S.E. ETRX sem IV (old) M-14.

Syb:- AEM

19/5/14

(OLD COURSE) QP Code : **MV-18801**

(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 probability distribution of a random variable X is given by **5**

X	:	−2	−1	0	1	2	3
P(X=x)	:	0.1	K	0.2	2K	0.3	K

Find K, mean and variance.

(b) Find the eigen values and eigen vectors of the matrix $\begin{bmatrix} 2 & -1 & 1 \\ 1 & 2 & -1 \\ 1 & -1 & 2 \end{bmatrix}$ **5**

(c) Find the residue at the pole for $\frac{ze^z}{(z-a)^3}$ **5**

(d) Let R be the relution defined on Z by x R y if $|x-y|$ is divisible by 5. Show that R is an equivalence relation. **5**

2. (a) Evaluate $\int_c \frac{3z^2+z}{z^2-1}\,dz$ where c is $|z| = 2$ **6**

(b) Can it be concluded that the average life-span of an Indian is more than 70 years, if a random sample of 100 Indian has an average life-span of 71.8 years with standard deviationof 7.8 years. **6**

(c) Show that the matrix A is diagonalisable. Find the transforming matrix and the diagonal matrix where $A = \begin{bmatrix} 8 & -8 & -2 \\ 4 & -3 & -2 \\ 3 & -4 & 1 \end{bmatrix}$ **8**

3. (a) Find the mean and variance of the poission distribution **6**

(b) Find A^n if $A = \begin{bmatrix} 7 & 3 \\ 2 & 6 \end{bmatrix}$ **6**

(c) Evaluate $\int_0^{2\pi} \frac{d\theta}{3+2\cos\theta}$ **8**

4. (a) A manufacturer knows from his experience that the resistance of resistors he produces is normal with μ=100 ohms and σ = 2 ohms. What percentage of resistors will have resistance between 98 ohms and 102 ohms? **6**

   (b) If $f(x)=2x+5$, $g(x) = x^2+1$, $h(x)=2x-5$ **6**
   where $f : R \to R$, $g: R \to R$, $h : R \to R$
   find fog, goh, foh

   (c) Find all possible laurent's series for $f(z) = \dfrac{4z+3}{z(z-3)(z+2)}$ indicating the region of convengence. **8**

5. (a) Let G be the set of rational numbers different from 1. Let $a*b = a+b-ab$ for all $a, b \in G$. Prove that $(G, *)$ is a group. **6**

   (b) The number of car accidents in a metropolitian city was found to be 20, 17, 12, 6, 7, 15, 8, 5, 16, 14 per month respectively. Use χ^2 – test to check whether these frequencies are in agreement with the belief that occurence of accidents was the same during 10 months period. **6**

   (c) Check whether A = {2, 4, 12, 16} and B= {3, 4, 12, 24} are lattices under divisibility. Draw their Hasse diagrams. **8**

6. (a) Use Cayley-Humilton theorem to find **6**

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

   (b) Fit a Bionomial distribution to the following data **6**

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

   Also calculate the expected frequencies.

   (c) Find the characteristic equation of the matrix A and verify that it is satisfied by **8**
   A and hence find A^{-1} where $A = \begin{bmatrix} 2 & -1 & 1 \\ -1 & 2 & -1 \\ 1 & -1 & 2 \end{bmatrix}$

7. (a) Ten individuals are chosen at random from a population and their heights are found to be 63, 63, 64, 65, 66, 69, 69, 70, 70, 71 inches. discuss the suggestion that the mean height of the universe is 65 inches. **6**

   (b) An insurance company found that only 0.01% of the population is involved in a certain type of accident each year. If its 1000 policy holders were randomly selected from the population, what is the probability that not more than two of its clients are involved in such accident next year? **6**

   (c) The first four moments of a distribution about the value 5 are 2, 20, 40 and 50 calculate the values of mean, variance, μ_3, μ_4. **8**

