SE | ETRX | IV (Rev) 26 | 11 | 12

A. Engg. maths

ws Sept, 2012 (b) 28

Con. 7907–12. KR–7025

(3 Hours) [Total Marks : 100

N. B. : (1) Question No. 1 is **compulsory**.
(2) Attempt any **four** questions from the remaining **six** questions.
(3) **Figures** to the **right** indicate **full** marks.

1. (a) The length of time (in minutes) a lady speaks on telephone is found to be a random variable with probability density function : 5

$$f(x) = \begin{cases} Ae^{-x/5} & \text{for } x \geq 0 \\ 0 & \text{elsewhere} \end{cases}$$

Find 'A' and the probability :
(i) that she speaks more than 10 minutes
(ii) that she speaks less than 5 minutes.

(b) If $f(x) = 2x^2 + 3$; $g(x) = 4x + 3$ where $f : R \to R$ and $g : R \to R$ 5
(i) Test whether the inverse function exists for both f and g.
(ii) Find fog.

(c) Prove that the eigen values of an orthogonal matrix are ± 1. 5

(d) Find Taylor's series expansion of $f(z) = \frac{1}{(z)(z-1)}$ about z = 2. 5

Find radius of convergence.

2. (a) Fit a Binomial Distribution to the following data and test the goodness of fit : 7

x	0	1	2	3	4	5	6
f	5	18	28	12	7	6	4

(b) Find the rank and signature of the real quadratic form : 7

$2x_1^2 + x_2^2 - 3x_3^2 - 8x_2x_3 - 4x_2x_3 - 12x_1x_2$ by expressing in cononical form.

(c) Determine the nature of poles of the following function. Also find the residue at each pole. 6

$$f(z) = \frac{\sin \pi z}{(z-1)^2(z-2)}.$$

3. (a) Verify Cayley Hamilton Theorem and find A^{-1} for $A = \begin{bmatrix} 1 & 4 \\ 2 & 3 \end{bmatrix}$. Hence find 7

$A^5 - 4A^4 - 7A^3 + 11A^2 - A - 10I$ in term of 'A'.

(b) Let L = {1, 2, 3, 5, 30} and the relation 'is divisible by'. 7
Test whether : (i) L is a distributive Lattice (ii) L is a complemented Lattice.

[TURN OVER

(c) Two independant random samples of size '8' and '10' have means 950 and 1000. The standard deviation of two populations are 80 and 100. Test the hypothesis that the two population have same mean. 6

4. (a) The height of 1000 soldiers in a regiment are distributed normally with mean 172 cms and standard deviation = 5 cm. How many soldiers have height > 180 cms. 7

(b) Prove that (R, t, ·) where R = {0, 1, 2, 3, 4}, is a ring under 'addition modulo 5' and 'multiplication modulo 5'. Is it an integral domain. Give reasons. 7

(c) If $A = \begin{bmatrix} 3/2 & 1/2 \\ 1/2 & 3/2 \end{bmatrix}$; determine A^{10} and 4^A. 6

5. (a) Intelligence tests of two groups of boys and girls obtained from two normal population having the same standard deviation gave the following data. 7

	Mean	Standard Deviation	No.
Girls	84	10	121
Boys	81	12	81

Is the difference between means significant at 5% LOS.

(b) Evaluate : 7

$\oint_C \tan z \, dz$ where C is

(i) the circle $|z| = 2$

(ii) the circle $|z| = 1$

(c) Let R be the relation defined on Z by xRy iff $|x - y|$ in divisible by 7. 6

(i) Show R in an equivalence relation

(ii) Find the equivalence classes.

6. (a) Which probablity distribution in appropriate to describe the situation where 100 misprints are randomly distributed over 100 pages of a book. For this distribution, find the prob that a page selected at random will contain at least 3 misprints. 7

(b) Is the following matrix diagnolizable ? 7

$A = \begin{bmatrix} 1 & -2 & 0 \\ 1 & 2 & 2 \\ 1 & 2 & 3 \end{bmatrix}$. Justify your answer.

(c) A box contains 2 red and 3 black balls. Three balls are drawn at random. Let 'X' denote total no. of red balls drawn from this box. 6

Find : (i) The M. G. F. of X (ii) Hence find E(X) and Var(X).

7. (a) State Central Limit Theorem. Use the theorem to estimate 7

$P(180 < S_n < 250)$ where $S_n = \sum_{i=1}^{n} X_i$ and $n = 70$.

