S.E/ ETRX/ Sem IV

Elect & Electrical Meas on the & Mechinery

Con. 5892-10. GT-6447

(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 any **four** :– **20**
   (a) What are the factors involved in the selection of electronic analog voltmeter ?
   (b) Explain digital storage oscilloscope.
   (c) State the requirements of good laboratory type signal generator.
   (d) Compair Analog and digital phase meter.
   (e) Explain Beat frequency oscillator.

2. (a) What are different methods of converting analog signal to digital signal ? **10**
   (b) State general characteristics of digital voltmeter. Explain with block diagram of staircase Ramp type of DVM. **10**

3. (a) Describe the working of phase measurement by voltage addition method. **10**
   (b) Explain in detail Digital frequency meter. **10**

4. (a) Explain dual trace and double beam CRO with block diagram and wave form. **10**
   (b) What properties of oscilloscope governs its ability to reproduce a square wave most faithfully ? **10**

5. (a) Explain construction and working principles of moving Iron power factor meter. **10**
   (b) Explain Wheatstone's bridge. **10**

6. (a) How is Kelvin Double Bridge different from Wheastone's bridge ? Explain. **10**
   (b) Explain schering bridge for capacitance measurement. **10**

7. Write short note (any **three**) :– **20**
   (a) Megger
   (b) DC Motors
   (c) Stepper Motor
   (d) Starting Methods of Induction Motors.

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3rd Jan 2011

S.E. / Electronics / Sem IV

Advanced Engineering Maths

Con. 6312-10. **GT-6453**

(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. (a) Let X be a continuous random variable with probability distribution – **5**

$$P(x) = \frac{x}{6} + K, \qquad 0 \le x \le 3$$
$$= 0 \qquad \text{otherwise}$$

Find K and P $(1 \le x \le 3)$.

(b) Define relation R in the set of integers as follows – **5**
'x R_y if and only if 3x + 5y is divisible by 8'.
Is R an equivalence relation ? If yes find equivalence classes.

(c) If $A = \begin{bmatrix} 1 & 0 \\ 2 & 4 \end{bmatrix}$ then find the eigen values of $4A^{-1} + 3A + 2I$. **5**

(d) Find Laurent's series for $f(z) = \dfrac{e^{3z}}{(x-1)^3}$ about z = 1. **5**

2. (a) Seven dice are thrown 729 times. How many times do you expect at least four dice to show three or five ? **7**

(b) Using residue theorem, evaluate – **7**

$$\int_0^{\pi} \frac{d\theta}{3 + 2\cos\theta}$$

(c) Prove that the set G of all integers under the binary operation $*$ defined by – **6**
$a * b = a + b - 5$ is a group.

3. (a) Prove that every field is an integral domain. Is the converse true ? Justify. **7**

(b) Theory predicts that the proportion of beans in four groups should be 9:3:3:1. In an experiment among 1600 beans the numbers in four groups were 882, 313, 287 and 118. Does the experimental results support the theory ? **7**

(c) Apply Cayley-Hamilton theorem to $A = \begin{bmatrix} 1 & 2 \\ 2 & -1 \end{bmatrix}$ and deduce that $A^8 = 625\,I$. **6**

4. (a) When a random variable X is said to follow Poisson distribution ? Find it's mean and variance. 7

(b) If the heights of 500 students is normally distributed with mean 68 inches and standard deviation 4 inches. Find the expected number of students having heights : 7

(i) greater than 72 inches

(ii) less than 62 inches.

(c) Is the mapping $f : IR - \{2\} \rightarrow IR - \{0\}$ defined by $f(x) = \frac{1}{x-2}$ bijective ? If so, find the inverse of f. 6

5. (a) Fit a Poisson distribution to the following data – 7

No. of deaths	0	1	2	3	4
Frequencies	123	59	14	3	1

(b) Is the following matrix diagonalisable ? Justify your answer – 7

$$A = \begin{bmatrix} 1 & 2 & 3 \\ 0 & 2 & 0 \\ 0 & 0 & 2 \end{bmatrix}$$

(c) Determine the nature of singularities if any for the following functions – 6

i) $f(z) = \dfrac{z^2+1}{(z-1)^2\,(z+1)}$

ii) $f(z) = \dfrac{z-3}{4}\,\sin\left(\dfrac{1}{z-1}\right)$

6. (a) In a sample of 600 men from a certain city, 450 found to be cricket players. In another sample of 900 men from another city 450 are cricket players. Do the data indicate that cities are significantly different with respect to liking of cricket among men ? 7

