17/6/2011 SE (CET RK) Sem-IV maths. Advanced Engg

Con. 3847–11. RK–1866

(3 Hours) [Total Marks : 100

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

1. (a) The probability density function of a random variable X is — 5

X	0	1	2	3	4	5	6
P (X = x)	k	3k	5k	7k	9k	11k	13k

Find P (x < 4), P (3 < x ≤ 6)

(b) A relation R in the set of integers is defined by xRy if and only if x < y + 1 5
Examine whether R is
(i) relex1w (ii) symmetric (iii) transitive

(c) A random sample of 50 items gives the mean 6·2 and standard deviation 10·24. Can it be regarded as drawn from a normal population with mean 5·4 at 5% LOS ? 5

(d) The matrix A is defined as $A = \begin{bmatrix} 1 & 2 & 3 \\ 0 & -2 & 6 \\ 0 & 0 & -3 \end{bmatrix}$ 5

Find the eigen values of $3A^3 + 5A^2 + 6A + I$.

2. (a) Represent the function $f(z) = \frac{4z+3}{z(z-3)(z+2)}$ in Laurent's series. 6

(i) Within $|Z| = 1$
(ii) In the annular region between $|z| = 2$ and $|z| = 3$

(b) State moment generating function for Binomial distribution and hence find its mean and variance. 6

(c) Prove that the set of real numbers is a group under * defined by $a * b = a + b - 2$. 8

3. (a) Determine the residue at the poles for the function— 6

$$f(z) = \frac{z^2}{(z^2+3z+2)^2}$$

(b) Prove that Z_4 is a ring under addition and multiplication modulo 4. 6

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

Number Obtained on upper face	1	2	3	4	5	6
Frequency	15	20	25	15	29	28

Test the hypothesis that the die is unbiased.

4. (a) Test whether the matrix $A=\begin{bmatrix} 2 & -1 & 1 \\ 2 & 2 & -1 \\ 1 & 2 & 1 \end{bmatrix}$ is diagonalizable. 6

(b) The marks obtained by students in a college are normally distributed with mean 65 and variance 25. If 3 students are selected at random from this college. What is the probability that at least one of them would have scored more than 75 marks. 6

(c) Functions f and g are defined as follows :— 8

$f : R \longrightarrow R$, $g : R \longrightarrow R$, $f(x) = 2x + 3$, $g(x) = 3x - 4$

find fog, f^{-1}, g^{-1} and verify that $(fog)^{-1} = g^{-1}\ of^{-1}$

5. (a) Verify Cayley–Hamilton thm. for $A = \begin{bmatrix} \cos\theta & \sin\theta \\ -\sin\theta & \cos\theta \end{bmatrix}$ and hence find A^{-1}. 6

(b) Draw the Hasse diagram for L = { 1, 2, 3, 5, 6, 10, 15, 30 } and let the relation R be 'is divisible by'. Determine whether it is lattice. 6

(c) Sample of two types of electric bulb & were tested for length of life and the following data were obtained. 8

	Type I	Type II
No of Samples	8	7
Mean of the samples (in hours)	1134	1024
Standard deviation (in hours)	35	40

Test at 5% level of significance whether the difference in the sample means is significant.

6. (a) Evaluate $\int_C \frac{\sin\pi z^2 + \cos\pi z^2}{z^2+3z+2}\,dz$ where C is (i) $|z| < 1$ (ii) $|z| < 2$ 6

(b) A random variable X has the probability function $f(x) = \frac{4x}{81}\left(9 - x^2\right)$, $0 \le x \le 3$. 6

Find first four moments about origin and about mean.

(c) If $A = \begin{bmatrix} 2 & 2 & 1 \\ 1 & 3 & 1 \\ 1 & 2 & 2 \end{bmatrix}$, find the characteristic roots and characteristic vectors of $A^3 + I$. 8

7. (a) Using Residue Theorem evaluate $\int_C \frac{(z+4)^2}{z^4+5z^3+6z^2} dz$, where C is the circle $|z| = 1$. 6

(b) It is known that the probability of an item produced by a certain machine will be defective is 0·05. If the produced items are sent to the market in the packets of 20, find the number of packets containing (i) at least (ii) exactly (iii) at most 2 defective items in a consignment of 1000 packets using poisson approximation to the Binomial distribution. 6

(c) If X_1 has mean 5 and variance 5, X_2 has mean -2 and variance 3. If X_1 and X_2 are independent random variables, find 8

(i) $E(x_1 + x_2)$, $V(x_1 + x_2)$

(ii) $E(2x_1 + 3x_2 - 5)$, $V(2x_1 + 3x_2 - 5)$.

