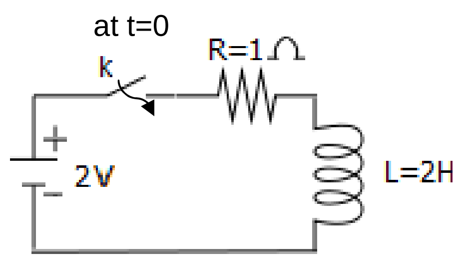

Fig.1

**Q.3** a. For the periodic signal as shown in Fig.2, obtain the Laplace Transform. **(8)**

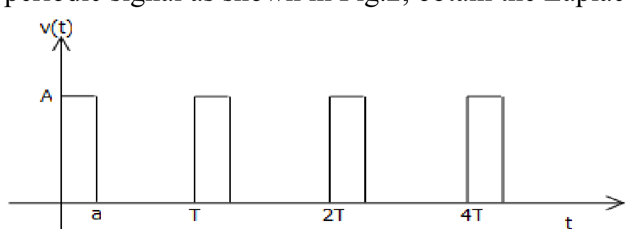

Fig.2

b. State and prove initial and final value theorems. **(8)**

**Q.4** a. State and explain the following theorems
(i) Reciprocity (ii) Compensation. **(4+4)**

b. Determine the current through the resistor of 2Ω connected across AB for the network as shown in Fig.3 using Thevenin's theorem. **(8)**

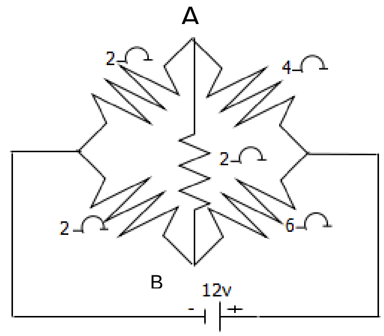


Fig.3

**Q.5** a. Define the driving point impedance of a two port network. Also find the transform impedance Z(s) of a one port network as shown in Fig.4. **(2+6)**

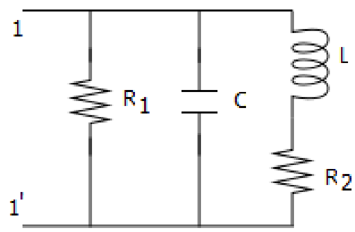


Fig.4

b. Define ABCD and Z parameters. Derive the expression of ABCD parameters in terms of Z-parameters. **(4+4)**

Q.6 a. Derive the expressions of lower and upper cut-off frequencies for series RLC resonant circuit. **(8)**

b. A 0.5µF capacitor is connected in parallel with a coil whose resistance and inductance are 1 Ω and 2H respectively. The parallel circuit is supplied by a 100V sinusoidal generator that is operating at the resonance. Find (i) the resonance frequency (ii) the input impedance of the circuit at resonance (ii) the input current at resonance and (iv) the quality factor. **(8)**

**Q.7** a. With the help of a neat circuit diagram of a unit section transmission line, obtain the general solution for voltage and current in exponential form. **(8)**

b. Define reflection coefficient and reflection loss. **(4)**

c. The primary constants of transmission line per kilometer are R=6Ω, G=0.25µ mhos, L=2.2mH, and C=0.005µF. Calculate the characteristic impedance of the line at the operating frequency of 1kHz. **(4)**

**Q.8** a. Obtain the voltage, current and impedance waveforms of a short-circuited loss less lines. **(6)**

b. Derive the relationship between VSWR and the reflection coefficient. **(4)**

c. A line of characteristic impedance 400Ω connected to a load of (200+j 300)Ω is excited by a generator of frequency 800MHz. Find the location and length of single stub nearest to the load to produce an impedance matching using Smith Chart. **(6)**

**Q.9** a. Mention the advantages of an m-derived filter over the constant K-filter. Design constant K high pass T-section network for cut-off frequency of $f_c$ = 2kHz and a load resistance of 5 kΩ. **(8)**

b. An attenuator is composed of symmetric T-section having series arm resistance, each of 175Ω and shunt arm of 350Ω. Calculate the characteristic impedance and attenuation per section of this network. **(8)**