Sem. III
ETRX / EXTC (CBSGS)
AM-3

18/05/2017

Q.P. Code : 13608

(3 Hours) [Total marks : 80

Note :-
1) Question number **1** is **compulsory.**
2) Attempt any **three** questions from the remaining **five** questions.
3) **Figures** to the **right** indicate **full** marks.

Q 1.A) Show that u = $y^3 - 3x^2y$ is a harmonic function. Also find its harmonic conjugate. **(5)**

B) Find half range Fourier sine series for f(x) = x^3, $-\pi < x < \pi$. **(5)**

C) If $\bar{F} = xye^{2z}i + xy^2coszj + x^2cosxyk$ find div$\bar{F}$ and curl$\bar{F}$ **(5)**

D) Evaluate $\int_0^\infty e^{-2t}sin^3t\ dt$. **(5)**

Q.2) A) Prove that $J_{-\frac{1}{2}}(x) = \sqrt{\frac{2}{\pi x}}\ cosx$ **(6)**

B) Find an analytic function f(z) whose imaginary part is $e^{-x}(ysiny + xcosy)$ **(6)**

C) Obtain Fourier series for f(x) = $1 + \frac{2x}{\pi}$ $-\pi \leq x \leq 0$

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

Hence deduce that $\frac{\pi^2}{8} = \frac{1}{1^2} + \frac{1}{3^2} + \frac{1}{5^2} + \ldots$ **(8)**

Q.3) A) Show that $\bar{F} = (2xyz^2)i + (x^2z^2 + zcosyz)j + (2x^2yz + ycosyz)k$, is a conservative field. Find its scalar potential φ such that $\bar{F} = \nabla\varphi$ and hence, find the work done by $\bar{F}$ in displacing a particle from A(0,0,1) to B(1,π/4,2) along straight line AB **(6)**

B) Show that the set of functions $f_1(x) = 1, f_2(x) = x$ are orthogonal over (-1, 1). Determine the constants a and b such that the function $f_3(x) = -1 + ax + bx^2$ is orthogonal to both f_1 and f_2 on that interval **(6)**

TURN OVER

C) Find (i) $L^{-1}\left\{log\left[\frac{s^2+a^2}{\sqrt{s+b}}\right]\right\}$

(ii) $L\{(e^{-t}cost.H(t-\pi)\}$ **(8)**

Q.4) A) Prove that $\int J_5(x)\,dx = -J_4(x) - \frac{4}{x}J_3(x) - \frac{8}{x^2}J_2(x)$ **(6)**

B) Find inverse Laplace of $\frac{s}{(s^2-a^2)^2}$ using Convolution theorem. **(6)**

C) Expand $f(x) = \frac{3x^2-6x\pi+2\pi^2}{12}$ in the interval $0 \le x \le 2\pi$ as a Fourier series.

Hence, deduce that $\frac{\pi^2}{6} = \frac{1}{1^2} + \frac{1}{2^2} + \frac{1}{3^2} + \ldots$ **(8)**

Q.5) A) Using Gauss Divergence theorem, prove that $\iint_s (y^2z^2i + z^2x^2j + z^2y^2k).\bar{N}ds = \frac{\pi}{12}$

where S is the part of the sphere $x^2 + y^2 + z^2 = 1$ and above the xy-plane. **(6)**

B) Prove that $J_3(x) + 3J_0(x) + 4J_0'''(x) = 0$ **(6)**

C) Solve $(D^3-2D^2+5D)y = 0$, with y(0)= 0, y'(0)=0 and y''(0)= 1, **(8)**

Q.6) A) Evaluate by Green's theorem for $\int_c(\frac{1}{y}\,dx + \frac{1}{x}dy)$ where C is the

the boundary of the region define by x = 1, x = 4, y = 1 and $y = \sqrt{x}$ **(6)**

B) Find the bilinear transformation which maps the points z = 1, i, -1

onto points w = i, 0 –i **(6)**

C) Find Fourier cosine integral representation for $f(x) = e^{-ax}, x > 0$

Hence, show that $\int_0^\infty \frac{cos\omega s}{1+\omega^2}d\omega = \frac{\pi}{2}e^{-x}$, $x \ge 0$ **(8)**

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ETRX III Electronics devices 12/5/17

CBGS

Q.P. Code :10591

[Time: 3 Hours] **[Marks:80]**

Please check whether you have got the right question paper.

N.B:
1. **Question -1 is compulsory,**
2. **Solve any THREE from remaining questions.**
3. Assume suitable if it is required.

