S.E. ETRx Sem IV (K.T) (old) 21/11/14.
AE Maths

(OLD COURSE) **QP Code :14309**

(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 **right** indicate **full** marks.
(4) Use of statistical table is **allowed.**

1. (a) Find the sum of the residues of $f(z) = \frac{\sin z}{z \cos z}$ at its pole inside the circle $|z| = 2$. **5**

(b) Find the eigen values of $A^3 - 3A^2 + A$ where $A = \begin{bmatrix} 4 & 6 & 6 \\ 1 & 3 & 2 \\ -1 & -4 & -3 \end{bmatrix}$. **5**

(c) If the mean of the following distribution is 16 find m, n and variance. **5**

X	:	8	12	16	20	24
P (X= x)	:	1/8	m	n	1/4	1/12

(d) Prove that the set A = {0, 1, 2, 3, 4, 5} is a finite Abelian group under addition modulo 6. **5**

2. (a) If X is the random variable showing the number of boys in a family with 4 children construct a table showing the probability distribution of X. **6**

(b) Obtain the expansion of $f(z) = \frac{z+1}{(z-3)(z-4)}$ about $z = 2$. **6**

(c) Is the following matrix diagonalizable ? Justify your answer. **8**

$$\begin{bmatrix} 1 & -2 & 0 \\ 1 & 2 & 2 \\ 1 & 2 & 3 \end{bmatrix}.$$

3. (a) A certain injection administered to 12 patients resulted in the following changes of blood pressure : **6**

5, 2, 8, –1, 3, 0, 6, –2, 1, 5, 0, 4

Can it be concluded that the injection will be in general accompanied by an increase in blood pressure ?

(b) Use Cayley–Hamilton theorem to find— 6

$$2A^5 - 3A^4 + A^2 - 4I \text{ where } A = \begin{bmatrix} 3 & 1 \\ -1 & 2 \end{bmatrix}$$

(c) Let A = { 1, 2, 3, 5, 6, 10, 15, 30 } and R be the relation 'is divisible by'. Obtain the relation matrix and draw the Hasse diagram. 3

4. (a) Of a large groups of men 5% are under 60 inches in height and 40% are between 60 and 65 inches in height. Assuming the distribution to be normal, find the mean and variance. 6

(b) Evaluate $\int_C \frac{z^2 + 4}{(z-2)(z+3i)}$ where C is $| z - 2 | = 2$. 6

(c) Two samples drawn from two different populations gave the following results. 8

	Size	Mean	S.D
Sample I	300	87	10
Sample II	250	84	8

Find 95% confidence limits for the difference between the population means.

5. (a) Fit a Poisson distribution to the following data. 6

X :	0	1	2	3	4	5	6	7	8
f :	56	156	132	92	37	22	4	0	1

(b) Test whether the following function is one to one, onto or both. 6

$f : Z \to Z,\ f(x) = x^2 + x + 1$

(c) If X denotes the outcome when a fair die is tossed, find Moment Generating function of X and hence, find the mean and variance of X. 8

6. (a) A relation R is defined on Z (the set of all integers) as aRb if a + b is divisible by 2. Is R an equivalence relation ? If so find its equivalence classes. **6**

(b) If $A = \begin{bmatrix} 1 & 2 & -2 \\ 0 & 2 & 1 \\ 0 & 0 & -1 \end{bmatrix}$ find A^{100} **6**

(c) A die was thrown 132 times and the following frequencies were observed. **8**

No. Obtained	:	1	2	3	4	5	6	Total
Frequency	:	15	20	25	15	29	28	132

Test the hypothesis that the die is unbiased.

7. (a) Using the residue theorem. **6**

evaluate $\int_0^{2\pi} \frac{d\theta}{1-2a\cos\theta+a^2}, |a|<1$

(b) Find the mean and variance of Binomial Distribution. **6**

(c) Prove that Z_5 is a ring under addition and multiplication modulo 5. **8**

S.E. ETRX Sem IV (old) 27/11/14.
DSD-II.