13/6/2011

S.E ETRX TV (Rev)
Electronic + Electrical Measurements + Machine

Con. 3508-11.

RK–1857 RK-1875

(3 Hours) [Total Marks : 100

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

1.A) Compare 'true rms meter' and 'average responding meter'. 05

B) Why Kelvin's double bridge is superior to wheatstone's bridge in low resistance measurement. 05

C) Explain significance of back emf in D.C. motors. 05

D) Explain gear wheel method used for frequency measurement. 05

2. A) What are the different methods of converting analog to digital signal ? Explain successive approximation type ADC. 10

B) Explain various performance parameters of digital voltmeters. 10

3. A) Explain construction and working of digital frequency meter with the help of neat labeled diagram. 10

B) Write a short note on component testing using CRO. 10

4.A) Explain requirements of a good laboratory type of signal generator. 10

B) Explain measurement of capacitance using Schering Bridge with the help of vector diagram 10

5 A) Explain the need of starter for induction motors .What are the various types of starters used for induction motors? Explain any one in details. 10

B) Draw and explain front panel of dual trace oscilloscope. 10

6. A) State the various types of stepper motors. Explain hybrid stepper motor in details. 10

B) Derive torque equation for moving iron meters. 10

7. Write a short note on **(any three)**. 20

A) megger.
B) Speed control of dc series motors.
C) Ohmmeter.
D) Weston type frequency meter.

SE ETRX IV (Rev)
Basic & Analog & Digital Communication Systems

Con. 3631-11.

RK-1860

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

N.B. : (1) Question No. **1** is **compulsory**.
(2) Attempt any **four** questions out of remaining **six** questions.

1. Answer the following :— **20**
   (a) Distinguish between : Narrow Band and Wide Band FM.
   (b) Classify and explain to various noises that affect communication.
   (c) Derive an expression for an AM signal.
   (d) Explain Time Division Multiplexing.

2. (a) Compare the following amplitude modulated systems :— **12**
   DSB-FC, DSB-SC, SSB, ISB.
   (b) Explain basic block diagram of communication system in detail. **8**

3. (a) With the help of neat block diagram explain the working of TRF Receiver. **10**
   (b) Draw the block diagram of PCM system and explaiin each block in detail. Also draw the waveforms. **10**

4. (a) Explain PAM and PWM generation with the help of block diagram and waveforms: How is PAM demodulated ? **10**
   (b) Draw the block diagram and waveforms of Adaptive Delta Modulator and explain in detail. What are the advantages of this modulator over delta Modulator ? **10**

5. (a) Explain with the help of block diagram and waveforms superheterodyne radio receiver. **10**
   (b) Sketch the circuit and phasor diagram of a phase discriminator and prove that it works as a FM demodulator. **10**

6. (a) Explain the following terms :— **10**
   (i) Signal to noise ratio
   (ii) Noise factor
   (iii) Noise figure
   (iv) Equivalent noise temperature.
   (b) Draw the following line codes :— **10**
   (i) Unipolar NRZ
   (ii) Unipolar RZ
   (iii) Polar NRZ
   (iv) Polar RZ
   (v) A. M. I. (Bipolar).

7. Write short notes on following :— **20**
   (a) Vestigial sideband
   (b) AGC in radio receiver
   (c) High level plate Modulator
   (d) Frequency division multiplexing.

30/5/11

SE ETRX TV (Rev)
Electronic Circuit Analysis & Design

89-mk : 1stHf-11.

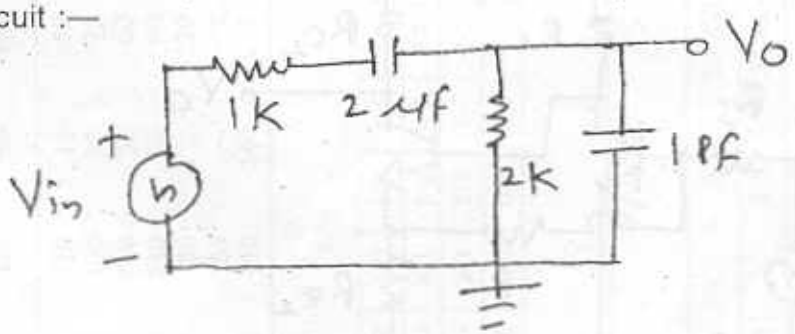
Con. 2946-11.

