

**DiplETE – ET (Current Scheme)**

Time: 3 Hours

**DECEMBER 2015**

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. The energy stored in a capacitor is
- (A)  $E = CV^2$  (B)  $E = 2CV^2$   
 (C)  $E = \frac{1}{2}CV^2$  (D)  $E = \frac{1}{2}CV$
- b. The Inverse Laplace Transform of  $\frac{1}{s+3}$  is
- (A)  $3e^t$  (B)  $3e^{t/3}$   
 (C)  $e^{3t}$  (D)  $e^{-3t}$
- c. A Two-port network is said to be reciprocal, if and only if
- (A)  $Z_{11} = Z_{22}$  (B)  $A = D$   
 (C)  $BC - AD = -1$  (D)  $h_{12} = h_{21}$
- d. For the symmetrical two-port network  $Z_1 = 30\Omega$  and  $Z_2 = 10\Omega$ , then the values of A and D
- (A)  $A=4$   $D=4$  (B)  $A=4$   $D=1/4$   
 (C)  $A=1/4$   $D=1/4$  (D)  $A=1/4$   $D=4$
- e. The cut-off frequency of a constant-K LPF is
- (A)  $f_c = \pi\sqrt{LC}$  (B)  $f_c = 4\pi\sqrt{LC}$   
 (C)  $f_c = \frac{1}{\pi\sqrt{LC}}$  (D)  $f_c = \frac{1}{4\pi\sqrt{LC}}$
- f. The value of 'm' for LPF having  $R_o=600\Omega$ ,  $f_c = 1800\text{Hz}$ ,  $f_\infty = 2000\text{Hz}$  is
- (A) 0.43 (B) 0.62  
 (C) 0.81 (D) 0.25

- g. Which of the following is the characteristic Impedance of a lossless transmission line?
- (A)  $\sqrt{\frac{L}{C}}$  (B)  $\sqrt{\frac{L}{G}}$   
 (C)  $\sqrt{\frac{R}{G}}$  (D)  $\sqrt{\frac{R}{C}}$
- h. A Quarter wave Impedance transformer is terminated by a short circuit. The Input Impedance is equal to
- (A) The line characteristic Impedance  
 (B) Zero  
 (C) Infinity  
 (D) Square root of the line characteristic Impedance
- i. A Series RLC circuit resonates at 3MHz and has a 3dB bandwidth of 10kHz. The Q of the circuit at resonance is
- (A) 30 (B) 300  
 (C)  $300\sqrt{2}$  (D)  $\frac{300}{\sqrt{2}}$
- j. When VSWR is 3, reflection coefficient is
- (A) 1/2 (B) 1  
 (C) 3/2 (D) 1/4

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

- Q.2 a. (i) What is duality in electrical networks? Explain the steps involved in construction of a dual of a network. (6+2)  
 (ii) Draw the dual of the network shown in Fig.1. (6+2)

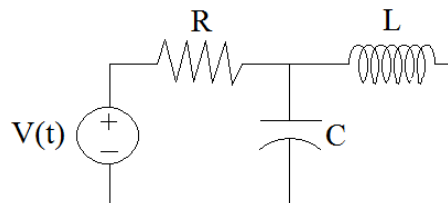


Fig.1

- b. Explain the Dot convention rules in magnetically coupled coils. (8)
- Q.3 a Find the Laplace Transform of the following signals: (6+2)  
 (i)  $f(t) = \cos \omega t$   
 (ii)  $f(t) = U(t - 3)$
- b. Find the Initial and Final values for the following: (4+4)  

$$X(s) = \frac{s + 4}{s^2 + 3s + 5}$$

- Q.4** a. Find the Power dissipated in  $10\Omega$  resistor in the circuit shown in Fig.2 using Norton's Theorem. (8)

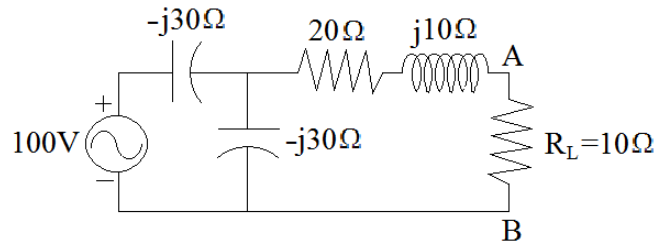


Fig.2

- b. Using Milliman's theorem, find out the voltage across the load resistance for the circuit shown in Fig.3. (8)

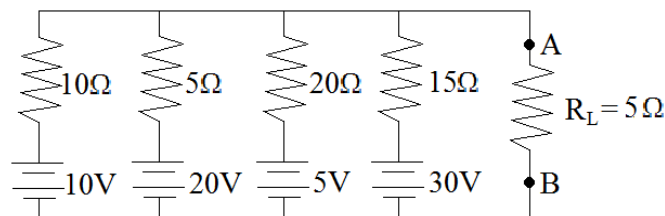


Fig.3

- Q.5** a. The Z-Parameters of a two-port network are  $Z_{11}=30\Omega$ ,  $Z_{22}=40\Omega$ ,  $Z_{12}=Z_{21}=20\Omega$ . Find the equivalent T-network. (8)
- b. The Impedance parameters of a two-port network are  $Z_{11}=6\Omega$ ,  $Z_{22}=4\Omega$ ,  $Z_{12}=Z_{21}=3\Omega$ . Compute the Y-Parameters and write the equations. (8)
- Q.6** a. Define Selectivity and Bandwidth of R-L-C circuit. (8)
- b. A resistor and a capacitor are in series with a variable Inductor. When the circuit is connected to a 200V, 50Hz supply, the maximum current obtainable by varying the Inductance is 0.314A, the voltage across the capacitor is then 300V. Find the circuit elements. (8)
- Q.7** a. Explain how  $\frac{R}{L} = \frac{G}{C}$  is a distortionless condition of a transmission line. (8)
- b. Derive the expressions for Attenuation Constant( $\alpha$ ) and Phase constant ( $\beta$ ) of a transmission line in terms of R, L, C and G. (8)
- Q.8** a. Explain the Phenomenon of Standing Wave ratio (SWR) and derive the relationship between SWR and Reflection Coefficient. (2+6)
- b. A certain lossless line has a characteristic impedance of  $400\Omega$ . Determine the SWR with the following receiving end Impedance. (4+4)
- (i)  $Z_R = 70 + j0\Omega$
- (ii)  $Z_R = 450 + j50\Omega$
- Q.9** a. Define Decibel and Neper? Derive the numerical relationship between the Decibel and Neper. (2+2+4)
- b. Design a Constant-K Low pass filter to have a cut-off frequency of 2 kHz and terminating impedance of  $600\Omega$ . Design for both T and  $\pi$  sections. (8)