(OLD COURSE) **QP Code :14342**

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

N.B.

- Question no 1 is compulsory
- Solve any four from remaining six questions
- Figures on right indicate maximum marks

Q1 A) Explain different modeling types used in VHDL. (20)

B) Describe the working of 4x2 ROM with neat diagram.

C) Draw a 4 bit ring counter using D flipflop and its output waveforms with respect to clock signal.

D) Draw state diagram of sequence detector that detects sequence 1001 as Mealy overlapping machine.

Q 2 A) Design a synchronous counter to count in sequence, 2-3-5-1-0-2. Use suitable flipflops. (10)

Q2 B) Write VHDL code for 4 bit binary counter with clear,and load inputs. (10)

Q3 A) Reduce the following state table and draw the minimized state diagram. (10)

Present state	Next State/Output	
	Input X=0	Input X=1
A	C/0	B/0
B	D/0	B/0
C	C/0	B/0
D	C/0	E/0
E	F/1	B/0
F	C/0	E/0

Q3 B) Write VHDL code for full adder using half adder as a component. (10)

Q4 A) Analyze the following state machine. Write the next state equation, output equation,

State transition table, and draw state diagram. (10)

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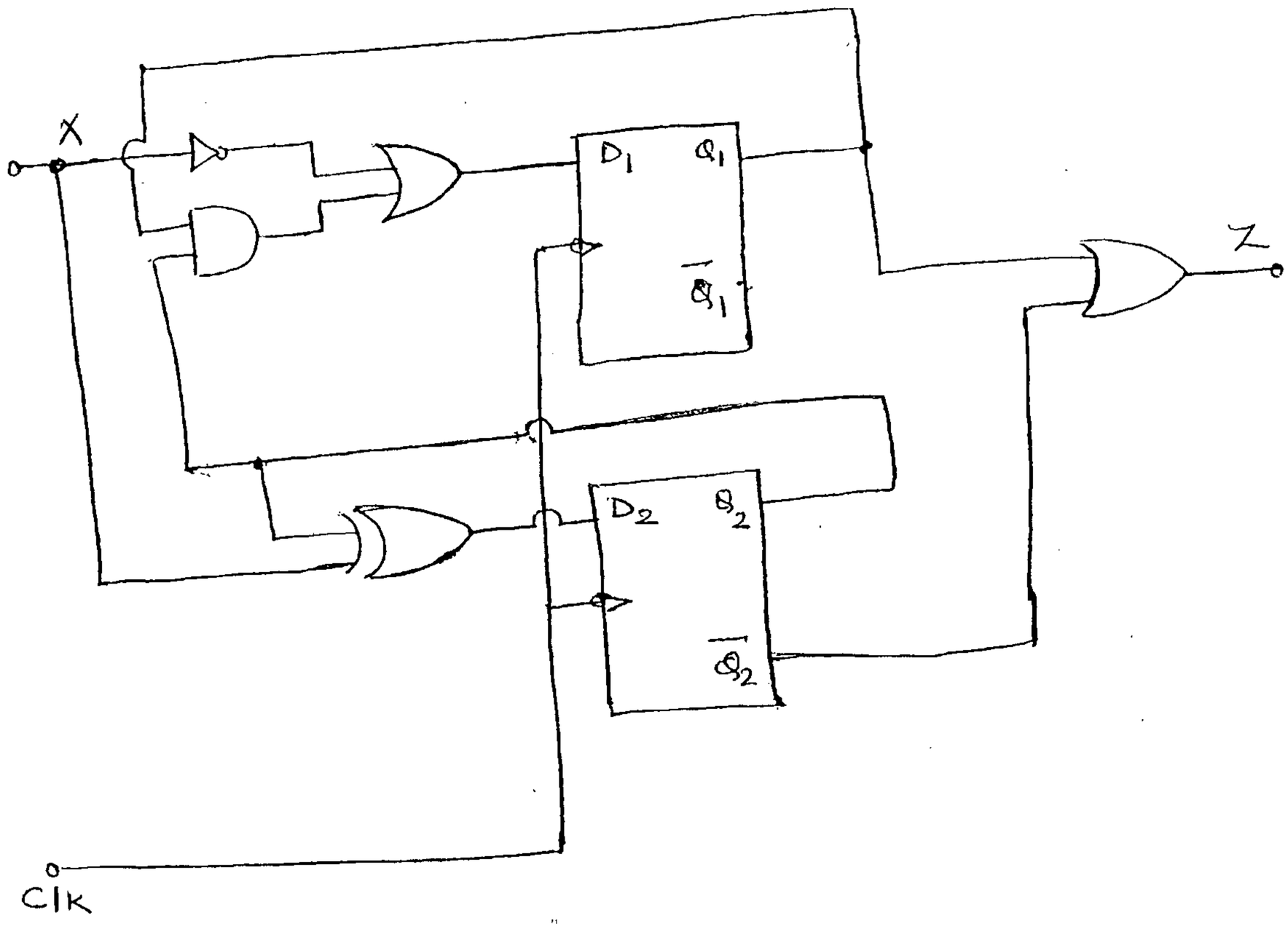
LM-Con.:8601-14.