1 a) How Zener diode is different than normal diode? (5)
b) Explain nonlinear effects in MOSFET? (5)
c) Draw and explain Ebers. moll model of BJT (5)
d) Compare BJT and IGBT (5)

2 a) Draw the graph of built is potential Vbi for a symmetrical si diode (Na = Nd) at T = 300°k. over the range $10^{14} \leq Na \leq 10^{19}$ cm^{-3}. (10)
b) Explain working of BJT considering all possible modes of operation. (10)

3 a) Derive the equation of threshold Voltage V Th of n channel Enhancement MOSFET (10)
b) Neatly sketch all FET characteristics. Explain how various parameters can be determined from the characteristics. State drain current equation of FET. (10)

4 a) Sketch and explain Tunnel diode characteristics. Explain applications of this diode (10)
b) Explain construction, working and characteristics of D – MOSFET. (10)

5 a) Explain how optical device are classified? Explain any one photodetector in detail. (10)
b) Draw and explain construction and characteristics of UJT. State its applications. (10)

6 Write notes on any TWO of the following. (20)
a) HBT
b) Solar Cell.
c) SCR
d) Diac and Triac

Sem III Etrx (CBGS) 24/05/17

T1523 / T1492 DIGITAL CIRCUITS AND DESIGN

Q.P. Code :10402

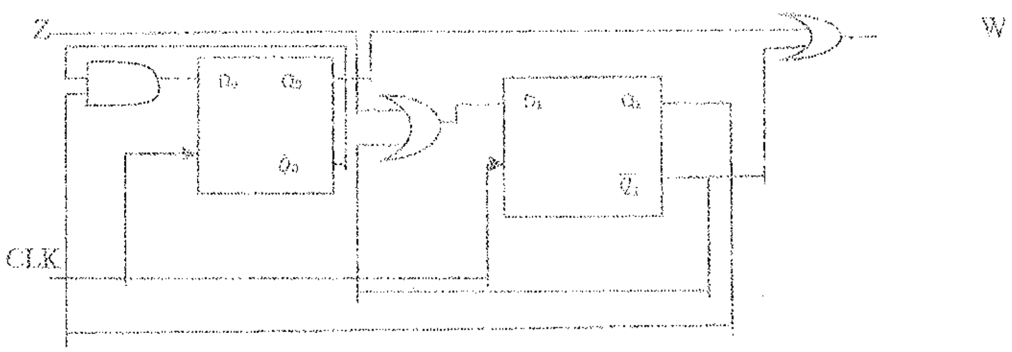
[Time: 3 Hours] [Marks:80]

Please check whether you have got the right question paper.

N.B: 1. Question No.1 is Compulsory
2. Solve any three from the remaining five questions.
3. Draw neat logic diagram and assume suitable data wherever necessary.

Q.1 a. Two inputs TTL NAND gate 05
b. Explain ring counter 05
c. Draw truth table and logic diagram of Full Subtractor using half Subtractors and gates 05
d. Explain the characteristics parameters of logic families 05

Q.2 a. Analyze the clocked synchronous machine given below. Write excitation equations, excitation/transition table and state/ output table (Use state names A-D for Q1-Q2=00-11) 10



b. Design 1 digit BCD adder using IC 7483 and perform $(1010)_{BCD}+(1100)_{BCD}$ 10

Q.3 a. Design a mealy sequence detector to detect----0100---- using D flip-Flops and logic gates 10
b. Design a circuit with optimum utilization of PLA to implement the following functions 10
$P=\Sigma m\ (1,3,8,10,10,15)$
$Q=\Sigma m(0,1,5,7,9,12,14)$
$R=\Sigma m(0,2,5,8,9,11)$

Q.4 a. Implement following function using 4:1 MUX and NAND gates 10
$F(A,B,C,D)=\Sigma m(1,2,6,7,8,10,13,14)$
b. Explain IC 74194 working in detail with applications 10

Q.5 a. Use K-map to reduce following function and then implement it by NOR gates. 10
$F=\pi M(0,1,4,7,3,11,12,14)+d(2,5,6)$
b. Eliminate redundent states and draw the reduced state diagram 10

Present state	Next State X=0	Next State X=1	Output Y
A	B	C	1
B	D	C	0
C	F	G	0
D	E	B	1
E	D	C	1
F	C	E	0
G	F	G	0

Q.P. Code :10402

Q.6 Write short notes on any three 20

1. Master slave JK Flip Flop
2. Write a VHDL code for full adder
3. Stuck at '0' and '1' faults
4. CPLD and FPGA architecture block diagram

06/06/17

Sem III Etrx (CBGS)

Q.P. Code :10761

[Time: 3 Hours] **[Marks:80]**

Please check whether you have got the right question paper.

