SE | ETRX | IV OLD. 15|5|15.

~~AEM. IV~~

AEM

**Q.P. Code : 4032**

**(OLD COURSE)**

(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.
(4) Use of statistical table is allowed.

1 (a) If, $A=\begin{bmatrix} -1 & 0 & 0 \\ 2 & -3 & 0 \\ 1 & 4 & -2 \end{bmatrix}$ find the eigen values of $A^2$. 5

(b) Find the solution of $5 * x = 2$ 5

(i) In the group of real numbers under the binary operation
$a * b = a + b - 1$

(ii) In the group of rational numbers different from -3 under the binary operation $a * b = a + b + \frac{ab}{3}$

(c) Determine the pole of the function : 5

$f(z)=\frac{z^2}{(z-1)^2(z+2)}$ and also find the residue at each pole.

(d) 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 the mean and variance.

2. (a) Find the Laurent's series for : 6

$f(z)\frac{4x+3}{z(z-3)(z+2)}$ valid for $2 < |z| < 3$

(b) With usual notation find P of Binomial distribution if $n = 6$, $9P(X = 4) = P(X = 2)$ 6

(c) Show that the matrix $A=\begin{bmatrix} 8 & -6 & 2 \\ -6 & 7 & -4 \\ 2 & -4 & 3 \end{bmatrix}$ is diagonalisable. Find the transforming matrix and the diagonal matrix. 8

3. (a) Ten school boys were given a test in statistics and their scores were recorded. They were given a months special coaching and a second test was given to them in the same subject at the end of the coaching period. Test if the marks given below give evidence to the fact that the students are benefitted by coaching. 6

Marks in Test I : 70, 68, 56, 75, 80, 90, 68, 75, 56, 58

Marks in Test II : 68, 70, 52, 73, 75, 78, 80, 92, 54,56

(b) Find the characteristic equation of the matrix. 6

$\begin{bmatrix} 2 & -1 & 1 \\ -1 & 2 & -1 \\ 1 & -1 & 2 \end{bmatrix}$ and verify that it is satisfied by A and hence find $A^{-1}$.

(c) Let L = {1, 2, 3, 6} and R be the relation 'is divisible by' Prove that L is a lattice. 8

4. (a) Using normal distribution. find the probability of getting 55 heads in the toss of 100 fair coins. 6

(b) Evaluate $\int_C \frac{dz}{z^3(z+4)}$, where C is the circle $|z| = 2$ 6

(c) The means of two samples of sizes 1000 and 2000 respectively are 67.50 and 68.0 inches. Can the samples be regarded as drawn from the same population of standard deviation 2.5 inches, at 0.27% level of significance. 8

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

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

(b) If $f : \{R-(2/5)\} \to \{R-(4/5)$ is a function defined by $f(x)=\frac{4x+3}{5x-2}$, prove that f is a bijection and find $f^{-1}$. 6

(c) A random variable X has the following probability mass function. 8

| | | | | |
|---|---|---|---|---|
| X | : | -2 | 3 | 1 |
| P(X = x) | : | 1/3 | 1/2 | 1/6 |

Find (i) first four raw moments
(ii) first four central moments

6. (a) For x, y, $\in Z$, xRy if and only if $2x + 5y$ is divisible by 7. Is R an equivalence relation ? 6

(b) If $A=\begin{bmatrix} \pi & \pi/4 \\ 0 & \pi/2 \end{bmatrix}$, find cos A 6

(c) The following table gives the number of accidents in a city during a week. Find whether the accidents are uniformly distributed over a week. 8

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Day | : | Sun | Mon | Tue | Wed | Thu | Fri | Sat | Total |
| No.of accidents | : | 13 | 15 | 9 | 11 | 12 | 10 | 14 | 84 |

7. (a) Evaluate $\int_0^{2\pi} \frac{\cos 2\theta}{5+4\cos\theta} d\theta$ 6

(b) Find the Binomial distribution if the mean is 4 and variance is 3. Find also its mode. 6

(c) Prove that $Z_4$ is a ring under addition and multiplication modulo 4. 8

DSD-II ETRX Sem IV (OLD)

21st May 20k

**(OLD COURSE)** QP Code : **4034**

(3 Hours) [ Total Marks : 100

N. B. : (1) Question no **1** is **compulsory**.
(2) Solve any **four** from remaining **six** questions.
(3) **Figures** on **right** indicate **maximum marks**.

