3E1614

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3E1614

B.Tech. III Semester (Main/Back) Examination, Dec. - 2016
Applied Elect. & Inst. Engg.
3AI3 Circuit Analysis & Synthesis
EC, EI, EX, AI, BM

Time : 3 Hours **Maximum Marks : 80**
Min. Passing Marks : 26

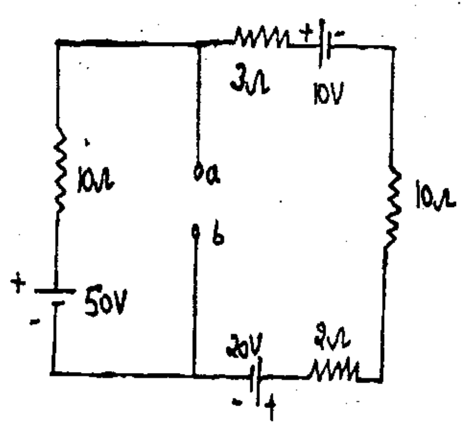
Instructions to Candidates:

*Attempt any **five** questions, selecting one question from **each unit**. All questions carry equal marks. (Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used/calculated must be stated clearly.*

Unit - I

1. a) State and explain Thevenin's theorem with the help of suitable example. **(8)**

   b) Using superposition theorem, find the current through a link is to be connected between terminals a-b. Assume the link resistance to be zero.

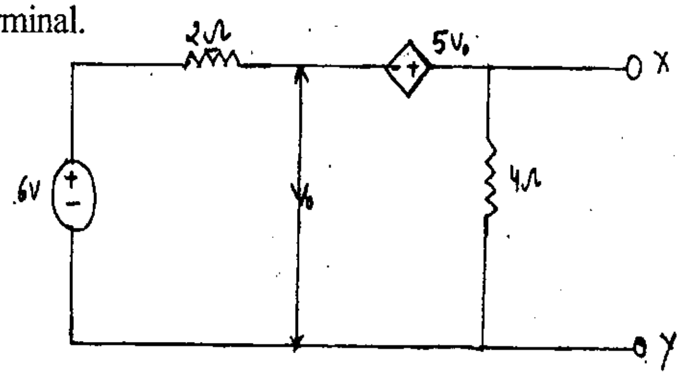


(8)

OR

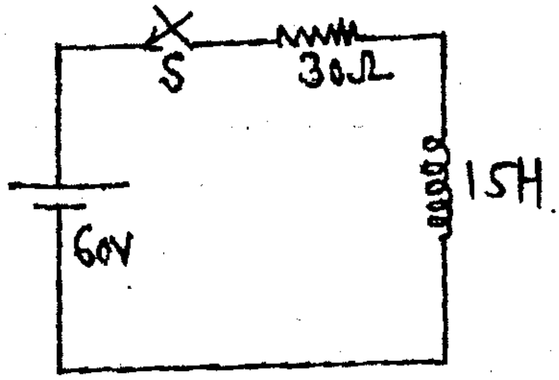
1. a) State and prove maximum power transfer theorem. **(8)**

   b) Find the Norton's equivalent of the circuit shown in figure at the left of X-Y terminal. **(8)**



Unit - II

2. a) A series RL circuit with $R=30\Omega$ and L = 15 H has a constant voltage V = 60V applied at t = 0 as shown in fig. Determine the current i, the voltage across resistor and the voltage across the inductor.