(b) Draw the Hasse diagram for the following poset under the relation 'Is divisible by' and determine whether it represents lattice. 7

$S = \{2, 3, 4, 6, 8, 24, 48\}$

(c) A random variable x has the following pmf – 6

$$P(X=x) = \frac{x}{15} \text{ for } x = 1, 2, 3, 4, 5$$

Find $E(X), E\left(2X^2+1\right)$ and $E(3X+8)$

7. (a) Find the moment generating function of the random variable having the following probability density function. Also find the mean and variance – 7

$$f(x) = \frac{1}{2}, \quad -1 \le x \le 1$$
$$= 0 \quad \text{elsewhere}$$

(b) Determine the nature of poles of the following function and find the residue of each pole. 7

$$f(z) = \frac{1-e^{2z}}{z^3}$$

(c) Evaluate $\int_C \dfrac{z-1}{(z+1)^2\,(z-2)}\,dz$ where C is $|z-i| = 2$. 6

SE/ETRX/Sem IV
Digital System Design - II

2-12-10

Con. 5678-10. **GT-6444**

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

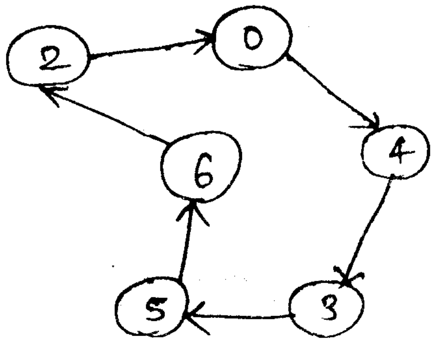
N.B. (1) Question No. **1** is **compulsory**.
(2) Solve any **four** from the remaining questions.

1. (a) Compare the synchronous and asynchronous sequential machines. **5**
(b) Explain the analog controls available in I/O block of XC 4000 FPGA family. **5**
(c) Write a VHDL code for an asynchronous decade counter 7490 using mod 5 counter and mod 2 counter. Use structural architecture. **10**

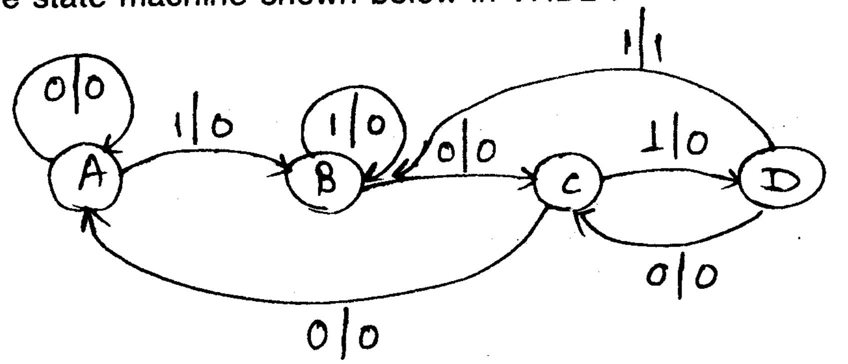
2. (a) Draw and explain the working of SRAM cell. Using it, draw the structure for 4 × 2 SRAM memory. **10**
(b) With reference to XC 9500 CPLD family, explain : **10**
(i) Product term Allocator and Macro cell structure
(ii) Architecture of functional block.

3. (a) Design a Moore sequential machine that detects serial input sequence of X = 010110. Output Z goes high when such a sequence is detected. Use JK flip-flops and logic gates for the design. **10**
(b) Draw and explain logic diagram of 64 × 1 diode ROM. Use two dimensional decoding. **10**

4. (a) Design a three-bit Gray code counter using D flip-flop and NAND gates only. **10**
(b) Design a synchronous counter that counts the following sequence using D flip-flops. **10**