ETRX (old) ECAD 29/5/2014

SEM IV

(OLD COURSE) **QP Code No. MV-18873**

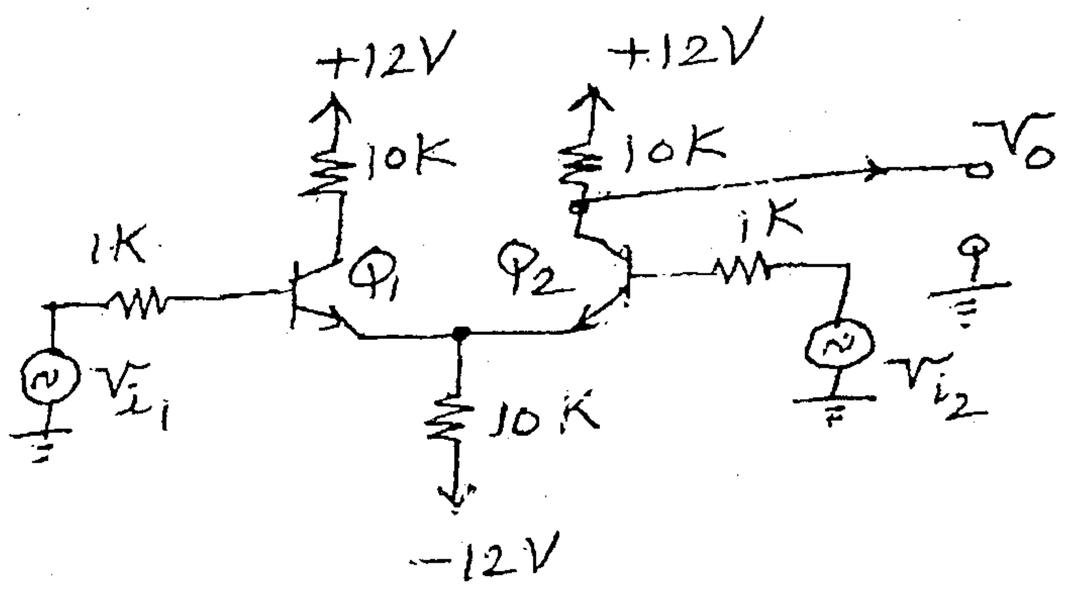
(3 Hours) **[Total Marks : 100**

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

1. Solve any **four** from the following :– **20**
   (a) Compare a.c. small signal amplifiers using BJT and using JFET. Consider input resistance, voltage gain and maximum output voltage swing.
   (b) Differentiate between a.c. small signal amplifiers and a.c. large signal amplifiers.
   (c) Compare CE and CB amplifiers considering thermal stability S_{ICO}
   (d) Explain why constant current sources are used in differential amplifiers.
   (e) Give important features of CASCODE amplifier.

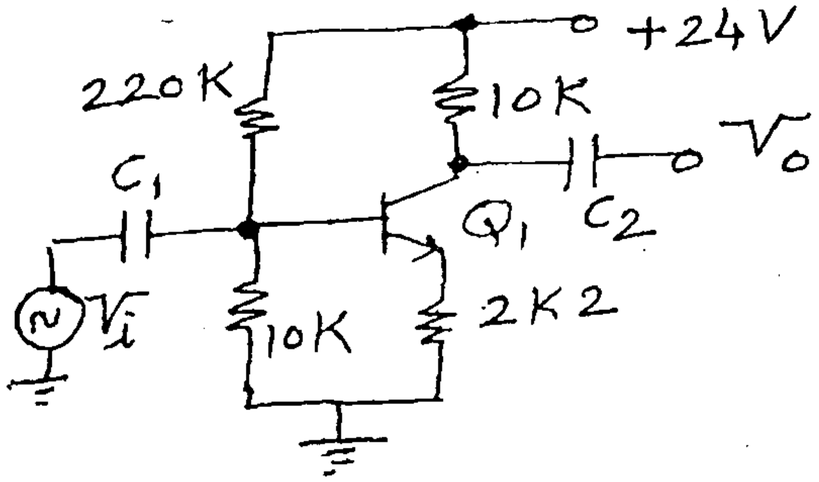
2. Design a two stage R-C coupled amplifier for the following specifications :– **20**
   $A_v > 850$, $S_{ICO} < 8$, $R_i = 5\ K\Omega$
   $V_{CC} = 24V$, $f_L < 15$ Hz.
   Select appropriate transistors from the data table given at the end of question paper.
   Neglect h_{re} and h_{oe}