Note : Assume $X_1, X_2, \ldots\ldots, X_n$ are Poisson variates.

(b) Expand $f(z) = \dfrac{1}{z(z+1)(z+2)}$ in Laurents series when 7

(i) $|z| < 1$ (ii) $1 < |z| < 2$ (iii) $|z| > 2$.

(c) For a normal distribution 5% of students get below 60 marks and 40% students obtain between 60 and 65 marks. 6
Find the mean and variance of Normal distribution.

Sem IV E TRX

DSD II

01/12/12

P4-Exam-Oct. 2012-ConNo.-30

Con. 9710-12.

KR-7127

(3 Hours) **[Total Marks : 100**

N.B. : Question No. **1** is **compulsory** and solve any **four** questions from the remaining.

Q1. A. Explain Moore and Mealy type of sequential circuits. 05
B. Write a VHDL code for one bit comparator. 05
C. Draw the circuit for 8x1 diode ROM using two dimensional decoding approach. 05
D. Draw a mealy state diagram for NOR-NOR latch. 05

Q2. A. Design MOD 160 counter using IC's 7490 and few gates. 10
B. Write VHDL code for a four bit bidirectional shift register. 10

3. A. Write VHDL code for 3:8 decoder which functions like IC 74138. 10
B. Explain product term allocator and macrocell of XC 9500. 10

4. A. Write a VHDL code for four bit twisted ring counter using structural modeling. 10
B. Eliminate redundant states if any for the state table given below using Partitioned method. Draw the minimized state diagram. 10

PS	NS		o/p Y
	X=0	X=1	
A	B	C	1
B	D	F	1
C	F	E	0
D	B	G	1
E	F	C	0
F	E	D	0
G	F	G	0

5. A. Information bits are encoded on a single line x so as to synchronize with a clock. Bits are encoded so that three or more consecutive 1's or three or more consecutive 0's should never appear on line x. An error indicating sequential circuit is to be designed to indicate an error by generating 1 on the output line Z coinciding with the third bit of every sequence of three zeros or three ones. Draw state diagram for the error detector. Perform state reduction and design the above circuit using D Flip-Flops using minimal risk approach. 16
B. Wirte VHDL code for 2:1 MUX using conditional signal assignment statement. 04

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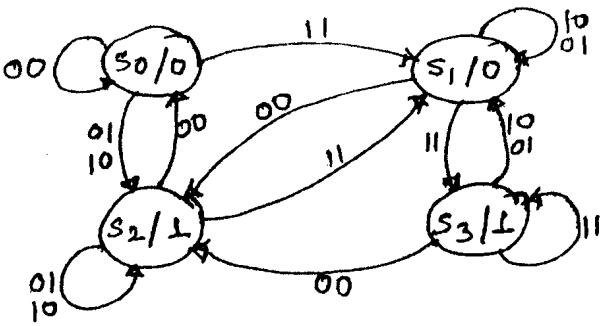
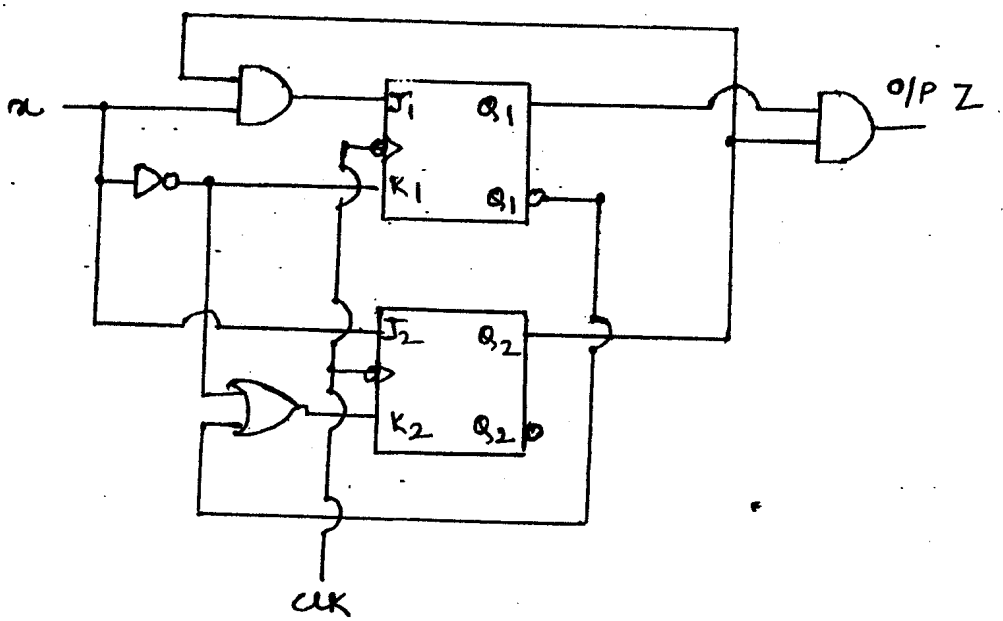
Q6. A. Write VHDL code for the state diagram given below. 10



