S.E - III - ETRX - CBSGS. 16/12/15

Electronic Instruments & Measurements

DEC - 2015

QP Code : **5250**

(3 Hours) [Total Marks : 80

N.B. : (1) Question No. **1** is **compulsory**.
(2) Solve any **three** questions from **remaining**.

1. Solve any **four** :—
   (a) Compare Electronic Voltmeter & Conventional Analog Voltmeter. 5
   (b) Draw Schering Bridge. List applications of it. 5
   (c) Define transducer. List different types of transducers. 5
   (d) Explain generalized data acquisition system in brief. 5
   (e) Explain sensitivity of voltmeter with one example. 5

2. (a) Explain strain gauge transducer. Derive its gauge factor. 10
   (b) Explain capacitive transducer for displacement measurement. Derive its expression. 10

3. (a) Compare RTD and Thermocouple with construction,working & application 10
   (b) List flow meters. Draw and explain ultrasonic flow meter in detail state advantage of it. 10

4. (a) Draw and explain low ,medium and high resistance measurement techniques in detail. 10
   (b) Draw and explain Maxwell's bridge. Write its advantages, disadvantages and applications 10

5. (a) Explain the importance of Lissaious figures in detection of frequency and phase. 10
   (b) Draw & explain DSO. Write the applications of DSO. 10

6. Write note on any two :— 20
   (a) FET type voltmeter.
   (b) Liquid Level measurement application using LVDT.
   (c) Data logger.

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MD-Con. 11521-15.

SE - III - ETRX - CBSGS

09/12/15

Circuit Theory

Dec-2015

QP Code : 5208

(3 Hours) [Total Marks :80

N.B. : (1) Question no. 1 is **compulsory.**
(2) Attempt any **three** questions out of remaining questions..
(3) **Figures** to the **right** indicate **full** marks.
(4) **Assume** suitable **data if required.**
(5) **Use smith chart** for **transmission** line problem.

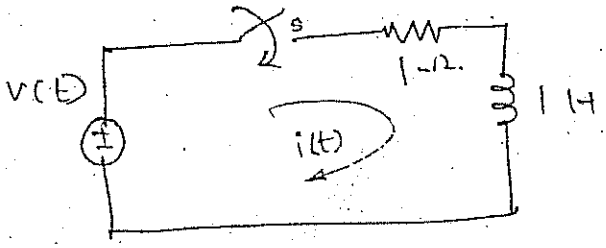
1. (a) The constants of a transmission lines are 5

$R = 6/km, L = 2.2mH/km$

$G = 0.25 \times 10^{-6}$ mho/km $C = 0.005 \times 10^{-5}$ F/km

Determine the characteristic impedance propagation constant phase constant and attenuation constant at 1KHz

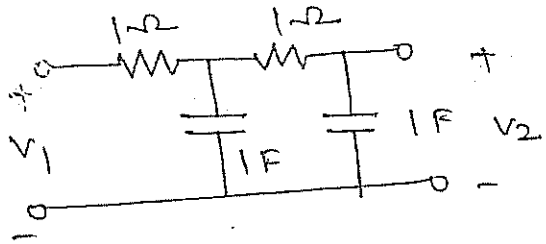
(b) Obtain the expression for i(t) if switch is closed at t = 0 If v(t) is r(t) = ramp signal 5



(c) Check whether the polynomial is hurwitz or not by continued fraction method. 5

$F(S) = S^4 + S^3 + 4S^2 + 2S + 3$

(d) Find out $\frac{V2}{V1}$ for the following n/w given below. 5



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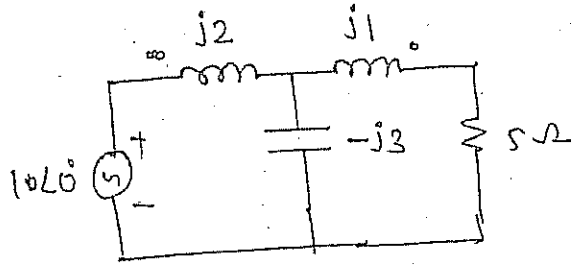
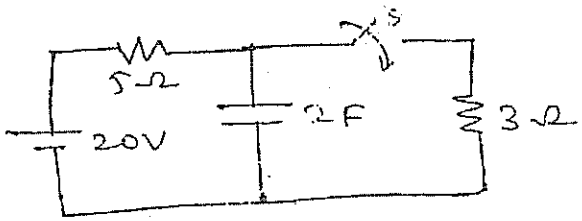
2. (a) Find the voltage across 5 Ω resistor in the network shown below. If K = 0.8 is coefficient of coupling 8



