**Code: DE07** **Subject: NETWORK AND TRANSMISSION LINES**
**Time: 3 Hours** **Max. Marks: 100**

## DECEMBER 2010

**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 half an hour 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.**

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

a. A capacitor has a capacitance of 5 μF, calculate the energy stored in it if a d.c voltage of 100 V is applied across it.

**(A)** $2.5\times10^{-2}$ joules **(B)** $2\times10^{-2}$ joules
**(C)** $2.5\times10^{-3}$ joules **(D)** $0.5\times10^{-2}$ joules

b. If the two capacitance $C_1$ & $C_2$ are in parallel then what will be the total capacitance:-

**(A)** $\frac{1}{C}=\frac{1}{C_1}+\frac{1}{C_2}$ **(B)** $C=C_1+C_2$
**(C)** $C=\frac{C_1+C_2}{C_1C_2}$ **(D)** $C=\frac{C_1C_2}{C_1+C_2}$

c. What will be the form factor of a sinusoidal voltage wave:-

**(A)** 2.22 **(B)** 1.92
**(C)** 1.11 **(D)** 1.10

d. Laplace transform of unit step function is:-

**(A)** $1/s$ **(B)** s
**(C)** $1/s^2$ **(D)** $1/s^3$

e. Laplace transform of parabolic function:-

**(A)** $2/s^2$ **(B)** $2/s^3$
**(C)** $1/s^3$ **(D)** $1/s^2$

f. Condition of reciprocity in a two port network in Z-parameters:-

**(A)** $Z_{12} = \frac{1}{Z_{12}}$ **(B)** $Z_{12} = \frac{1}{Z_{21}}$

**(C)** $Z_{12} = Z_{21}$ **(D)** $Z_{11} = Z_{22}$

g. In a series R-L circuit the current and voltage are given as, $I = \cos(314t - 20^\circ)$, $V = 10\cos(314t + 10^\circ)$ then the value of R & L is.

**(A)** $L = 14.9mH, R = 7.66\Omega$ **(B)** $L = 15.9mH, R = 8.66\Omega$

**(C)** $L = 10.9mH, R = 5.01\Omega$ **(D)** $L = 15.3mH, R = 8.11\Omega$

h. Quality factor of a series resonance circuit is:-

**(A)** $Q = R\sqrt{\frac{L}{C}}$ **(B)** $Q = R\sqrt{LC}$

**(C)** $Q = \frac{1}{R}\sqrt{\frac{L}{C}}$ **(D)** $Q = \frac{1}{R}\sqrt{\frac{C}{L}}$

i. A coil is at resonance at 10 KHz with a capacitor. If the resistance and inductance of the coil are $200\Omega$ and 5H, then Q- factor of the coil is:-

**(A)** 1520 **(B)** 1000

**(C)** 1560 **(D)** 1570

j. In a simple T- section, a low pass filter has a design impedance $R_o$. Then $Z_{o\pi}$ at 0.9 $f_c$ is;-

**(A)** 2.9 $R_o$ **(B)** 2.3 $R_o$

**(C)** 2.7 $R_o$ **(D)** 2.0 $R_o$

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

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**Q.2** a. Distinguish between;- . **(4+4)**
(i) unilateral & bilateral elements.
(ii) lumped & Distributed elements.

b. A Voltage wave is represented by V = 200 sin (314 t) find
(i) Maximum value (ii) RMS value
(iii) Frequency (iv) Average value
(v) Time period (vi) Instantaneous value at t = 0.05 s **(8)**

**Q.3** a. Define unit impulse function $\delta(t)$,unit step function u (t) and ramp function **(8)**

b. In the Laplace domain, a function is given by- **(8)**

$$F(S) = M\left[\frac{(S+\alpha)\sin\theta}{(S+\alpha)^2+\beta^2} + \frac{\beta\cos\theta}{(S+\alpha)^2+\beta^2}\right]$$