B. Analyze the sequential circuit given below. Write excitation equations, transition table and state diagram. 10



Q7. A. Design Full adder using PLA. 10

B. Explain input-output block architecture of 4000 FPGA family 10

7/12/12

S.E. ETRX Sem IV (Rev) Dec-12

Subj:- ECAD

7-p3-d-upq-SH KL12 B

KR–7241

Con. 7826–12.

(3 Hours) [Total Marks : 100

N.B. :(1) Question No. 1 is **compulsory**.
(2) Solve any **four** questions from Question Nos. 2 to 7.
(3) Assume **suitable** data wherever **necessary**.
(4) Figures to the **right** indicate **full** marks.

1. Solve any **four** from the following :— **20**
   (a) Explain the steps to find lower cutoff frequency of the self biased JFET amplifier
   (b) Explain crossover distortion in class B power amplifier and how it can be over come
   (c) With suitable example, state how Barkhausen criteria can be applied to oscillator circuit.
   (d) What is the need of constant current source in differential amplifier ? Explain one of the circuit ?
   (e) What are the characteristics of -ve feedback amplifier ?

2. Design two stage CS Amplifier for the given specifications $A_V > 150$, $F_L = 20Hz$, $V_0 = 2{\cdot}5V$, use self biased circuit with $Idq = \frac{IDS}{4}$ use suitable JFET transistor. **20**

3. (a) Explain the concept of RC phase shift oscillator, draw its circuit diagram and derive equation of frequency. **10**
   (b) Explain High frequency response of BJT amplifier. **10**

4. (a) Design class B power amplifier to give output power of 20 W to 8 Ω load. **10**
   (b) Give classification of oscillators, explain one of the High frequency oscillator. **10**

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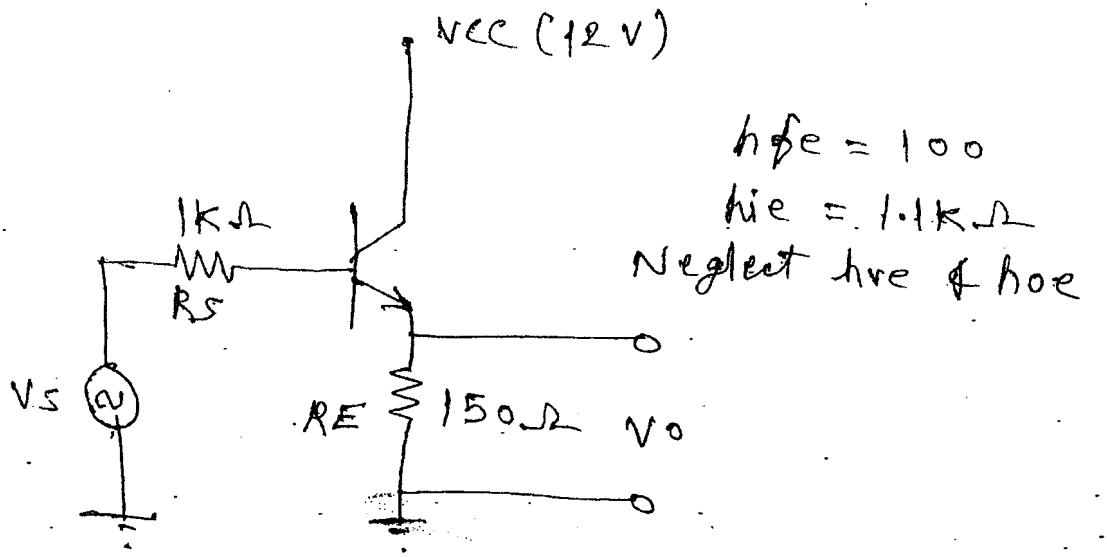
5. (a) For the given circuit, identify type of feedback and find β, A_v, A_{vf}, R_{if} and R_{of}. **10**