(8)

b) Explain different types of functions used in transient analysis. (8)

OR

2. a) Find the transient responses of:

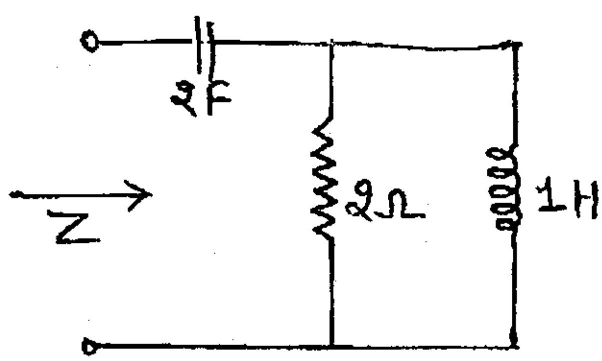
   a) Series R-L

   b) Series R-C circuit having sinusoidal excitation (8)

b) The step voltage applied to a series R-L circuit is 36 V with $R=15\Omega$. Determine the value of inductance L required to make the current of 1.0 A at 250 μ sec. Assume the initial current is zero. (8)

Unit - III

3. a) Find Z(s) for the following network. (8)



b) Explain the relationship between pole position and stability. (8)

OR

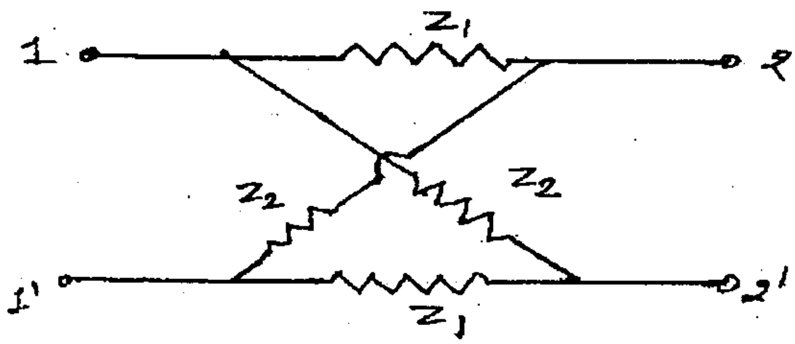
3. a) Obtain the pale zero diagram of the given function and obtain the time domain response.

$$I(S)=\frac{2S}{(S+1)(S^2+2S+4)}$$ (8)

b) Check whether the following polynomial $P(S)=S^4+S^3+2S^2+2S+3$ is stable or not comment on your findings. **(8)**

Unit - IV

4. a) For the lattice two port network of fig. Find the image impedance and the image transfer constant.



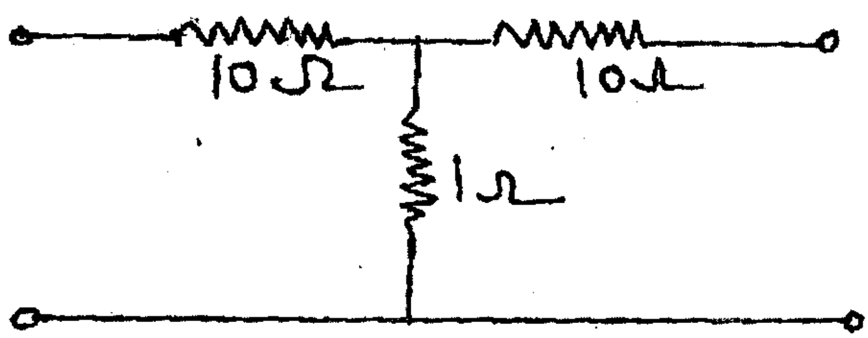
(8)

b) Derive Z-parameters in terms of hybrid parameters. **(8)**

OR

4. a) Derive the condition for reciprocity and symmetry in case of ABCD parameters. **(8)**

b) Two identical T section, as one shown in fig. are connected in cascade. Determine the Z-parameters of the combination.