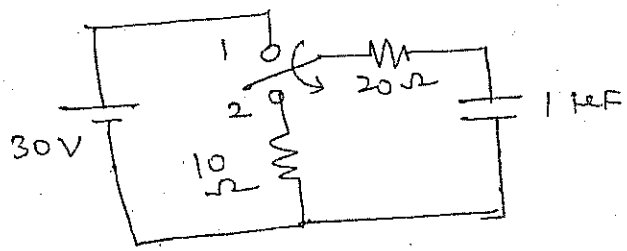
8

(b) In the circuit shown, find out the expression for voltage V(t) across capacitor for t > 0 At t = 0 Switch is closed.



(c) Define ABCD parameters for the two port network hence obtain condition for symmetry 4

3. (a) Find i, $\frac{di}{dt}$ and $\frac{d^2i}{dt^2}$ at t = 0^+ in the circuit given below. Switch is changed from position 1 to 2 at t = 0 6



(b) Compare and Obtain Foster I and Foster-II of the following RC impedance function. 8

$$Z(S)=\frac{2(S+2)(S+4)}{(S+1)(S+3)}$$

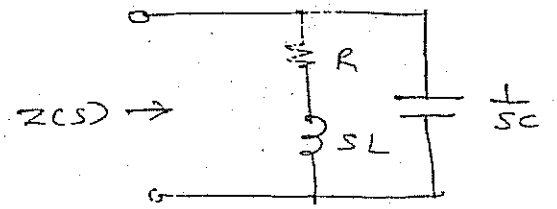
(c) Obtain cauer form I of LC network 6

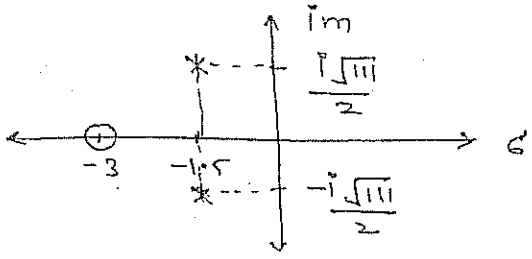
$$Z(s)=\frac{\left(s^2+4\right)\left(s^2+16\right)}{s(s^2+9)}$$

4. (a) Derive the characteristic equation of a transmission line also obtain $\alpha\ \beta\ \gamma$ of the transmission line 8

(b) Derive the relation for nominal impedance and cut off frequency for a constant k low pass filter. 4

(c) A network and its pole zero diagram are shown in fig. Determine the values of R, L, C if Z(0) = 1 8





5. (a) Check whether the following functions are PRF or not 8

(i) $F(S)=\frac{S(S+3)(S+5)}{(S+1)(S+4)}$

(ii) $F(S)=\frac{S^3+6S^2+7S+3}{S^2+2S+1}$

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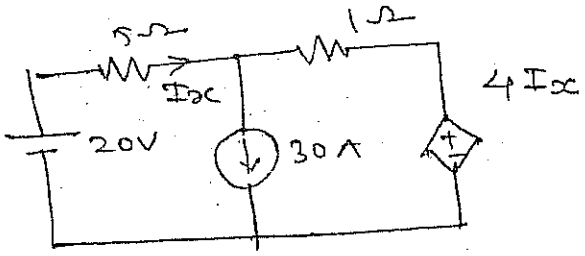
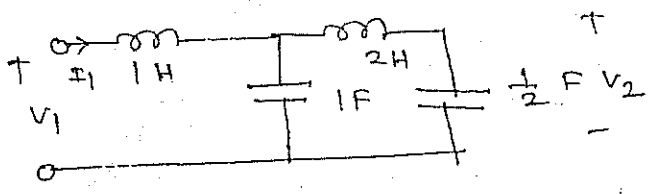
(b) Find the current I_x using superpostion theorem. 6



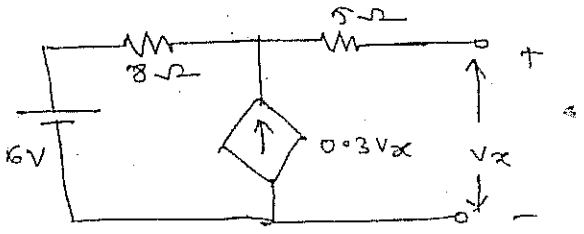
(c) The current $I(S) = \frac{2S}{(S+1)(S+2)}$ plot the pole zero pattern in s - plane hence obtain i(t) by finding out residues by graphical method. 6

6. (a) The characteristic impedance of a high frequency line is 100 Ω. If it is terminated by a load impedance of 100 + j100 Ω Using smith chart find out (i) VSWR (ii) Refection coefficient (iii) Impedance at $\frac{1}{10}^{th}$ of wavelength away from load (iv) VSWR minimum and VSWR maximum away from the load. 8

(b) For the network shown and find out $\frac{V_1}{I_1}$ and $\frac{V_2}{I_1}$ 6



(c) Find out Theverin's equivalent network 6



SE - III - ETRX - CBSGS.