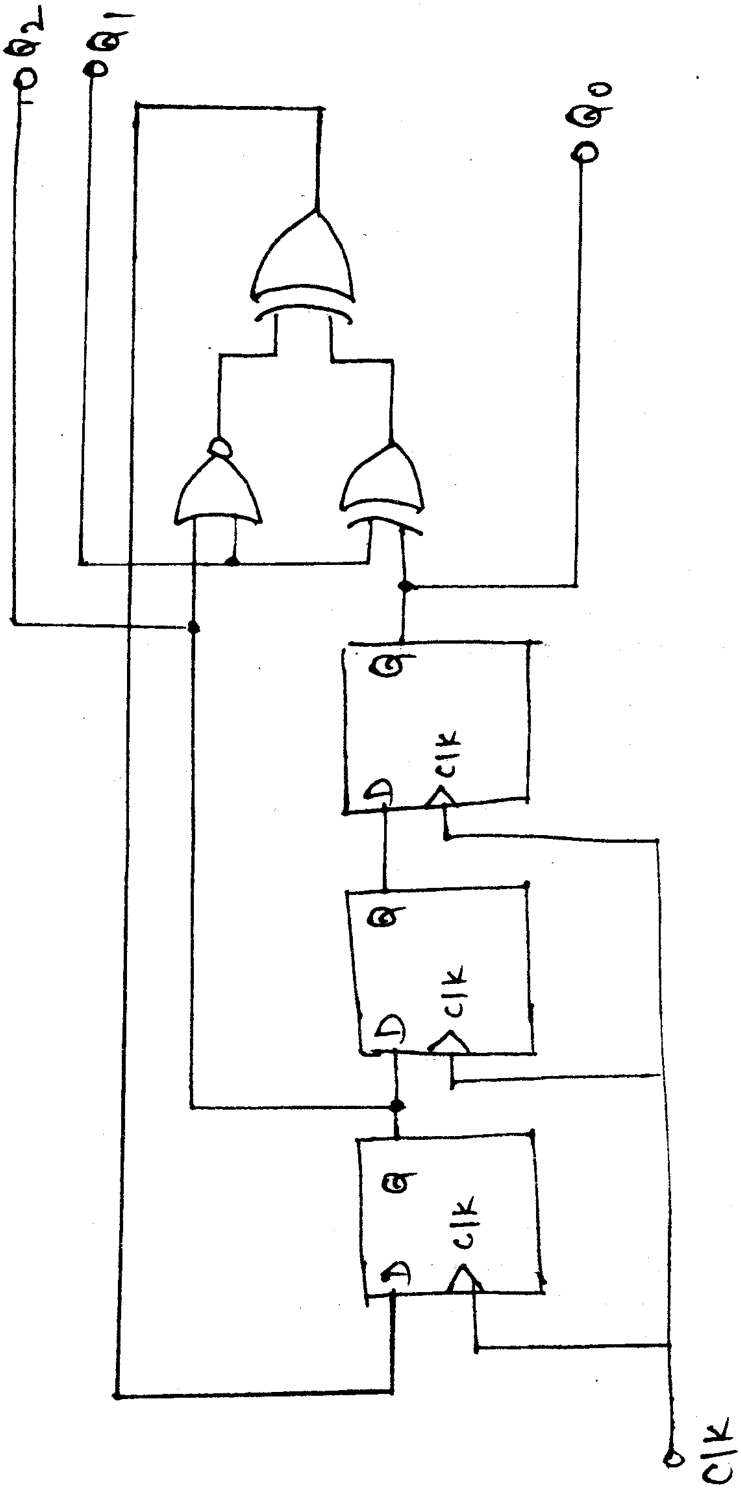


5. (a) Show VHDL code for a 4-bit counter that counts the following sequence :— **10**
0100, 0001, 1011 1010, 0110, 1111, 0111, 0000, 1000. After a clock pulse, if the count is 0001, the next count becomes 1011, and if the present count is 1000 the next count becomes 0100 (roll over).
(b) Describe the state machine shown below in VHDL :— **10**



[TURN OVER

6. (a) Analyze the clocked synchronous state machine in the given **figure**. Write excitation equations, excitation/transition table, and state table. (Use names A–H for Q_2 Q_1 Q_0 = 000 – 111). 10



(b) Explain in detail different modeling styles in VHDL. 10

7. Write short notes on the following :— 20
   (a) Design of Barrel shifter using VHDL
   (b) Component Instanitiation
   (c) Dynamic RAM
   (d) Xilinx XC 4000 FPGA family.

EE/ Electronic & Biomedical
Sem VI / old

141 2nd half-Exam 10-Mina (a)

Con. 6083-10. **(OLD COURSE)** **GT-7284**

Analog Integrated Circuits Application

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

N.B. (1) Question No. **1** is **compulsory**.
(2) Attempt any **two** questions from remaining **six** questions.
(3) Assume **suitable** data if **required** and state **clearly**.