N.B:
1. Question no.1 is compulsory.
2. From Q2 to Q6 solve any three.

Q1. Attempt **any four**. **20**

a. Draw Maxwell Bridge and list applications.
b. List different thermocouples and their typical range.
c. Short note on Q meter.
d. Define transfer. List different types of transducers.
e. Draw a neat and labeled diagram for LVDT.

Q2. a. Explain FET electronic voltmeter with neat diagram. **20**
b. Explain single channel and multichannel data acquisition system with neat labeled separate block diagrams.

Q3. a. Explain following approaches of temperature measurements: RTD, Thermisters, and Thermocouples. **20**
b. Draw block diagram of CRO. Also draw block diagram of DSO. No explanation needed. List applications of DSO.

Q4. a. Explain in detail Dead Weight Testing with neat labeled diagram. **20**
b. Draw and explain Schering bridge.

Q5. a. Explain frequency and phase measurement with oscilloscope. **20**
b. Explain in detail types of errors in measurement system.

Q6 Short note on **20**

a. Strain Gauges
b. Electromagnetic flow meter
c. Rota meter
d. Lissajous Figures

30/05/17

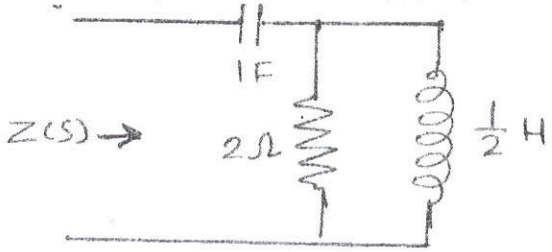
Q. P. Code : 13675

REVISED COURSE

(03 Hours) **Total Marks: 80**

N.B.: 1) Question number **one** is compulsory.
2) Attempt any **three** questions out of remaining **five** 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) Find poles and zeros of the impedance of the following network. 5)

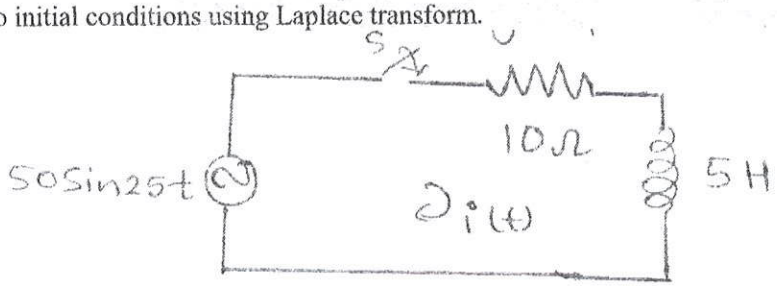


b) What are standing waves? Define reflection coefficient and VSWR of a transmission line. 5)

c) Explain various types of filters in circuit theory. 5)

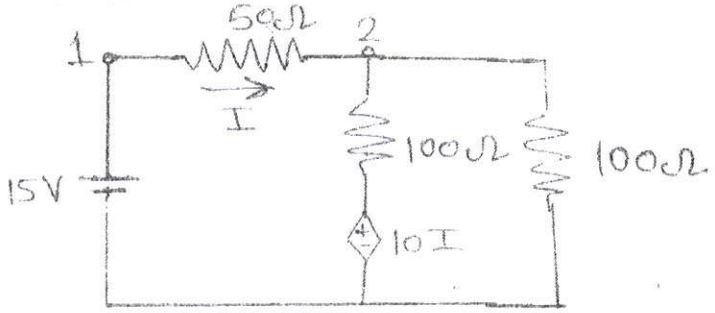
d) Explain the graphical representation of series resonance circuit. 5)

2. a) For the network shown determine the current i (t) when the switch s is closed at t=0 with zero initial conditions using Laplace transform. 10)



b) The impedance parameters of two port network are $Z_{11} = 6\Omega$, $Z_{22} = 4\ \Omega$, $Z_{12} = Z_{21} = 3\ \Omega$. Compute the Y parameters. 5)

c) Find the voltage at node 2 for the figure shown. 5)