1. Answer any four of the following questions. **20**
   (a) List the features of VHDL.
   (b) Compare Synchronous counters and Asynchronous counters.
   (c) Draw 4 bit ring counter using universal shift register IC 74194. Also draw its output waveforms w.r.t. clock.
   (d) Draw a state diagram of Moore type sequence detector that detects the sequence, '010100'. Overlapping of sequence is allowed.
   (e) Name various Programmable Logic Devices and explain the advantages of using those. **10**

2. (a) Design a synchronous counter that counts following count in binary.
   $011 \rightarrow 100 \rightarrow 010 \rightarrow 111 \rightarrow 101 \rightarrow 000 \rightarrow 011$ **10**
   (b) Write a VHDL code for 4 bit binary counter with clear, and clock. **10**

3. (a) Reduce the following state table and draw the state diagram for the reduced table.

| Present state | Next state | | O/P (z) | |
|---|---|---|---|---|
| | x=0 | x=1 | x=0 | x=1 |
| $S_0$ | $S_4$ | $S_3$ | 0 | 1 |
| $S_1$ | $S_5$ | $S_3$ | 0 | 0 |
| $S_2$ | $S_4$ | $S_1$ | 0 | 1 |
| $S_3$ | $S_5$ | $S_1$ | 0 | 0 |
| $S_4$ | $S_2$ | $S_5$ | 0 | 1 |

**10**

   (b) Design and explain the working of mod 50 counter using decade counter IC 7490.

[ TURN OVER

4. (a) Explain different modeling styles in VHDL with suitable examples. **10**
   (b) Design a sequential state machine that receives bits at its input terminal'S' serially in synchronism with the clock. It makes the output Z=1 when consecutive three 0's are received at the input. Otherwise Z remains low. **10**

5. (a) Write a VHDL code for Half adder. Declare it as a component. Using this component, design a Full adder. **10**
   (b) Write a VHDLcode for 3:8 decoder with active low enable. **10**

6. (a) Draw and explain the architecture of Xilinx XC 4000 FPGA family. **10**
   (b) Design a mod 8 Up/ Down synchronous counter that counts in Up direction when mode input M=0 and in Down direction when M=1. Use D flip flops and gates. **10**

7. Write short notes on (Any **three**) :– **20**
   (a) SRAM architecture
   (b) Shift Register and its applications
   (c) State assignment rules in designing a state machine
   (d) Functional block of Xilinx 95xx family CPLD

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/ S.E. Sem. IV Old - E7RX3 27/05/2015
ECAD