Digital Circuits and Design.

Nov-Dec'2015

03/12/15

QP Code : **5159**

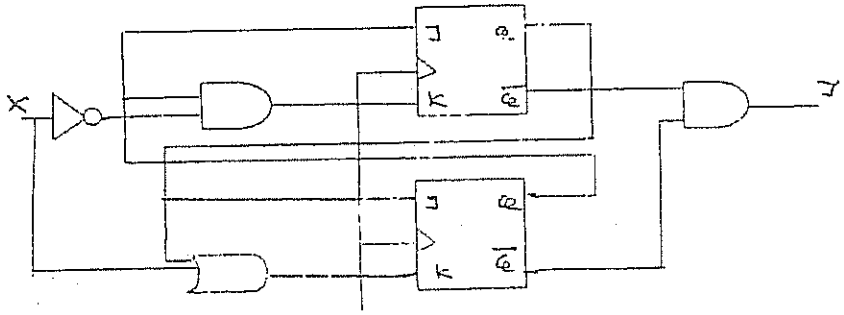
(3 Hours) [Total Marks : 80

N. B. : (1) Question No. 1 is **compulsory**.
(2) Attempt any **three** out of the remaining **four** questions.
(3) Use suitable data, wherever necessary.

1. (a) Explain drawback of synchronous counter. 5
(b) Differentiate synchronous and asynchronous counter. 5
(c) Draw truth table and logical diagram of half adder. 5
(d) Explain Fan in, fan out, power dissipation and noise immunity with reference to digital ICs 5

2. (a) Design MOD 12 asynchronous counter using T flip flop. 10
(b) Discuss Xilinx XC 9500 CPLD architecture. 10

3. (a) Design MOD-60 counter using IC 74163. 10
(b) Analyze the sequential state machine shown in figure. Obtain state diagram for the same 10



4. (a) Simplify following logic function and realize using NAND gates 10
(i) F=l:m(1,2,4,7, 10,11,13)+d(9,15)
(ii) F=2:m(1,2,3,5,8,9,11,13,15) + d(6)
(b) Design a Mealy type sequence detector to detect a serial input sequence of 101. 10

5. (a) Draw a circuit diagram of two input TTL NAND gate and explain its operation. 10
(b) Design 4 bit Johnson counter using J-K Flip Flop. Explain it operation using waveform. 10

6. Write a short note on 20
(a) Fault Model.
(b) Multiplexers.
(c) Noise Margin.

S.E- III – ETRX – CBSGS.

Electronic Devices

Nov-Dec 2015

20/11/15

Q.P. Code : 5064

(3 Hours) [Total Marks : 80]

N.B. 1)Question no.1 is compulsory and solve any three questions from remaining Questions
2) Assume suitable data if necessary
3) Draw neat and clean figures

Q-1	Solve any four	
a	Draw small signal model of pn junction diode, what is the main use of this model.	5
b	What do you mean by different transistor models, explain Hybrid Pi model.	5
c	What are the advantages of MESFET over MOSFET, explain basic principle of operation of MESFET	5
d	What is the basic operating principle of phototransistor, draw V_I characteristics and explain its use in field of optoelectronics.	5
e	How PUT is different than UJT, explain .	5
Q-2a	Explain structure, construction and working of IMPATT diode.	10
b	Explain working of BJT considering all possible current density components in an NPN transistor operating in Active mode.	10
Q-3a	Derive equation of Electric field for a pn junction under zero bias and hence derive equation of maximum electric field.	10
b	What is HBT , explain with the help of energy level diagram.	5
c	Explain qualitative characteristics of Schottky diode.	5
Q-4a	Explain JFET with the help of construction and V-I characteristics, how it is different than BJT	10
b	What is the basic working principle of Solar cell, explain construction, working and V-I characteristics, also explain what is the need to connect solar cells in series or in parallel fashion.	10
Q-5a	Derive equation of threshold voltage of a N channel MOSFET, also derive threshold voltage equation in generalized form.	10
b	Explain construction working and V-I characteristics of SCR , also explain how SCR can be switched OFF.	10
Q-6a	Explain working of MOSFET considering possible cases of VGS voltages.	10
b	Explain construction, working and V-I characteristic of TRIAC.	5
c	Explain channel length modulation in MOSFET.	5

S.E- III – ETRX – CBSGS
Applied Mathematics – III
Nov-Dec '2015

27/11/15

QP Code : 5106

(Revised course)

Time :3 hours Total marks :80

N.B : (1) Question No.1 is compulsory.
(2) Answer any three questions from remaining.
(3) Assume suitable data if necessary.