1. (a) Define V-to-I converter. Draw the circuit of V-to-I converter and derive its output expression. 5
(b) Give any five Ideal characteristics of op-amp. Also give their practical values with respect to op-amp IC 741. 5
(c) Draw the circuit of precision full wave rectifier. Draw its input and output waveforms. Explain, why it is called precision. 5
(d) Design a monostable multivibrator using IC 555 for a pulse width of 1 msec. 5

2. (a) What are the different types of analog to digital converters ? Explain any one of them with neat circuit diagram. 10
(b) Design a low pass, second order KRC Filter using equal component design for F_o = 2 kHz and Q = 5. Give its dc gain. 10

3. (a) Design a phase shift Oscillator with f_o = 10 kHz. How is the peak to peak output voltage adujsted ? 10
(b) What are the main features of IC 8038 ? 10

4. (a) Draw a functional block diagram of PLL IC 565 and explain its working. 10
(b) What are the switching voltage regulators ? How are they different from linear regulators ? Explain in brief the various topologies of switching regulations. 10

5. (a) Draw a neat circuit of an Instrumentation amplifier. Derive its output expression. 10
(b) Draw the circuit diagram of peak detecher and explain its working. 10

6. (a) Explain the frequency response of an ideal integrator and that of practical integrators with figures. 10
(b) Design a 1 amp current source using 7805 regulator IC. 10

7. Write short notes on following :— 20
(a) Switched Capacitor Filter
(b) Log Amplifier
(c) Difference in Lowpass Filter and Integrator
(d) Effect of Finite GBP on Integrator Circuits.

S.E / Electronic / sem IV
Basic of Analog and Digital com System.

V-II-IIE-Ex-10-E-27

Con. 6575-10. **GT-6450**

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

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

1. Answer the following :— **20**
   (a) Derive an expression for an A.M. signal.
   (b) Classify and explain the various noises that affect communication.
   (c) Distinguish between : Narrow band and Wide band FM.
   (d) What is companding ? Explain with typical companding curves.

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) What are the methods of SSB generation ? Explain any one of them. **8**
   (b) Explain Armstrong method of F.M. generation with the help of a neat block diagram and phasor diagram. **12**

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

5. (a) Explain with the help of waveforms P.A.M. P.W.M. and P.P.M. generation and detection. **10**
   (b) Explain F.D.M. with neat block diagram. **5**
   (c) State and explain Sampling theorem. **5**

6. (a) Sketch the circuit and phasor diagram of a phase discriminator and prove that it works as a F.M. demodulator. **10**
   (b) Draw the block diagram of Adaptive delta modulation and explain its operation. What are the advantages of this over delta modulation ? **10**

7. Write short notes on following :— **20**
   (a) Vestigial side band
   (b) AGC in radio receiver
   (c) Characteristics of radio receiver
   (d) High level plate modulator.

SE / ETRX / Sem IV

202 : 2nd Half-Exam-10-DD (A)

Electrical Mechanics & Instrument 27/12/10

Con. 6699-10. **GT-9792**

(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) Assume **suitable** data wherever **required** and state **clearly**.
(4) **Figures** to the **right** indicate **full** marks.
(5) Illustrate answer with **sketches** wherever **required**.

1. (a) Describe the operation of a frequency meter. **20**
   (b) What are Instrument Transformers ?
   (c) Derive the Torque equation of a D. C. Motor.
   (d) Why is the frequency of rotor currents in a three phase Induction motor under running condition less compared to the supply frequency ?

2. (a) Explain the characteristics of a D. C. Compound Motor in comparison with D. C. Shunt and Series Motors. **10**
   (b) A series motor with an unsaturated field and negligible resistance when running at a certain speed on a given load takes 40 Amperes at 440 Volts. If the load torque varies as the cube of the speed, calculate the resistance required to reduce the speed by 25%. **10**

3. (a) Explain the double field revolving theory and prove that there is no starting torque in a single phase motor. **10**
   (b) The power input to the rotor of a three phase 50 Hertz, 6 pole Induction motor is 80 kW. The rotor e.m.f. makes 100 revolutions/minute. Find :— **10**
      (i) Slip
      (ii) Rotor speed
      (iii) Mechanical power developed
      (iv) Rotor copper loss
      (v) Torque developed.