(8)

Unit - V

5. An impedance is given by $Z(s)=\dfrac{8(S^2+1)(S^2+3)}{5(S^2+2)(S^2+4)}$ Realise the network in Foster - I, II and cauer - I, II form. **(16)**

OR

5. Realise the function $z(s)=\dfrac{s\left(s^2+4\right)}{2\left(s^2+1\right)\left(s^2+9\right)}$ in both the cauer and foster forms of LC networks. **(16)**

3E1615

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3E1615

B.Tech. III Semester (Main/Back) Examination, Dec. - 2016
Electronic Instrumentation & Control Engineering
3EI5A Electromagnetic Properties of Materials
EC, EI

Time : 3 Hours **Maximum Marks : 80**
Min. Passing Marks : 26

Instructions to Candidates:

*Attempt any **five questions,** selecting **one** question from **each unit.** All questions carry **equal** marks. Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used/calculated must be stated clearly.*

Unit - I

1. a) Define relative permittivity, dipole moment, electronic polarization, and polarization vector. **(8)**

   b) The electronic polarizability of the Ar atom is 1.7×10^{-40} Fm^2. What is the static dielectric constant of solid Ar (below 84 K) if its density is 1.8 gcm^{-3}? **(8)**

OR

1. a) Define dielectric loss, loss tangent energy store, and loss in dynamic polarization. **(8)**

   b) From the following equivalent definition of the coupling coefficient,

$$k^2 = \frac{mechanical\ energy\ stored}{Total\ energy\ stored}$$

Show that $k^2 = 1 - \frac{fs^2}{fa^2}$ Given that typically for an X-cut quartz crystal, k = 0.1, what is f_a for f_s = 1MHz? What is your conclusion. **(8)**

Unit - II

2. a) Classify the magnetic materials and provide a summary of the magnetic properties of these classes of materials. **(10)**

   b) Define and explain the soft and hard magnetic materials. **(6)**

OR

2. a) Define magnetic flux density, magnetic permeability, magnetic susceptibility and magnetostatic energy. **(8)**

   b) A paramagnetic material has 10^{28} atoms/matms^3. The magnetic moment of each atom is 1.8×10^{-23} amperemetre^2. Calculate the paramagnetic susceptibility at 300 K. What would be the dipole moment of a bar of this material 0.1 meter long and 1 sq.cm cross - section placed in a field of 8×10^4 ampere/metre? **(8)**

Unit - III

3. a) Explain the degenerate and non - degenerate semiconductors. **(5)**

   b) Explain direct and indirect band gap semiconductors? **(5)**

   c) Describe the electrical properties of semiconducting materials. **(6)**

OR

3. a) What is effect of temperature on semiconducting materials? Discuss. **(5)**

   b) Describe the thermistors and sensitors **(5)**

   c) Explain the variation of semiconductor conductivity, resistance and bandgap with doping. **(6)**

Unit - IV

4. a) Explain electrical conductivity and mobility of metals. Show that electrical conductivity of metal is directly proportional to the square root of temperature. **(8)**

   b) Evaluate the temperature at which there is one percent probability that a State, with an energy 0.5 eV above the Fermi energy will be occupied by an electron. **(8)**

OR

4. a) Write short notes on : Type I and Type II superconductors. **(6)**

   b) A super conducting Sn has a critical temperature of 3.7 k is zero magnetic field and a critical field of 0.306 T at 0K, Find the critical field of 2k. **(5)**

   c) Calculate the critical current which can flow through a long thin superconducting wire of aluminium of diameter 1 mm. The critical magnetic field for Al is 7.9×10^3 ampers/metre. **(5)**

Unit - V

5. a) What is the nanomaterials and explain the change in band structure at nano - stage. **(8)**

   b) Explain the fabrication & characterization of manomaterials. **(8)**

OR

5. a) Describe the structure of single wall and multi - wall carbon nanotube. **(6)**

   b) Describe the electronic and optical properties at nano stage of material. **(5)**

   c) List the potential applications of nano materials? **(5)**

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3E1616

B.Tech. III Semester (Main&Back) Examination - 2016

Applied Elect. & Inst. Engg.