Q4 B) Design Mealy type state machine that generates output z=1 if consecutive four 1s are received at its serial input port x. Else output z=0. (10)

Q5A) Explain universal shift register IC 74194 input output pins, its operation in different modes. Design a twisted ring counter using the same IC and write the binary sequence obtained from it. (10)

Q5 B) Draw and explain architecture of Xilinx CPLD 95xx family. (10)

Q6 A) Write VHDL code for 3:8 decoder with active low outputs. (10)

Q6B) Explain the operation of counter IC 7490. Design mod 100 counter using the same. (10)

Q7. Write short notes (Any 3) (20)

1. Xilinx XC 4000 FPGA family
2. Comparison of asynchronous and synchronous counters
3. Features of VHDL
4. Internal structure of DRAM

S.E. - EXTC
Sem IV (Old) . ECAD 3/12/14.

(OLD COURSE) **QP Code :14391**

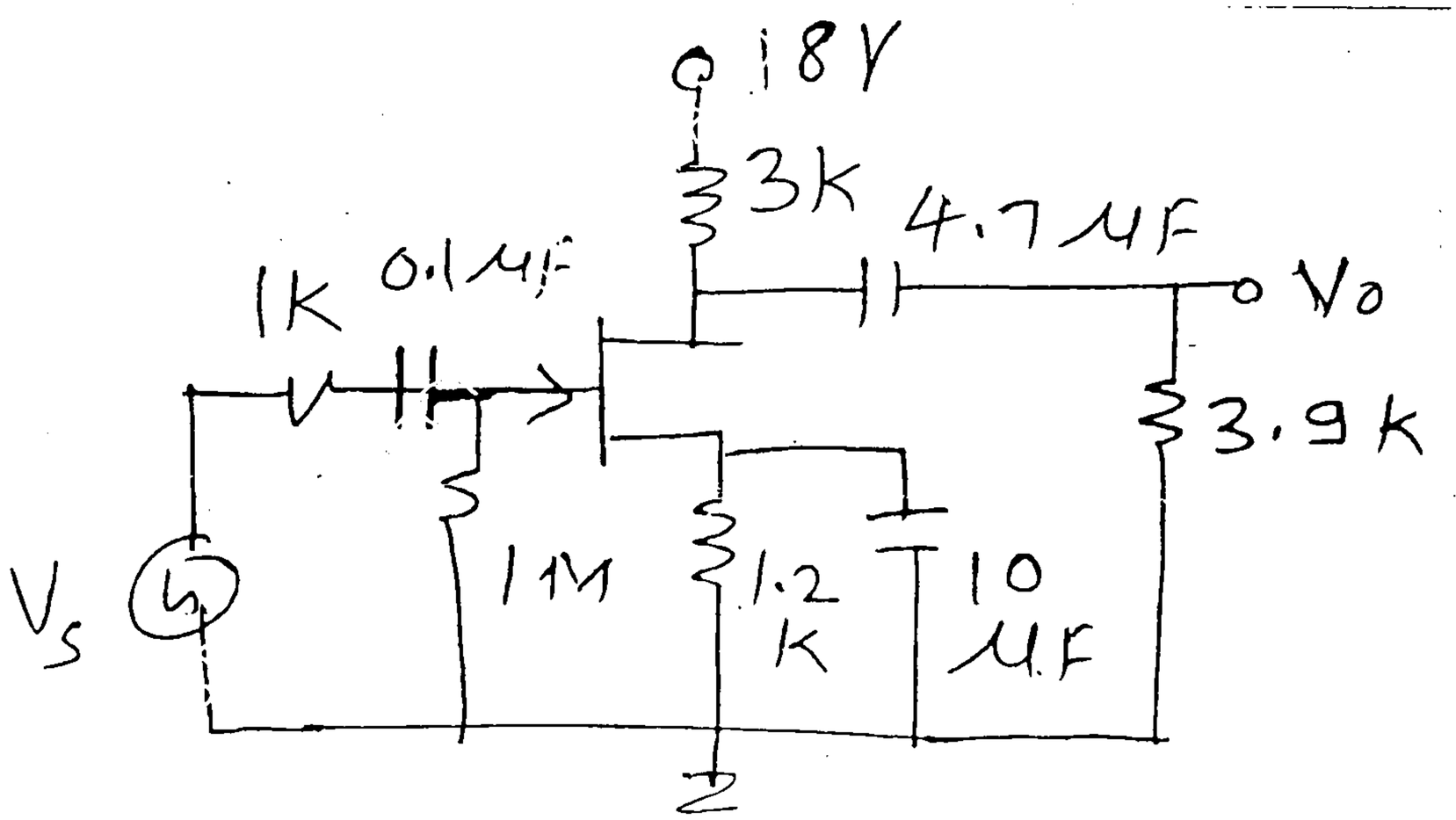
(3 Hours) **[Total Marks : 100**

N. B. : (1) Question No. **1** is **compulsory** and solve any **four** questions from the remaining questions.
(2) Assume suitable data if necessary.
(2) Figures to the **right** indicate **full** marks.

1. (a) Explain concept of open circuit and short circuit time constants related to amplifier's frequency response. **20**
(b) Explain steps in designing of RC phase shift oscillator.
(c) Explain the differences between complementary symmetry and transformer coupled class B amplifier.
(d) Draw the circuit diagram and explain the operation of differential amplifier with active load.

2. (a) Draw the circuit diagram of CE amplifier using BJT. Draw its high frequency equivalent circuit. Derive the expression of f_β and f_T. **10**
(b) Determine the lower cut off frequency for the amplifier shown below :– **10**

$I_{DSS} = 6$ mA
rd $= \infty$
$V_P = -6$v.