3. For differential amplifier shown in figure below determine– **20**
   (i) Q points of transistors
   (ii) Differential voltage gain (Ad)
   (iii) Common mode voltage gain (Ac).



Transistors Q_1 and Q_2 are BC 147 A
(refer to data table for transistor data)
Neglect h_{oe} & h_{re}

4. (a) For amplifier circuit shown in figure below using negative feedback approach determine type of feedback, stability ratio, Av_f and Ai_f 15



hie = 1kΩ

hfe = 80

(Neglect h_{re} and h_{oe})

(b) Explain the difference between a.c. small signal amplifier and power amplifier. 5

5. (a) Design class B power amplifier using transformer coupling to obtain 5 Watt output in 4 ohm load. Assume V_{CC} 12V and select suitable transistors from the data table. 15
(b) Differentiate between class A, class B and class C amplifiers. 5

6. (a) Draw circuit diagram of R-C phase shift oscillator. Design the circuit for oscillation frequency of 2 kHz. Assume d.c. supply of 12 V and select suitable transistor from the data table. Neglect h_{re} and h_{oe}. 15
(b) Explain how stability of amplifier with feedback is determined. 5

7. Write short notes on any **three** of the following :– 20
(a) Nyquist plot
(b) Colpitts oscillator
(c) Cross over distortion in class B amplifier.
(d) Crystal oscillator.

DBEC DATA SHEET

Transistor 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_{fc} °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
BC147A	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	—	—	—	—
BC147B	0·25	0·1	0·25	50	45	50	—	6	125	200	290	450	240	330	500	0·9	—	—

Transistor type	hie	hoe	hre	θja
BC 147A	2·7 K Ω	18μ ℧	1·5 × 10^{-4}	0·4°C/mw
2N 525 (PNP)	1·4 K Ω	25μ ℧	3·2 × 10^{-4}	—
BC 147B	4·5 K Ω	30μ ℧	2 × 10^{-4}	0·4°C/mw
ECN 100	50 Ω	—	—	—
ECN 149	15 Ω	—	—	—
ECN 055	12 Ω	—	—	—
2N 3055	6 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

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 ℧	6	50 KΩ	2 mW/°C	0·59°C/mW
BFW 11 (typical)	30	30	30	300 mW	200°C	7 mA	5600 μ ℧	2·5	50 KΩ	—	0·59° C/mW