4. (a) Kelvin Double Bridge is a modification of Wheatstone's Bridge. Explain by showing proper circuit diagram and derive balance conditions of Kelvin Double Bridge. **10**
   (b) Derive the balance condition of Anderson's Bridge with circuit diagram and phasor diagram. **10**

5. (a) Explain the types of A. C. and D. C. Potentiometers. **10**
   (b) How are stepper motors classified ? **10**

6. (a) How are magnetic materials classified ? **10**
   (b) Explain the working of Moving Iron Instruments. **10**

7. (a) The coil of a permanent magnet moving coil Instrument has 200 turns and dimensions of 30 mm × 20 mm. The control torque exerted by the spring is 200×10^{-6} N-m at full scale deflection. Determine the current through the meter at full scale deflection if the operating flux density is 0·8 Wb/m^2. **5**
   (b) Explain the operation of a Meggar. **7**
   (c) Differentiate between PMMC and Dynamometer type Instruments. **8**

SE / ETRX / Sem IV
Elect-Circ Anal & Design

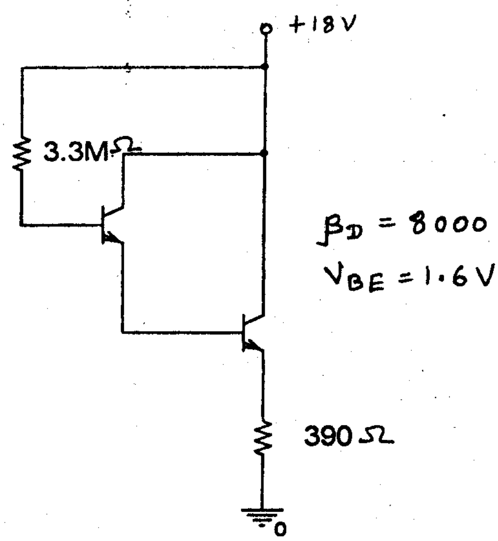
9/12/10

Con. 6122-10. **GT-6456**

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

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

1. Attempt any **four** of the following :- 20
   (a) State & explain Barkhausen criterion for oscillation.
   (b) Derive an equation for the Miller input & output capacitance for inverting amplifier.
   (c) Calculate the dc bias voltages & currents in the following circuit.



   (d) Compare various types of Negative Feedback.
   (e) State the methods to improve CMRR of a Differential amplifier & explain any one.

2. Design a two stage RC coupled CS amplifier for zero temperature drift for following requirements: F_L better than 15Hz using JFET BFW11(Max) with $|Av| = 49$ & Vo = 3V. 20

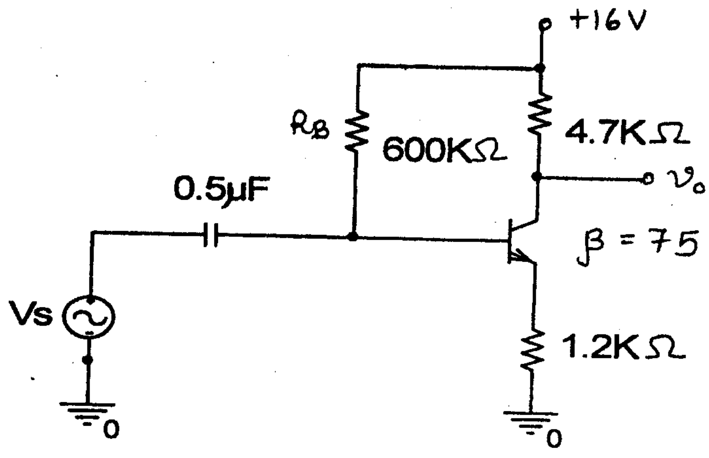
3. (a) Design a transformer coupled class A power amplifier to deliver 5Vrms to 4Ω load with Vcc=18V. 12

   (b) For a class B amplifier with Vcc=20V driving an 16Ω load, Determine 08
   (a) Maximum input power, (b) Maximum output power, (c) Maximum circuit efficiency, (d) Transistor dissipation