RK-1854

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

N.B. (1) Question No. **1** is **compulsory**.
(2) Attempt any **four** from remaining questions.
(3) Assume **suitable** data if **necessary**.

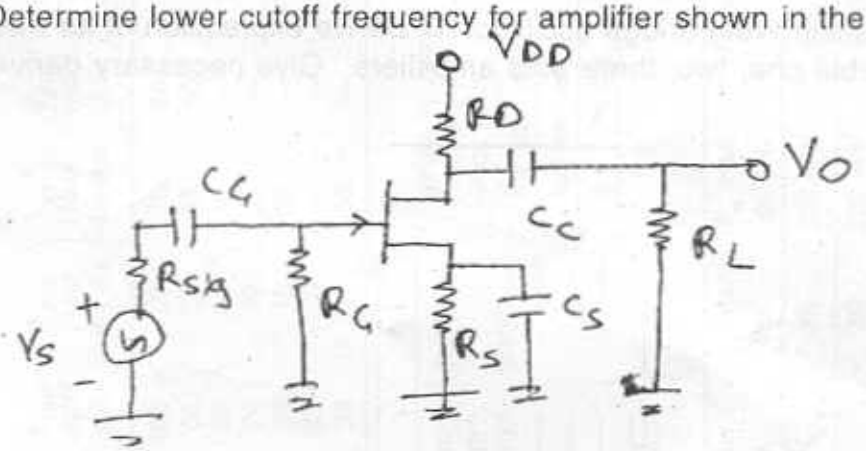
1. Attempt any **four** questions from the following :— **20**
   (a) State and prove Barkhausen criterion for sustained oscillations.
   (b) Write short notes on CASCODE amplifier.
   (c) Explain the use of swamping resistor in Differential Amplifier.
   (d) Explain design steps for Heat sinks.
   (e) For the following circuit, determine corner frequencies and bandwidth of the circuit :—



2. Design two stage RC coupled CE amplifier to provide $A_V = 3000$, $V_O = 2{\cdot}5$ V and S = 8. **20**
   Determine R_{in}, R_O, V_O of the amplifier you have designed.

3. Design class AB power amplifier for following specifications :— **20**
   $P_O = 12$ W, load resistance = 15 ohms, $V_{CC} = 12$ V,
   Calculate circuit efficiency, draw DC load line.
   Calculate power dissipation under zero signal conditions.

4. (a) Determine lower cutoff frequency for amplifier shown in the **figure** :— **14**



$C_G = 0{\cdot}01\ \mu F$
$R_{sig} = 10\ K\Omega$
$I_{DSS} = 8$ mA
$C_C = 0{\cdot}5\ \mu F$
$R_G = 1\ M\Omega$
$V_P = -4$ V

$C_S = 2\ \mu F$
$R_D = 4{\cdot}7\ K\Omega$
$R_S = 1\ K\Omega$
$R_L = 2{\cdot}2\ K\Omega$
$V_{DD} = 20$ V
$\gamma_d = \infty$

[TURN OVER

(b) Explain Miller effect in amplifiers. 6

5. For the amplifier shown in the **figure** determine :— 20

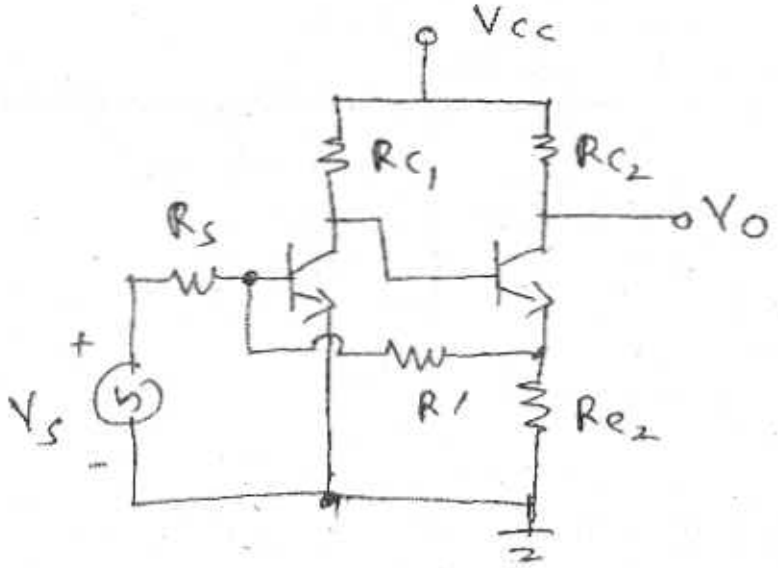
A Feedback factor β, A_{Vf}, Identify feedback type

B R_{in}, R_{inf}

C R_o, R_{of}

$RC_1 = 3$ K, $RC_2 = 500\ \Omega$, $R' = R_S = 1{\cdot}2$ KΩ

$RC_2 = 50\ \Omega$, $h_{ie} = 1{\cdot}1$ K, $h_{fe} = 50$, $V_{CC} = 15$ V.