**(OLD COURSE)**

**QP Code : 4039**

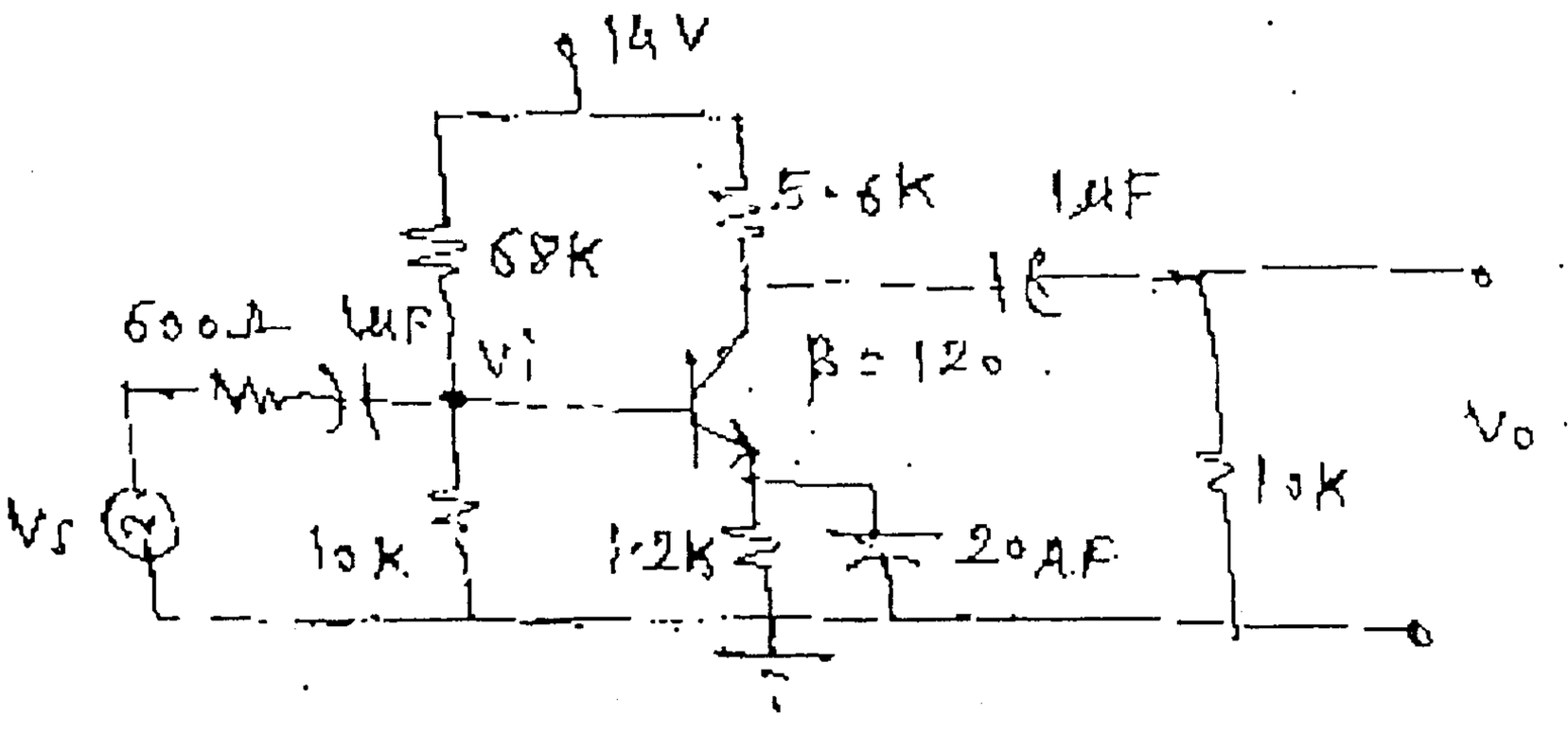
(3 Hours) **[ Total Marks :100**

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

1. (a) Design two stage JFET based CS Amplifier for AV $\geq$ 500, Vo = 3V use suitable biasing circuit. **15**
(b) From the designed circuit calculate Ri, Ro and Av. **5**

2. (a) Which components affect high frequency reswponse of JFET amplifier and hence derive equation of higher cut off frequency of JFET amplifier. **10**
(b) State the properties of crystal and hence explain different types of crystal oscillators, also state the different applications of it. **10**

3. (a) For the given circuit find : **10**
(i) re (ii) Avmid $\frac{Vo}{Vi}$ (iii) Lower cut off frequency




(b) Design RC phase shift oscillator to generate frequency of 20KHz. **10**

4. (a) What are the advantages of -ve feedback amplifiers, give the topologies of different -ve feedback amplifiers. **10**
(b) Design class B power amplifier to give output of 15W for 8Ω load. **10**