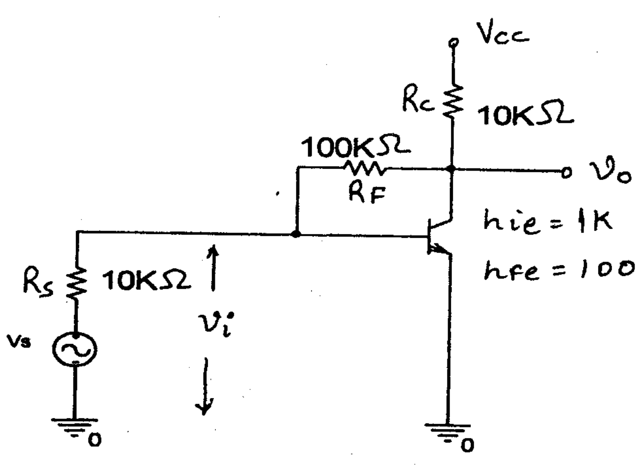
4. (a) For Dual input balanced output BJT differential amplifier with swamping resistance determine common mode gain, Ad & CMRR with hie=2 KΩ, hfe=100, $R_{in1}=R_{in2}$=1KΩ, R_c=2KΩ, $R_{E'}$(Swamping resistance)=100Ω, R_E=10KΩ.Derive necessary expressions. 10

   (b) Explain the low frequency analysis of a BJT amplifier. Derive necessary expressions. 10

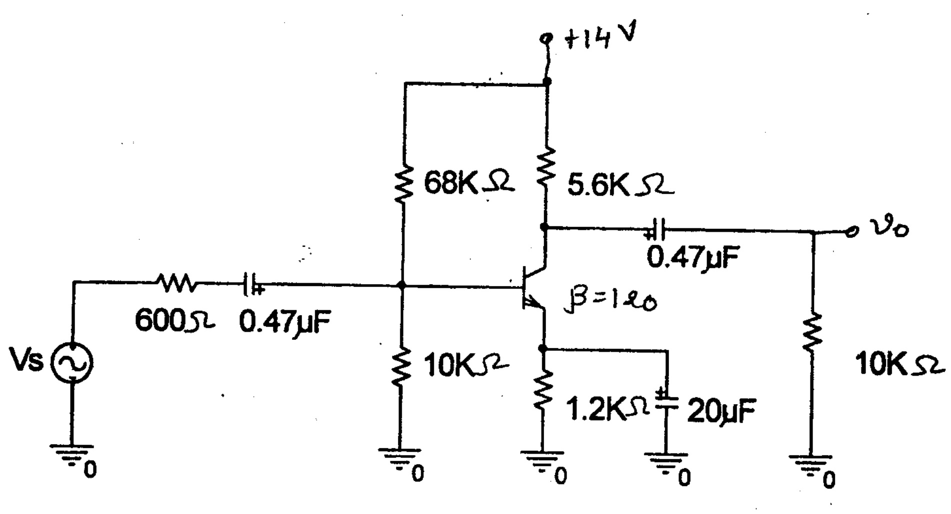
5 (a) For the following circuit determine A, β, A_f, Z_{if}, Z_{of} & A_{vf}. 10



(b) For the following circuit determine A, β, A_f, Z_{if}, Z_{of} & A_{vf}. 10



6 (a)Determine F_{Hi},F_{Ho},$F_β$ & F_T. Also sketch the frequency region using a Bode plot & determine the cutoff frequency. 10



(b) Draw the circuit diagram of Hartley oscillator & explain its working. Derive the necessary equation for frequency of oscillations & for sustaining oscillations. 10

Write short note on any **three** :- 20

a) MOSFET Differential amplifier

b) Class C Power amplifier

c) Cascode amplifier

d) Crystal Oscillator

DBEC DATA SHEET

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_{BEO} volts d.c.	T_j max. °C	D.C. current gain min	D.C. current gain typ.	D.C. current gain max.	Small Signal h_{fe} min.	Small Signal h_{fe} typ.	Small Signal h_{fe} max.	V_{BE} max.	θ_{fe} °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_{mo} (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	6	50 KΩ	2 mW/°C	0.59°C/mW
BFW 11 (typical)	30	30	30	300 mW	200°C	7 mA	5600 μ mho	2.5	50 KΩ	—	0.59°C/mW

DBEC DATA SHEET

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_{BEO} volts d.c.	T_j max. °C	D.C. current gain min	D.C. current gain typ.	D.C. current gain max.	Small Signal h_{fe} min.	Small Signal h_{fe} typ.	Small Signal h_{fe} max.	V_{BE} max.	θ_{fe} °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_{mo} (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	6	50 KΩ	2 mW/°C	0.59°C/mW
BFW 11 (typical)	30	30	30	300 mW	200°C	7 mA	5600 μ mho	2.5	50 KΩ	—	0.59°C/mW