(b) Explain class B push-pull amplifier with necessary waveforms. **10**

6. (a) Derive equation of voltage gain, input resistance and output resistance for a Dual input, Balanced output differential amplifier. **10**

(b) Give topologies of different negative feedback amplifiers. **10**

7. Write short notes on any **three** :— **20**

(a) Crystal Oscillator

(b) CASCODE Amplifier

(c) Difference between Direct coupling and RC coupling

(d) Nyquist Stability Criteria.

Transistor type	P_{dmax} @ 25°C Watts	I_{cmax} @ 25°C Amps.	$V_{CE(sat)}$ volts d.c.	V_{cbo} volts d.c.	V_{ceo} (Sus) volts d.c.	V_{cer} (Sus) volts d.c.	V_{cex} volts d.c.	V_{ebo} volts d.c.	T_j max. °C	D.C. current gain min	typ.	max.	Small Signal min.	typ.	h_{fe} max.	V_{BE} max.	θ_{ja} °C/W	Derate above 25°C W/°C
2N 3055	115.5	15.0	1.1	100	60	70	90	7	200	20	50	70	15	50	120	1.8	1.5	0.7
ECN 055	50.0	5.0	1.0	60	50	55	60	5	200	25	50	100	25	75	125	1.5	3.5	0.4
ECN 149	30.0	4.0	1.0	50	40	–	–	8	150	30	50	110	33	60	115	1.2	4.0	0.3
ECN 100	5.0	0.7	0.6	70	60	65	–	6	200	50	90	280	50	90	280	0.9	35	0.05
BC 147A	0.25	0.1	0.25	50	45	50	–	6	125	115	180	220	125	220	260	0.9	–	–
2N 525 (PNP)	0.225	0.5	0.25	85	30	–	–	–	100	35	–	65	–	45	–	–	–	–
BC 147 B	0.25	0.1	0.25	50	45	50	–	6	125	200	290	450	240	330	500	0.9	–	–

Transistor type	h_{ie}	h_{oe}	h_{re}	θ_{ja}
BC 147 A	2.7kΩ	18μmho	1.5×10^{-4}	0.4°C/mW
2N 525 (PNP)	1.4kΩ	25μmho	3.2×10^{-4}	—
BC 147B	4.5kΩ	30μmho	2×10^{-4}	0.4°C/mW
ECN 100	50Ω	–	—	—
ECN 149	15Ω	–	—	—
ECN 055	12Ω	–	—	—
2N 3055	6 Ω	–	—	—

BFW 11-JFET MUTUAL CHARACTERISTICS

$-V_{gs}$ volts	0.0	0.2	0.4	0.6	0.8	1.0	1.2	1.6	2.0	2.4	2.5	3.0	3.5	4.0
I_{ds} max. mA	10	9.0	8.3	7.6	6.8	6.1	5.4	4.2	3.1	2.2	2.0	1.1	0.5	0.0
I_{ds} typ. mA	7.0	6.0	5.4	4.6	4.0	3.3	2.7	1.7	0.8	0.2	0.0	0.0	0.0	0.0
I_{ds} min.mA	4.0	3.0	2.2	1.6	1.0	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

N-Channel JFET

Type	$V_{DS\,max.}$ Volts	$V_{DG\,max.}$ Volts	$V_{GS\,max.}$ Volts	$P_{d\,max.}$ @ 25°C	$T_{j\,max.}$	I_{DSS}	g_{os} (typical)	$-V_p$ Volts	r_s	Derate above 25°C	θ_{ja}
2N3822	50	50	50	300 mW	175°C	2 mA	3000 μ mho	6	50 KΩ	2 mW/°C	0.59°C/mW
BFW 11 (typical)	30	30	30	300 mW	200°C	7 mA	5800 μ mho	2.5	50 KΩ	—	0.59°C/mW

SE | E-TRX | IV (R.) 12|12|12

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92 : 12.C.nd.mk

Con. 7803-12. **KR-7352**

(3 Hours) **[Total Marks : 100**

N.B. (1) Question No. **1** is **compulsory**.
(2) Answer any **four** questions out of remaining **six** questions.
(3) **Figures** to the **right** indicate full **marks.**

1. Answer any **four** of the following :— **20**
   (a) Compare and contrast between AM and FM.
   (b) In a broadcast superheterodyne receiver having no RF amplifier, the loaded Q of the antenna coupling circuit is 150. If the IF is 455 kHz, calculate the image frequency and its rejection ratio at 1400 kHz.
   (c) Explain noise triangle in FM.
   (d) Explain the following terms :—
      (i) Signal-to-noise ratio
      (ii) Noise figure
      (iii) Noise factor
      (iv) Equivalent noise temperature.
   (e) Explain frequency division multiplexing.