Draw Equivalent circuit without feedback.

6. (a) Derive the expression of differential gain, common mode gain, CMRR for dual input balanced output differential amplifier. 10

(b) Derive the expression of $f\beta$ and fT. 10

7. (a) State and explain Wein bridge oscillator ? Derive expression of its frequency. 10

(b) Explain in detail one, two, three pole amplifiers. Give necessary derivations. 10

DBEC DATA SHEET

or type	Pdmax @ 25°C Watts	Icmax @ 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_{BEO} 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_{j-c} °C/W	Derate above 25°C W/°C
)	115·5	15·0	1·1	100	60	70	90	7	200	20	50	70	15	50	120	1·8	1·5	0·7
5	50·0	5·0	1·0	60	50	55	60	5	200	25	50	100	25	75	125	1·5	3·5	0·4
9	30·0	4·0	1·0	50	40	—	—	8	150	30	50	110	33	60	115	1·2	4·0	0·3
0	5·0	0·7	0·6	70	60	65	—	6	200	50	90	280	50	90	280	0·9	35	0·05
	0·25	0·1	0·25	50	45	50	—	6	125	115	180	220	125	220	260	0·9	—	—
PNP)	0·225	0·5	0·25	85	30	—	—	—	100	35	—	65	—	45	—	—	—	—
	0·25	0·1	0·25	50	45	50	—	6	125	200	290	450	240	330	500	0·9	—	—

or type	hie	hoe	hre	θja
	2·7 K Ω	18μ ℧	1·5 × 10⁻⁴	0·4°C/mw
(PNP)	1·4 K Ω	25μ ℧	3·2 × 10⁻⁴	—
	4·5 K Ω	30μ ℧	2 × 10⁻⁴	0·4°C/mw
)	500 Ω	—	—	—
)	250 Ω	—	—	—
5	100 Ω	—	—	—
	25 Ω	—	—	—

BFW 11—JFET MUTUAL CHARACTERISTICS

−Vgs 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
Ids 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
Ids 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
Ids 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

nel *JFET*

pe	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_{j-a}
	50	50	50	300 mW	175°C	2 mA	3000 μ℧	6	50 KΩ	2 mW/°C	0·59°C/mW
(typical)	30	30	30	300 mW	200°C	7 mA	5600 μ℧	2·5	50 KΩ	—	0·59° C/mW

S.E. Electronics IV (E)
Digital System Design - II.

Con. 3048-11. **RK-1863**

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

N.B. : (1) Question No. 1 is **compulsory**.
(2) Solve any **four** from Q. No. **2** to Q. No. **7**.
(3) Assume **suitable** data if **necessary**.

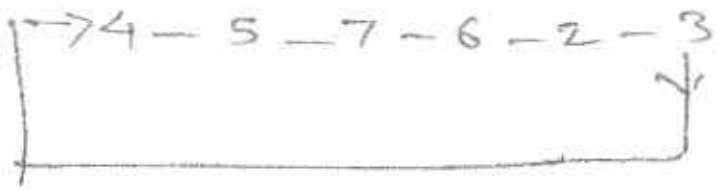
1. (a) Explain basic structure of VHDL file. 20
(b) Compare Moore and Mealy models.
(c) Explain Universal Shift Register for four bits.
(d) Memory Organisation and Operation.

2. (a) Explain VHDL statements. 10
(b) What are modeling styles in VHDL and write code for full adder using component modeling. 10

3. (a) Write VHDL code for multiplexer IC 74151 10
(b) Write a code Behavioral description of simple floating point encoder. 10

4. (a) Explain state reduction and state Assignments techniques. 10
(b) Design sequential circuit for detecting and overlaping sequence 1101 using J.K./F.F. 10

5. (a) Design a asynchronous counter using J.K./F.F. which runs through the sequences. 10



(b) Write VHDL code for two digit BCD counter. 10

6. (a) Explain Internal organization of RAM 10
(b) Explain XC9500 Architecture. 10

7. (a) Explain pulsed mode Asynchronous Circuit. 10
(b) Write short notes on :— 10
(i) Hazards
(ii) Race Condition Stability.