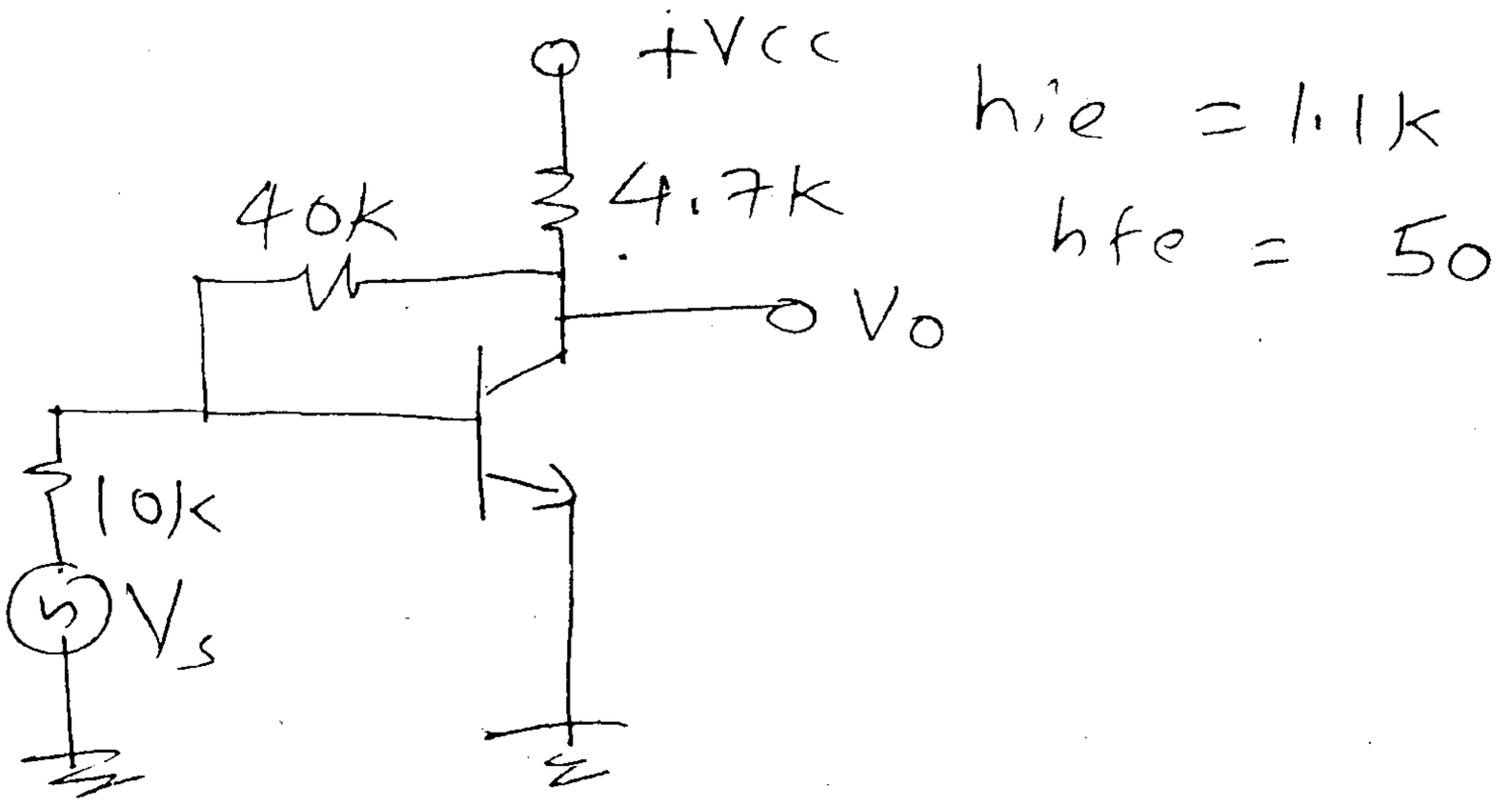


3. (a) Draw and explain wein bridge oscillater using BJT and derive the expression for its frequency. **10**
(b) Design colpitts oscillator using FET for f = 100 KHz. **10**

4. (a) Explain why distortion occours in power amplifier. Explain various types of distortion. **10**

[TURN OVER

5. (a) For the following feedback amplifier determine A, β, Av, Zif, Zof and Avf, Identify the type of feedback. 10



(b) Consider a three pole feedback amplifier with loop gain given as 10

$$T(f) = \frac{\beta(100)}{\left(1+i\left(\frac{f}{10^5}\right)\right)^3}$$

In this case all the three poles occur at same frequency. Determine stability for $\beta = 0.2$ and $\beta = 0.02$.

6. Design two stage CS amplifier for AV ≥ 100, Zin = 1M Ω, Vo = 2.5 V and f_L = 20 Hz. 20

7. Write notes on any **two** of the following :– 20
   (a) MOSFET diffeential amplifier
   (b) Applications of power amplifier
   (c) Heat sinks
   (d) Comparison of different types of negative feedback amplifier.