Show, by initial value theorem

$$\lim_{t \to 0} f(t) = M\sin\theta$$

**Q.4** a. In the circuit of Fig.1, find the power loss in the 1Ω resistor by Thevenin theorem **(8)**

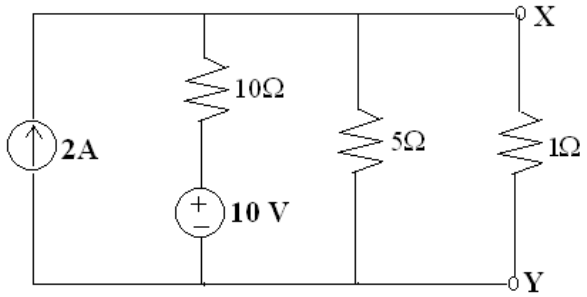


**Fig.1**

b. Find the value of K in the circuit of Fig.2 such that maximum power transfer takes place. What is the amount of this power? **(8)**

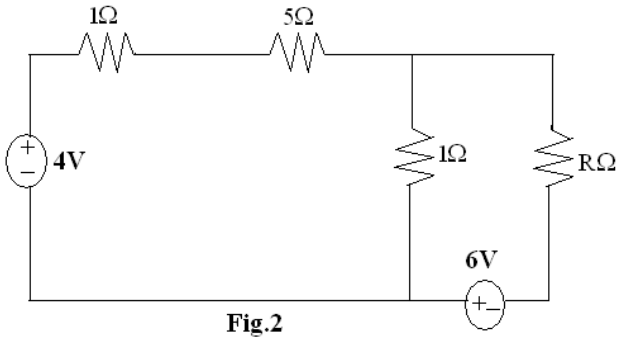


**Fig.2**

**Q.5** a. Derive the condition of reciprocity in symmetry in Z parameter representation. **(8)**

b. In the circuit shown in Fig.3, find the h parameter. **(8)**

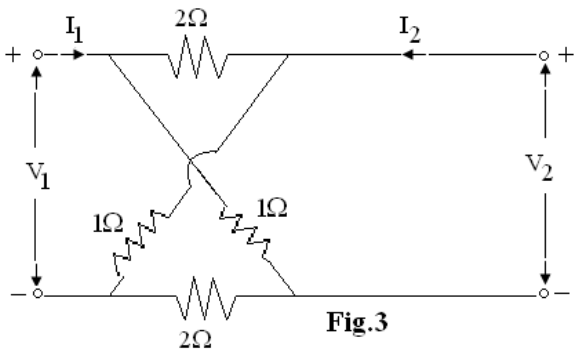


**Fig.3**

**Q.6** a. A 50 Hz sinusoidal voltage V=311 sin $\omega t$ is applied to a RL series circuit if the magnitude of resistance is $5\Omega$ and that of inductance is 0.02H.

(i) Calculate the R.M.S or effective value of steady state current and relative phase angle.
(ii) obtain the expression for the instantaneous current.
(iii) compute the effective magnitude and phase of voltage drop appearing across each circuit element. **(8)**

b. Define the concept of selectivity & bandwidth and their values in terms of Q and $\omega_o$. **(8)**

**Q.7** a. Determine the relationship between the resonance frequency $f_o$ and the half-power frequency $f_1$ and $f_2$ in a series resonating circuit. **(8)**

b. Show that no value of $R_L$ in the circuit shown in Fig.4 will make it resonant. **(8)**

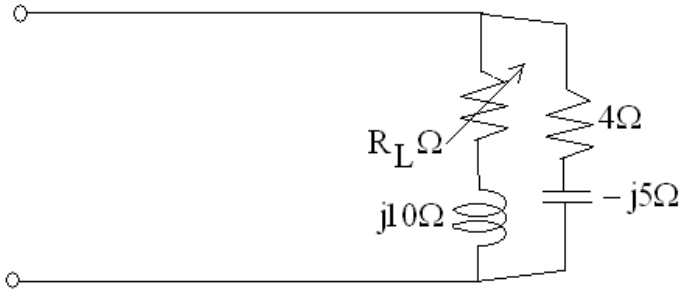


**Fig.4**

**Q.8** a. Drive the general equation of a transmission line characteristics impedance $(Z_o)$ **(8)**

b. Define single stub & double stub matching. And also explain the utility of smith chart for transmission lines.. **(8)**

**Q.9** a. Define symmetrical and asymmetrical attenuator and give the design parameters of $\pi$ type attenuator. **(8)**

b Design a T & $\Pi$ section constant K high pass fitter having cut off freq. of 12 KHz and nominal impedance. **(8)**
$R_O = 500\Omega$ also find its characteristics impedance and phase constant at 24 KHz.