SE - ETRX - OLD 23/5/14
Sem - IV - DSD - II

(OLD COURSE) QP Code : **MV-18834**

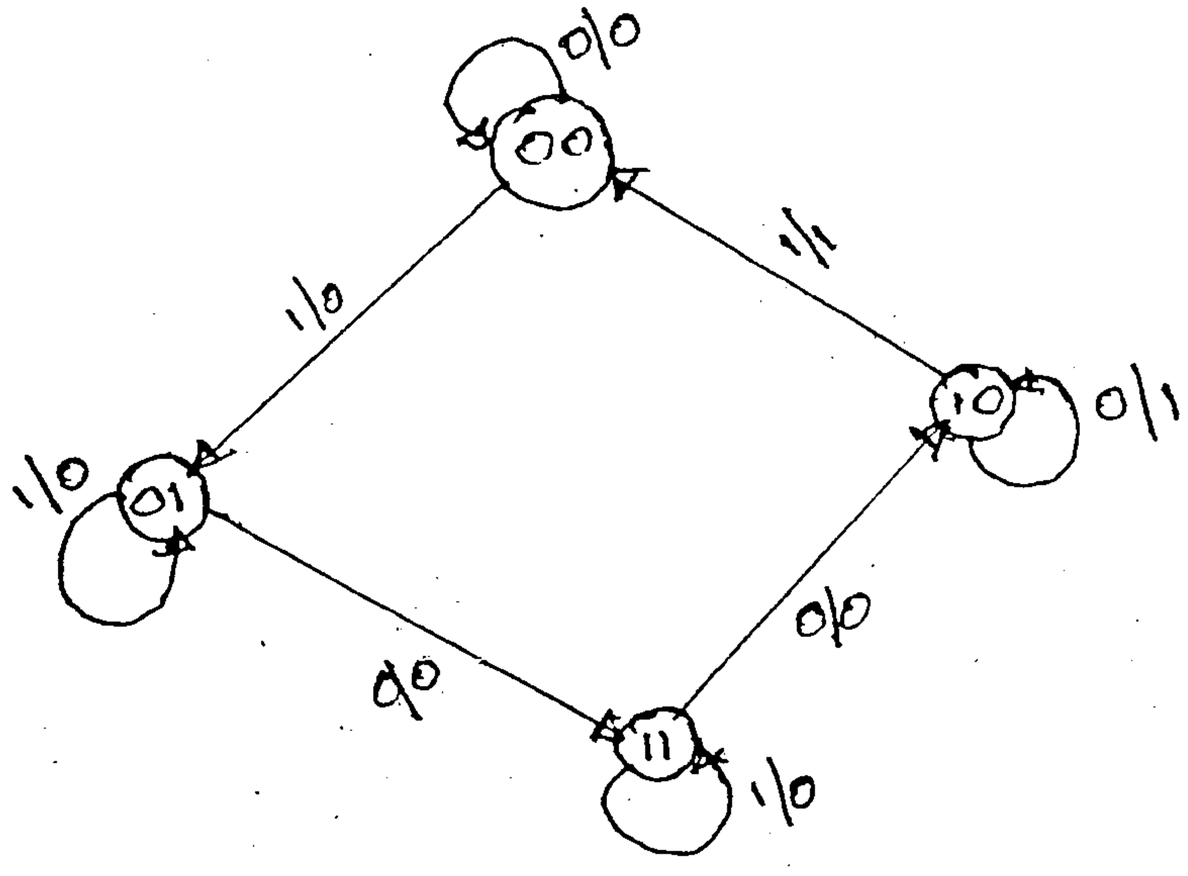
(3 Hours) **[Total Marks : 100**

N.B. (1) Question no. **1** is **compulsory.**
(2) Attempt any **four** questions out of questions no. **2** to 7.

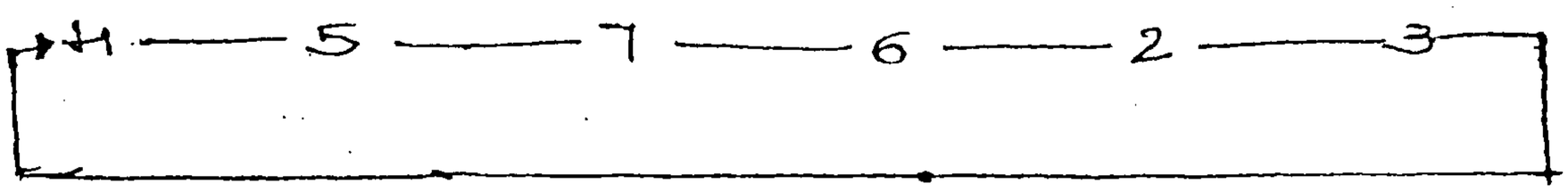
1. (a) Explain Moore and Mealy sequential circuits. **5**
(b) List the predefined datatypes and their declarations in VHDL. **5**
(c) Compare synchronous and Asynchronous sequential machines. **5**
(d) Compare SRAM and DRAM memory. **5**

2. (a) Write a VHDL code for multiplexer IC 74151. **10**
(b) With reference to XC 9500 CPLD family explain : **10**
(i) Architecture of functional block
(ii) Product term allocator and macro cell architecture.

