ROLL NO. _____

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

# DipIETE – ET

**Time: 3 Hours** **DECEMBER 2014** **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. Laplace transform of $\sin wt$ is:

**(A)** $\frac{s}{s^2 + w^2}$ **(B)** $\frac{s}{s + w}$

**(C)** $\frac{w}{s^2 + w^2}$ **(D)** $\frac{s^2}{s^2 + w^2}$

b. Applying maximum power transfer theorem, if the source impedance is equivalent to $R + jX$, the load impedance will be:

**(A)** $R + jX$ **(B)** $R$ only

**(C)** $R - jX$ **(D)** $-jX$ only

c. For determining h-parameters of a network, the measurements should be under the condition of:

**(A)** input port short; output port open
**(B)** both ports open
**(C)** both ports short
**(D)** input port open; output port short

d. In a series resonant circuit, the impedance of the circuit at resonance is:

**(A)** minimum **(B)** maximum
**(C)** infinite **(D)** zero

e. The power factor at resonance in parallel RLC circuit is

**(A)** unity **(B)** zero
**(C)** 0.8 lagging **(D)** 0.8 leading

f. A finite transmission line behave as an infinite line when the load end is:

**(A)** terminated by any impedance
**(B)** terminated by characteristic impedance of the line
**(C)** open circuited
**(D)** short circuited

g. The characteristic impedance of transmission line is given as:

**(A)** $\sqrt{\frac{Z_{OC}}{Z_{SC}}}$ **(B)** $\sqrt{Z_{OC} \times Z_{SC}}$

**(C)** $Z_{OC} \times Z_{SC}$ **(D)** $\frac{Z_{OC}}{Z_{SC}}$

h. A stub matching is more effective if done:

**(A)** as close to the source as possible
**(B)** at a voltage maximum
**(C)** as close to the load as possible
**(D)** at a voltage minimum

i. A band pass filter may be obtained by using a high pass filter followed by a:

**(A)** High pass filter **(B)** RC filter
**(C)** RL filter **(D)** Low pass filter

j. A simplest type of attenuator having only two resistors which can be used for matching between two unequal impedances is :

**(A)** Symmetrical T attenuator **(B)** Asymmetrical T attenuator
**(C)** Asymmetrical π attenuator **(D)** Asymmetrical L attenuator

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

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**Q.2** a. Find the value of $v(t)$ using Laplace transform if

$$V(s) = \frac{s+2}{s(s+1)+(s+3)}$$

What is its value at $t = 0^+$ and $t = \infty$? **(4+2+2)**

b. State and prove the shifting theorem of Laplace Transform. **(8)**

**Q.3** a. State and explain Thevenin's theorem. What are its limitations? **(6+2)**

b. Apply the superposition theorem to the network shown in **Fig.1** and obtain the current in the (3 + j4) Ohm impedance. **(8)**

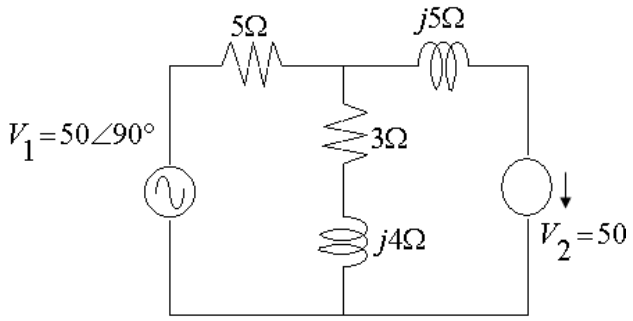


**Fig.1**

**Q.4** a. Find the z-parameters for the resistive network shown in **Fig.2** **(8)**

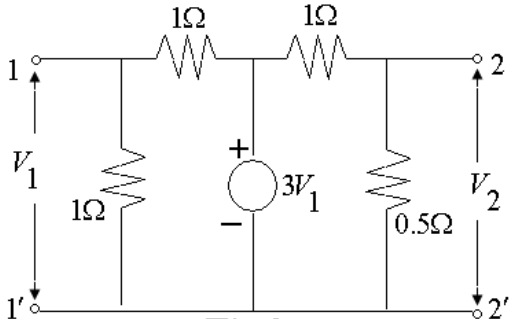


**Fig.2**

b. The z-parameters of a two port network are $Z_{11}$ = 10 Ω, $Z_{22}$ = 20Ω, $Z_{12}$ = $Z_{21}$ = 20Ω. Find the ABCD parameters of this two port network. **(8)**

**Q.5** a. The circuit shown in **Fig.3** represents a parallel resonant circuit where $R_L$ is the ohmic resistance of the inductor L. Find the resonant frequency of the circuit. **(8)**

**(8)**

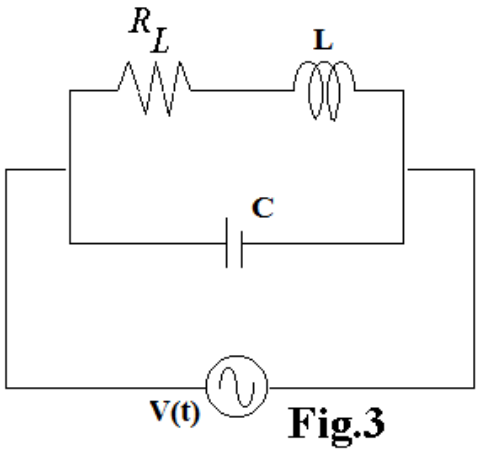


**Fig.3**

b. A 220 V, 100 Hz AC source supplies a series LCR circuit with a capacitor and a coil. If the coil has 50 mΩ resistance and 5 mH inductance and resonant frequency of the circuit is 100 Hz, than find the value of capacitor. Also calculate Q factor and half power frequencies of the circuit. **(4+2+2)**

**Q.6** a. Define and explain phase velocity and group velocity of a uniform transmission line. **(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. Derive expression for input impedance of open and short circuited line and show that characteristic impedance $Z_0 = \sqrt{Z_{OC} \times Z_{SC}}$ **(8)**

b. A 100 km long transmission line is terminated by a resistance of 200 ohm. It has characteristics impedance $Z_0 = 600\angle 0^o$ ohms, attenuation constant $\alpha = 0.01$ neper / km, phase shift constant $\beta = 0.03$ rad / km. Find the reflection coefficient and the impedance. **(8)**

**Q.8** a. Explain the operation and use of a quarter wave transformer. **(8)**

b. A low loss line with $Z_0$ = 70 Ω terminates in an impedance of $Z_R = 115 - j80$. The wave length of the transmission is 2.5 metres; using the smith chart find:
(i) Standing wave ratio
(ii) Maximum and minimum line impedance
(iii) Distance between load and first voltage maximum **(8)**

**Q.9** a. Draw the circuit of a symmetrical-T attenuator and derive the design equation. **(2+6)**

b. Design m-derived low pass filter having a design impedance of 600 Ω and cut-off frequency of 5000 Hz. The frequency of infinite attenuation is 6250 Hz. **(8)**