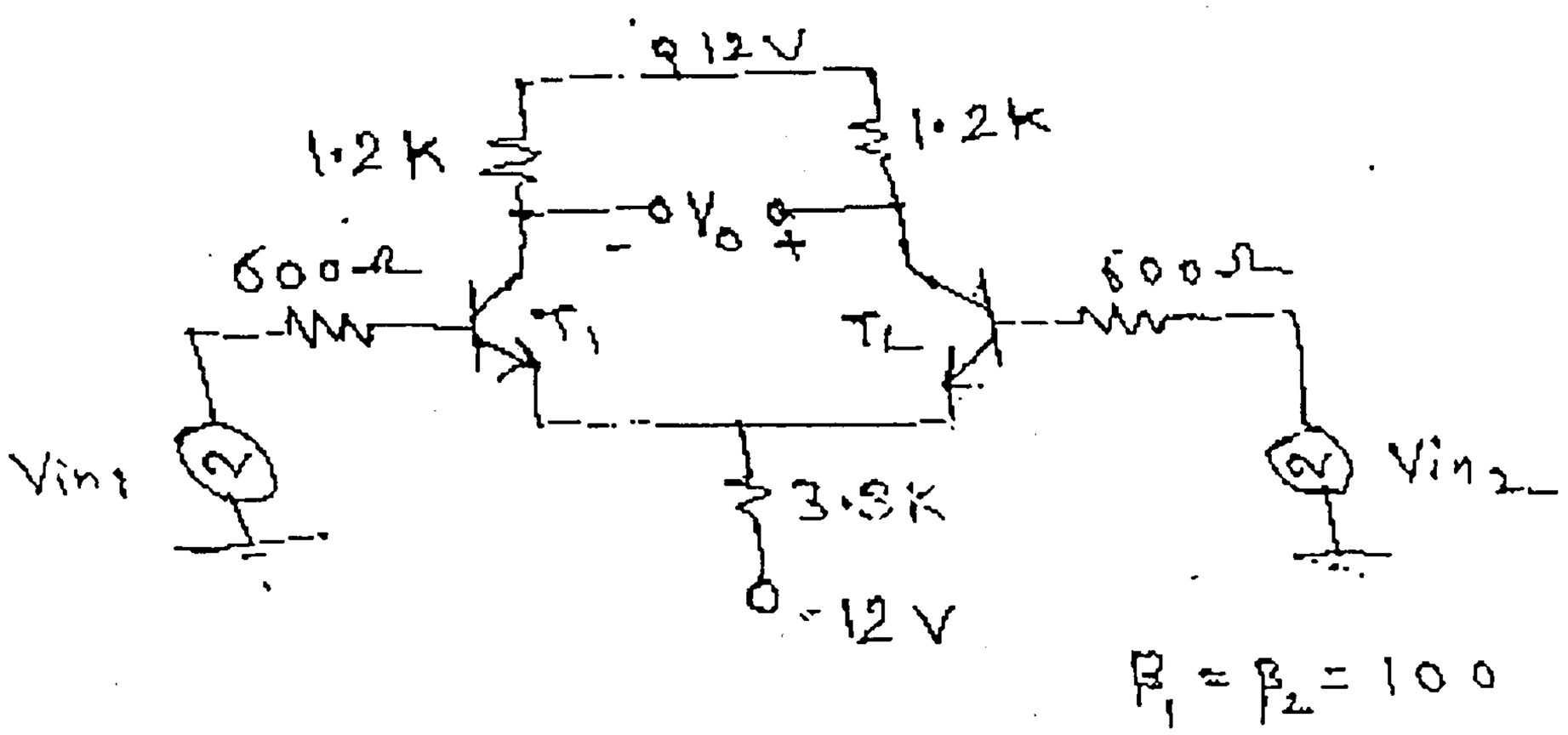
5. (a) Compare power amplifier with voltage amplifier and derive equation of efficiency of direct coupled series fed class A power amplifier. 10

(b) What do you mean by CMRR, how it can be improved in differential amplifier. 10

6. (a) Derive equation of $R_{iF}$, $R_{oF}$ and $A_F$ for voltage shunt type -ve feedback amplifier. 10

(b) For the given differential amplifier determine : 10

(i) Icq (ii) VCEq (iii)ACM (iv) Adm (v) CMRR.




7. Write short notes on any four : 20

(a) CASCODE Amplifier

(b) Types of power Amplifiers

(c) Differential Amplifiers

(d) Characteristics of -ve feedback Amplifier

(e) Clapp oscillator.

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QP Code : 4039

| Transistor type | $P_{dmax}$ @ 25°C Watts | $I_{cm}$ @ 25°C Amps. | $V_{CEO(sus)}$ volts d.c. | $V_{ceo}$ volts d.c. | $V_{cbo}$ (Sus) volts d.c. | $V_{ceo}$ (Sus) volts d.c. | $V_{ceo}$ volts d.c. | $V_{ebo}$ volts d.c. | $T_j$ max. °C | D.C. current gain min | D.C. current gain typ. | D.C. current gain max. | Small Signal min. | Signal typ. | $h_{fe}$ max. | $V_{ce}$ max. | $\theta_{ja}$ °C/W | Derate above 25°C W/°C |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2N 3055 | 115.5 | 15.0 | 1.1 | 100 | 100 | 70 | 100 | 7 | 200 | 20 | 60 | 70 | 15 | 50 | 120 | 1.8 | 1.5 | 0.7 |
| ECN 055 | 80.0 | 5.0 | 1.0 | 60 | 60 | 55 | 60 | 5 | 200 | 25 | 50 | 100 | 25 | 75 | 125 | 1.5 | 3.5 | 0.4 |
| ECN 140 | 30.0 | 4.0 | 1.0 | 50 | 40 | – | – | 8 | 150 | 30 | 50 | 110 | 33 | 80 | 115 | 1.2 | 4.0 | 0.3 |
| ECN 100 | 8.0 | 0.7 | 0.8 | 70 | 60 | 65 | – | 6 | 200 | 60 | 90 | 260 | 50 | 90 | 280 | 0.9 | 35 | 0.05 |
| BC 147A | .0.25 | 0.1 | 0.25 | 50 | 45 | 50 | – | 5 | 125 | 115 | 180 | 220 | 125 | 220 | 290 | 0.9 | – | – |
| 2N 525 (PNP) | 0.225 | 0.5 | 0.25 | 25 | 30 | – | – | – | 100 | 35 | – | 65 | – | 45 | – | – | – | – |
| BC 147 B | 0.25 | 0.1 | 0.25 | 50 | 45 | 50 | – | 5 | 125 | 200 | 290 | 460 | 240 | 330 | 500 | 0.9 | – | – |