3. (a) What are ring counters and twisted ring counter. Design Johnson counter using IC 74194 universal shift register. **10**
(b) For the state diagram shown below design the clocked sequential circuit using T flipflops. **10**



4. (a) Design asynchronous counter using JK flipflops which runs through a sequence of **10**



Flipflop responds to a positive edge of a clock pulse.
(b) Using structural modeling, write a VHDL code for full adder by using half adder. **10**

[TURN OVER

5. (a) Reduce the state table using implication chart method and design state machine using DFF. Use decoder for generation of excitation inputs. **10**

Present State	Next state			
	x = 0	z	x = 1	z
S_0	S_4	0	S_3	1
S_1	S_5	0	S_3	0
S_2	S_4	0	S_1	1
S_3	S_5	0	S_1	0
S_4	S_2	0	S_5	1
S_5	S_1	0	S_2	0

(b) Write a VHDL code for mod 8 synchronous counter. **10**

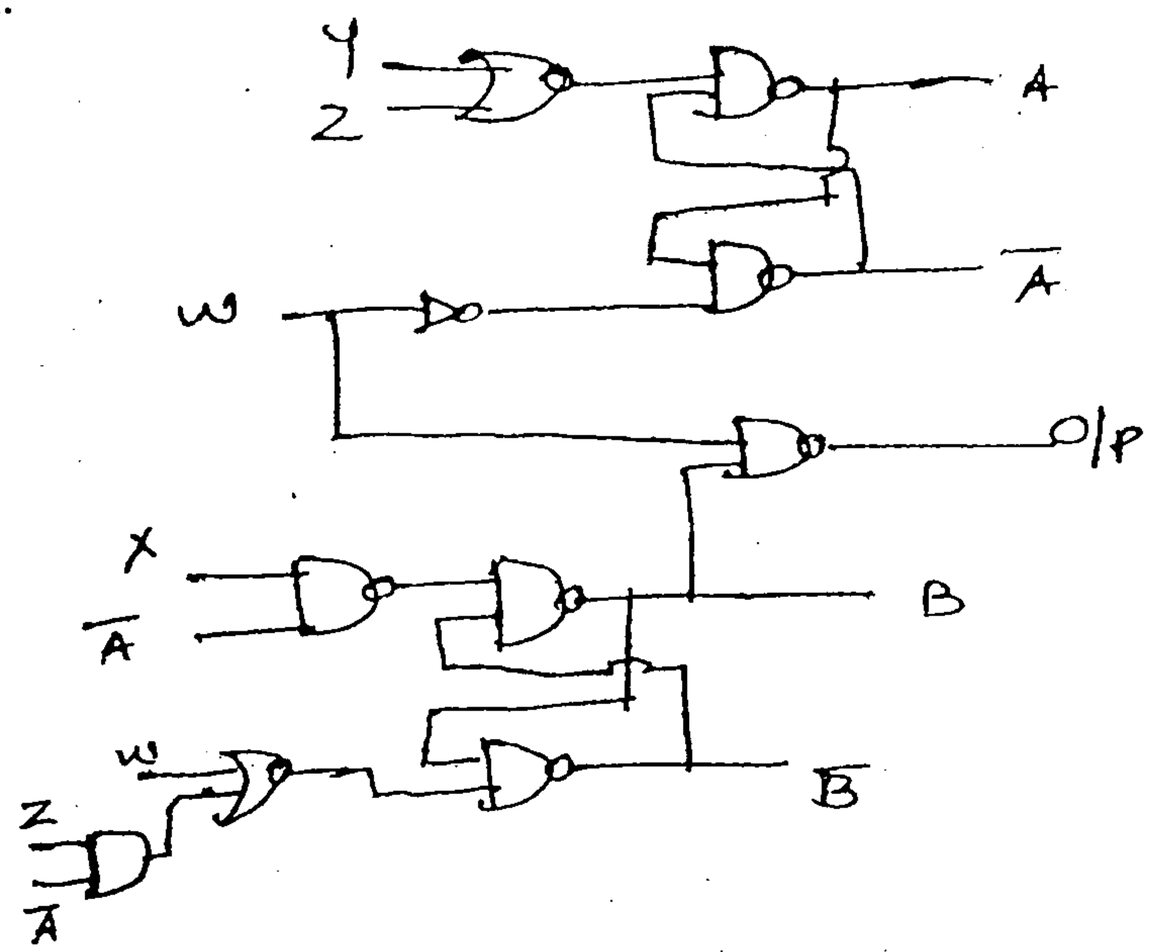
6. (a) Design a mod-8 synchronous counter using JK flipflop. Also draw a timing diagram. **10**