1. (a) Evaluate $\int_0^{\infty} e^{-t}\left(\frac{\cos 3t - \cos 2t}{t}\right)dt$ 05

(b) Obtain the Fourier Series expression for $f(x) = 2x - 1$ in (0,3) 05

(c) Find the value of 'p' such that the function $f(z) = \frac{1}{2}\log(x^2+y^2) + i\tan^{-1}\left(\frac{py}{x}\right)$ is analytic. 05

(d) If $\bar{F} = (y\sin z - \sin x)\hat{i} + (x\sin z + 2yz)\hat{j} + (xy\cos z + y^2)\hat{k}$.
Show that $\bar{F}$ is irrotational .Also find its scalar potential. 05

2. (a) Solve the differential equation using Laplace Transform 06

$\frac{d^2y}{dt^2} + 2\frac{dy}{dt} + y = 3te^{-t}$, given y(0)=4 and y'(0)=2

(b) Prove that 06

$J_4(x) = \left(\frac{48}{x^3} - \frac{8}{x}\right)J_1(x) - \left(\frac{24}{x^2} - 1\right)J_0(x)$

(c) i) In what direction is the directional derivative of 08
$\phi = x^2y^2z^4$ at (3,-1,-2) maximum. Find its magnitude.
ii) If $\bar{r} = x\hat{i} + y\hat{j} + z\hat{k}$
Prove that $\nabla r^n = nr^{n-2}\bar{r}$

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3. (a) Obtain the Fourier Series expansion for the function 06

$$f(x) = 1 + \frac{2x}{\pi}, -\pi \le x \le 0$$

$$= 1 - \frac{2x}{\pi}, 0 \le x \le \pi$$

(b) Find an analytic function f(z) =u+iv where. 06

$$u - v = \frac{x - y}{x^2 + 4xy + y^2}$$

(c) Find Laplace transform of 08

i) $\cosh t \int_0^t e^u \sinh u$

ii) $t\sqrt{1+\sin t}$

4. (a) Obtain the complex form of Fourier series for 06
$f(x) = e^{ax}$ in (-L,L)

(b) Prove that 06
$\int x^4 J_1(x)dx = x^4 J_4(x) - 2x^3 J_3(x) + c$

(c) Find 08

i) $L^{-1}\left[\frac{2s-1}{s^2+4s+29}\right]$

ii) $L^{-1}\left[\cot^{-1}\left(\frac{s+3}{2}\right)\right]$

5. (a) Find the Bi- linear Transformation which maps the points 06
1,i,-1 of z plane onto 0,1,∞ of w-plane

(b) Using Convolution theorem find 06

$$L^{-1}\left[\frac{s^2}{(s^2+4)^2}\right]$$

(c) Verify Green's Theorem for $\int_C \overline{F}.\overline{dr}$ where 08

$\overline{F} = (x^2 - y^2)\hat{i} + (x + y)\hat{j}$ and C is the triangle with vertices (0,0) ,(1,1) and (2,1)

6. (a) Obtain half range sine series for 06

$f(x) = x, 0 \le x \le 2$

$= 4 - x, 2 \le x \le 4$

(b) Prove that the transformation 06

$w = \frac{1}{z+i}$ transforms the real axis of the z-plane into a circle in the w-plane.

(c) i) Use Stoke's Theorem to evaluate $\int_C \overline{F}.\overline{dr}$ where 08

$\overline{F} = (x^2 - y^2)\hat{i} + 2xy\hat{j}$ and C is the rectangle in the plane z=0,bounded by x=0,y=0,x=a and y=b.

ii) Use Gauss Divergence Theorem to evaluate $\iint_S \overline{F}.\hat{n}ds$ where $\overline{F} = 4x\hat{i} + 3y\hat{j} - 2z\hat{k}$ and S is the surface bounded by x=0,y=0,z=0 and 2x+2y+z=4