QP Code :14391

Transistor type	P_{device} @ 25°C Watts	I_{cmax} @ 25°C Amps.	$V_{CE(sat)}$ volts d.c.	V_{cao} volts d.c.	V_{ceo} (Sus) volts d.c.	V_{cer} (Sus) volts d.c.	V_{cex} volts d.c.	V_{aso} volts d.c.	T_j max. °C	D.C. current gain min	typ.	max.	Small Signal min.	typ.	h_{fe} max.	V_{ae} 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	–	8	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	500Ω	–	—	—
ECN 149	150Ω	–	—	—
ECN 055	120Ω	–	—	—
2N 3055	6Ω	–	—	—

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_{os} 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_{os} 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_{os} 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_{fs} (typical)	$-V_p$ Volts	r_d	Derate above 25°C	θ_{ja}
2N3822	50	50	50	300 mW	175°C	2 mA	3000 μ mho	8	50 KΩ	2 mW/°C	0.5°C/mW
BFW 11 (typical)	30	30	30	300 mW	200°C	7 mA	5800 μ mho	2.5	50 KΩ	—	0.58°C/mW

LM-Con. 9590-14.

S. E. ETRX Sem IV (Old). 9/12/14
BADC

(OLD COURSE) Q.P. NO : **14427**

(3 Hours) [Total Marks : 100

N.B. : (1) Question **1** is **compulsory.**
(2) Solve any **four** questions from Q. **2** to Q. **7.**

1. (a) Explain elements of communication system. 20
   (b) Compare Analog signal & Digital signal.
   (c) Explain function of IF Amplifier.
   (d) Explain Delta modulation.

2. (a) Explain different types of noise in communication system. 10
   (b) What is need of modulation. 10

3. (a) Explain partical diode detector ? 10
   (b) Explain S.S.B. generation technique any one. 10

4. (a) Explain superhetrodyne radio receiver. 10
   (b) Explain Pre-emphasis & De-emphasis. 10

5. (a) Explain Indirect FM generation technique. 10
   (b) Explain F.M. Modulation & Demodulation. 10

6. (a) Explain PAM system. 10
   (b) Explain Adaptive Delta modulation. 10

7. (a) Explain PCM System. 10
   (b) Explain FDM System. 10

SE - SEM IV (old) - ETRX

Dec 2014

E. E. M. I. M.

(OLD COURSE)

QP Code : **14502**

(3 Hours)

[Total Marks :100

N.B. (1) **Question** No. 1 is **compulsory**.
(2) **Attempt** any **four** out of remaining six questions
(3) **Figures** to the **right indicate** full marks.
(4) **Assume** suitable data wherever necessary.

1. Answer the following:—
   (a) Compare analog and digital phase meter. **5**
   (b) Explain the function of delay line in oscilloscope what are different types of delay lines. **5**
   (c) What is back emf. Explain is significance. **5**
   (d) Define sensitivity of analog instrument For PMMC instrument with FSD=100 mA. calculate sensitivity. **5**

2. (a) Draw and explain any one of the types of electronic voltmeter. state it's advantages over analog voltmeter. **10**
   (b) Explain any two types of ADCs in detail. **10**

3. (a) Explain Beat frequency oscillator. State its advantages and applications. **10**
   (b) Explain the construction, working of electrodynamometer type power factor meter. **10**

4. (a) How will you find the value of capacitance with the help of Schering bridge. Draw its vector diagram. **10**
   (b) What is the need of TBG in standard oscilloscope How the TBS is generated. Explain why sometimes the triangular wave moves left or right continuously. **10**

5. (a) How kelvin double bridge is different from wheat-stone's bridge. Explain. **10**
   (b) Explain different methods for speed control of dc motor. **10**

6. (a) Explain starting methods of induction motor. **10**
   (b) Explain the principle of operation of PMMC and moving iron type of instrument. compare the two basic types. **10**

7. Write short note on:— **20**
   (a) Stepper motor
   (b) Megger
   (c) DSO
   (d) FET voltmeter.