(b) Write notes on : – **10**

(i) Different modeling styles in VHDL

(ii) Application of shift registers

7. (a) Analyse the pulse mode asynchronous sequential machine and obtain the state diagram. **10**



(b) Draw and explain SRAM architecture. **10**

SE sem IV (ETRX) (CBSGS) BADCS 4/6/2014

(OLD COURSE) **QP Code : MV-18910**

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

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

1. (a) Explain elements of communication. **20**
(b) What is need of modulation ?
(c) Explain VSB system.
(d) Explain function of R.F. Amplifier in radio receiver stage
(e) Explain Sampling theoram.

2. (a) Explain function of Balance modulator in A.M. **10**
(b) Explain ISB system. **10**

3. (a) Explain indirect F.M. generation technique. **10**
(b) Draw any explain frequency spectrum of F.M. system. **5**
(c) Compare narrow band and wide band of F.M. **5**

4. (a) What is need of Superhetrodyne Radio Receiver ? **10**
(b) Explain ratio detector. **10**

5. (a) Explain PCM system. **10**
(b) What is aliasing effect, how to avoid it ? **10**

6. (a) Explain PWM system. **10**
(b) Explain Adaptive Delta modulator. **10**

7. Write short notes on any **three** :— **20**
(a) FDM
(b) Modulation index of AM
(c) Delta modulator
(d) Filter method for SSB generation.

B.E (ETRX) (old)
EEMIM Sem IV

16 June 2014

(OLD COURSE)

QP Code : MV-18981

(3 Hours)

[Total Marks : 100

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

1. Answer the following :–
   (a) Explain the operation of Megger **5**
   (b) Compare analog and digital phase meter **5**
   (c) Explain how components can be tested on CRO **5**
   (d) What is back emf. Explain its significance. **5**

2. (a) Explain different methods of A to D conversions. **10**
   (b) Draw and explain Maxwell's inductance bridge with phasor diagram. **10**

3. (a) Explain the working principle of 3-ϕIM. Explain V/F method of speed control of IM. **10**
   (b) Explain the various performance parameters of DVMs. **10**

4. (a) What are the essentials of indicating instruments. Explain it in detail. **10**
   (b) Explain the operation of PMMC and moving iron type of instruments in detail. **10**

5. (a) Draw the front panel of CRO and explain the functions of various controls. **10**
   (b) Write a note of digital storage oscilloscope. **10**

6. (a) Explain a neat block diagram and waveforms with the operation of digital phase meters. State its advantages and limitations. **10**
   (b) With the help of neat diagrams explain the working of a digital frequency meter. How it is used for time internal measurement. **10**

7. Write short note (any **three**) : – **20**
   (a) BFO
   (b) FET voltmeter
   (c) AF signal generator
   (d) Electrodynamometer waltmeter.