2. (a) When the modulation percentage is 75 an AM transmitter produces 10 kW. How much of this is carrier power ? What would be the percentage power saving if the carrier and one of its sidebands were suppressed before transmission took place ? **6**
   (b) Explain VSB transmission. **8**
   (c) Explain the phase shift method for SSB generation giving voltage equations at each stage. **6**

3. (a) Compare FM and PM. **4**
   (b) Explain Armstrong method of FM generation with the help of a neat block diagram and phasor diagrams. **10**
   (c) In an FM system, when the audio frequency is 1000 Hz and AF voltage is 2 V, the frequency deviation is 4·8 kHz. If the AF voltage is raised to 10 V while the AF is dropped to 500 Hz, find the modulation index in each case. **6**

4. (a) With the help of a neat block diagram and waveforms explain superheterodyne AM radio receiver. **10**
   (b) Explain the working of a phase descrimininator FM detector with the help of a neat circuit diagram and phasor diagrams. **10**

5. (a) State sampling theorem. Explain flat-top sampling. Draw its spectrum and explain aperture effect. **10**
   (b) Explain generation and demodulation of PAM, PPM and PWM with waveforms. **10**

[TURN OVER

6. (a) Explain delta modulation with a neat block diagram and waveforms. Also explain slope overload error and granular noise. Suggest the remedy for both. **10**

   (b) Draw the following line codes for 11010 :— **5**

   (i) Unipolar NRZ
   (ii) Polar NRZ
   (iii) Polar RZ
   (iv) Unipolar RZ
   (v) AMI.

   (c) Draw and explain the block diagrams of PCM transmitter and receiver. **5**

7. Write short notes on :— **20**

   (a) Companding in PCM
   (b) AGC in radio receiver
   (c) Choice of IF in radio receivers
   (d) Practical diode detector.

SE sem IV (ETRX) (Lib copy)

EEMIM 21/12/2012

41 : 2nd half-12-(f) JP

Con. 7886-12. **KR–7580**

(3 Hours) [**Total Marks : 100**

N.B.: (1) Question No. **1** is **compulsory** and solve any **four** questions out of remaining **six** questions.
(2) Assume suitable data if **necessary** and mention that assumption while solving that question.
(3) **Figures** to the **right** indicate **full** marks.

1. Answer any **four** :— **20**
   (a) Define sensitivity of an analog instrument. For PMMC instrument with FSD = 100 mA find sensitivity.
   (b) What is Meggar ? Explain its working.
   (c) For ADC, define resolution. Give suitable example.
   (d) Explain the working principle of DC Motor.
   (e) Explain the function of delay line in oscilloscope. What are the types of delay lines ?

2. (a) What is intensity modulation ? For what purpose it is used ? Can phase and frequency be measured using intensity modulation ? **10**
   (b) What is Q meter ? Explain any one of the types of Q meter with the help of circuit diagram. **10**

3. (a) Draw and explain Kelvin's Bridge. **10**
   (b) Explain the operating principle of 3–phase induction motor. **10**

4. (a) Draw and explain the block diagram of digital storage oscilloscope. **10**
   (b) Explain R–2 R ladder technique of digital to analoge converter. **10**

5. (a) Draw and explain any one of the types of electronic voltmeter. State its two advantages over analog voltmeter. **10**
   (b) Explain digital phase meter using flip flop. Draw relevant waveforms at each point in a block diagram to illustrate. **10**

6. (a) Explain Schering bridge for measurement of capacitance. Derive the equation of unknown capacitance at balanced condition. **10**
   (b) What is energy meter ? Draw its constructional view and explain. **10**

7. Write short notes on (any **two**) :— **20**
   (a) Variable reluctance stepper motor.
   (b) A. F. signal generator
   (c) Digital frequency meter.