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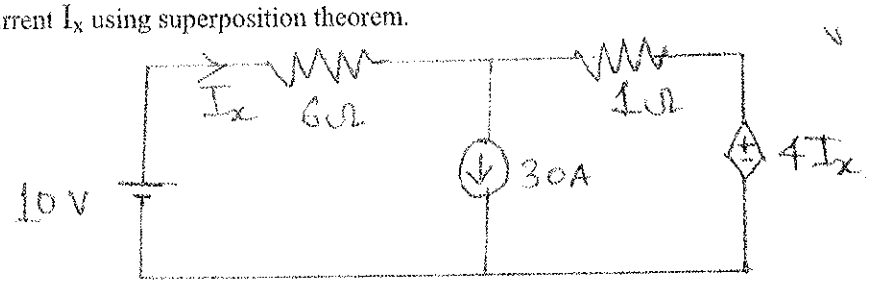
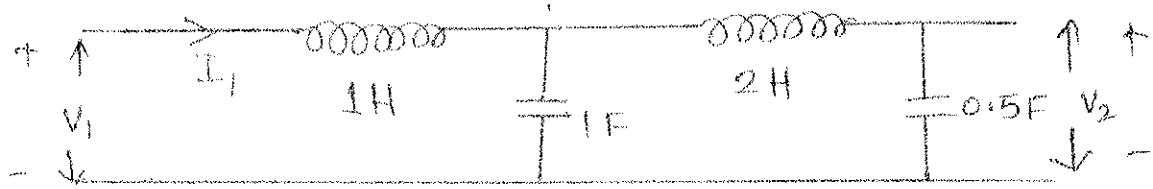
3. a) Design a short circuit shunt stub match for Z_L=150 -200j (Ω) for a line of Z_0=100 Ω and Frequency at f = 20 MHz using Smith chart. 10)

b) Find the current I_x using superposition theorem. 5)



c) Determine $\frac{V_1}{I_1}$ and $\frac{V_2}{I_1}$ for the given network. 5)



4. a) Test whether following functions are a positive real function . 10)

i) $F1(s) = \frac{s^2+1}{s^3+4s}$

ii) $F2(s) = \frac{2s^2+2s^2+3s+2}{s^2+1}$

b) Use continued fraction expansion method to check whether the given polynomials is Hurwitz or not. 5)

$$P(s) = s^7+2s^6+2s^5+s^4+4s^3+8s^2+8s+4$$

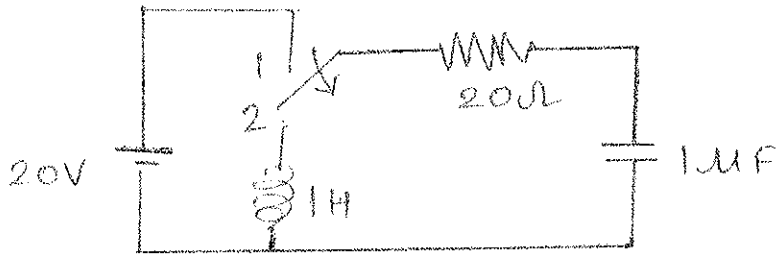
c) Realize Caur first form of the following L C impedance function. 5)

$$Z(s) = \frac{10s4+12s^2+2}{2s3+2s}$$

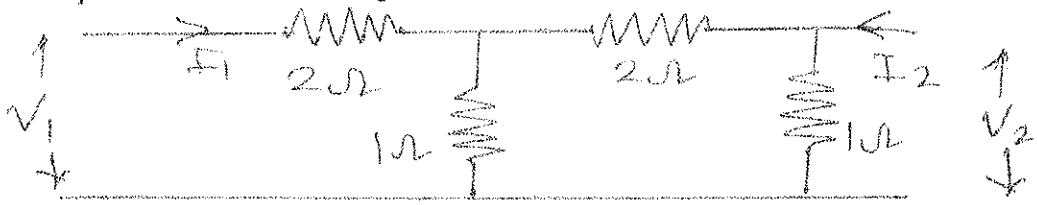
Q. P. Code : 13675

5. a) In the network shown, the switch is changed from position 1 to position 2 at t=0. 10)

Steady state condition having reached before switching. Find the value of i, $\frac{di}{dt}$ and $\frac{d^2i}{dt^2}$ at t=0 $^+$



b) Determine h parameters of the network given. 5)



c) The constants of a transmission line are R= 6 Ω /K.m, L=2.2 mH /km, G=0.25 x 10^{-6} mho /km, C = 0.005 μF/km. Determine the characteristic impedance and propagation constant of the Line at a frequency of 1 k Hz. 5)

6. a) Design an m- derived T- section high pass filter with a cut off frequency of 2KHz . 5)
Design impedance of 700Ω and m =0.6.

b) What are scattering parameters. State their properties. 5)

c) Explain characteristics and applications of Smith chart. 5)

d) List the types of damping in a series R-L-C circuit and mention the condition for each damping. 5)