| Transistor type | $h_{ie}$ | $h_{oe}$ | $h_{re}$ | $h_{fe}$ |
|---|---|---|---|---|
| BC 147 A | 2.7kΩ | 18μmho | $1.5 \times 10^{-4}$ | 0.4°C/mW |
| 2N 525 (PNP) | 1.4kΩ | 25μmho | $3.2 \times 10^{-4}$ | — |
| BC 147B | 4.5kΩ | 30μmho | $2 \times 10^{-4}$ | 0.4°C/mW |
| ECN 100 | 600Ω | – | — | — |
| ECN 140 | 150Ω | – | — | — |
| ECN 055 | 120Ω | – | — | — |
| 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 | 2.8 | 3.0 | 3.5 | 4.0 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| $I_{ds}$ max. mA | 10 | 9.0 | 8.5 | 7.5 | 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 | 0.3 | 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 | $V_{GS\ max.}$ Volts | $V_{DG\ max.}$ Volts | $V_{GS\ max.}$ Volts | $P_{d\ max.}$ @ 25°C | $T_{j\ max.}$ | $I_{GSS}$ | $\vert I_{fs} \vert$ (typical) | $-V_p$ Volts | $r_{ds}$ | Derate above 25°C | $\theta_{ja}$ |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 2N3822 | 50 | 50 | 50 | 300 mW | 175°C | 2 nA | 3000 μ mho | 8 | 80 KΩ | 2 mW/°C | 0.58°C/mW |
| BFW 11 (typical) | 30 | 30 | 30 | 300 mW | 200°C | 7 nA | 6500 μ mho | 2.5 | 80 KΩ | — | 0.58°C/mW |

RJ-Con. : 10835-15.

S.E. (SEM IV) (OLD)
ETRX
ELECTRONIC & ELECTRICAL MEASURING INSTRUMENTS & MACHINE
DT. 12/06/15

**(OLD COURSE)** QP Code : **4044**

(3 Hours) [ Total Marks : 100

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

1. Answer any **four** :– 20
   (a) State the requirements of good laboratory type signal generator.
   (b) Explain the operation of a megger.
   (c) Compare analog nad digital phase meter.
   (d) Explain multirange ohm meter with neat diagram.
   (e) Explain the stepper motor characterstics.

2. (a) Draw neat diagram of front panel of dual trace oscillascope and explain it in detail. 10
   (b) What are essentials of indicating instruments. Explain it in detail. 10

3. (a) Explain digital phase meter using Flip-flop. Write its advantages and disadvantages. 10
   (b) Explain the principle of operation of PMMC and moving Iron type of instruments. Compare the two basic types. 10

4. (a) Explain different methods of D to A converters. 10
   (b) What is z-modulation in CRO for what purpose it is used. Can the frequency and phase difference be measured using z-modulation. 10

5. (a) Explain the measurement of self inductance with maxwells bridge with vector diagram. Write advantages and disadvantages. 10
   (b) Explain with the block diagram basic elements of a laboratory type function generator. Which is the basic function generated. How the frequency is controlled & how the sine function is generated. 10

6. (a) Explain the various performance parameters of DVM. 10
   (b) Explain the need of starter for induction motor what are various types of starters used for IM. Explain any one in detail. 10

7. Write short notes on (any **three**) :– 20
   (a) FET voltmeters
   (b) Weston type frequency meter
   (c) Derivation of torque equation for moving iron meter
   (d) Power factor meter

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