3AI1 Mathematics III/Advanced Engg. Mathematics - I

EC, EIC, BM, AI, CR, PE, PC

Time : 3 Hours **Maximum Marks : 80**

Min. Passing Marks : 26

Instructions to Candidates:

*Attempt any **five** questions, selecting **one** question from **each unit**. All questions carry **equal** marks. (Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used/calculated must be stated clearly.)*

Unit - I

1. a) Find the Laplace transform of the following functions :

   i) $\cos(at)\ \cosh(at)$

   ii) $t^2 e^t \sin 3t$

   b) Use Laplace transform theory to solve the equation

   $$\left(D^2 - 3D + 2\right)x = 1 - e^{2x}, x(0) = 1, x'(0) = 0. \text{ Where } D = \frac{d}{dt}.$$

OR

1. a) Find the inverse Laplace transform of the following functions :

   i) $\dfrac{4s+5}{(s-1)^2(s+2)}$

   ii) $\dfrac{e^{-2s}}{s-3}$

   b) Use Laplace transform theory to solve

   $$\frac{\partial u}{\partial t} = \frac{\partial^2 u}{\partial x^2}, u(x,0) = 3\sin 2\pi x,\ u(0,t) = 0, u(1,t) = 0, \text{ where } 0 < x < 1,\ t > 0.$$

Unit - II

2. a) Find the Fourier series for $f(x)=x+x^2, -\pi<x<\pi$. Hence show that

$$\frac{\pi^2}{6}=1+\frac{1}{2^2}+\frac{1}{3^2}+..........$$

b) i) Find z-transform of $\{a^k\}; k\geq 0$

ii) Find Z-transform of $\{f(k)\}$ where $f(k)=\begin{cases}4^k; k<0\\3^k; k\geq 0\end{cases}$

OR

2. a) The following table gives the variations of a periodic current over a period

t(secs)	0	$\frac{T}{6}$	$\frac{T}{3}$	$\frac{T}{2}$	$\frac{2T}{3}$	$\frac{5T}{6}$	T
A (amps)	1.98	1.30	1.05	1.30	-0.88	-0.25	1.98

Show by harmonic analysis that there is a direct current part of 0.75 amp. in the variable current and obtain the amplitude of the first harmonic.

b) Find the sequence $\{f(k)\}$ if $f(z)=\frac{z}{z-a}$ for

i) $|z|>|a|$

ii). $|z|<|a|$

Unit - III

3. a) Find the Fourier sine and cosine transform of $f(x)$, where

$$f(x)=1, \ \textit{for } 0<x<a$$
$$=0, \ \textit{for } x>a$$

b) Solve $\frac{\partial u}{\partial t}=\frac{\partial^2 u}{\partial x^2}$, given that $u_x(0,t)=0$ and $u(x,0)=\begin{cases}x, & 0\leq x\leq 1\\0, & x>1\end{cases}$ u (x,t) is bounded and $x>0$, $t>0$.

OR

3. a) Find the Fourier sine and cosine transform of $f(x)=e^{-x}, x\geq 0$. Also, show that

$$\int_0^\infty \frac{x\sin mx}{x^2+1}dx=\frac{\pi}{2}e^{-m}, m>0.$$

b) Solve the heat equation $\frac{\partial u}{\partial t} = c^2 \frac{\partial^2 u}{\partial x^2}, -\infty < x < \infty, t > 0$. Subject to $u(x,0) = f(x)$,

where $f(x) = \begin{cases} u_0, & |x| < a \\ 0, & |x| > a \end{cases}$

Unit - IV

4. a) Define an analytic function. If $f(z) = u + iv$ is an analytic function of $z = x + iy$ and $u - v = e^x(\cos y - \sin y)$, find f(z) in terms of z.

b) Evaluate the following integral by using Cauchy's integral formula $\int_c \frac{\cos \pi z^2}{(z-1)(z-2)} dz$, where C is the circle $|Z| = 3$.

OR

4. a) Show that the function $u + iv = f(z)$, where

$$f(z) = \begin{cases} \dfrac{x^3(1+i) - y^3(1-i)}{x^2 + y^2} & , z \neq 0 \\ 0 & , z = 0 \end{cases}$$

Satisfies the Cauchy - Riemann equations at the origin, yet $f'(0)$ does not exist.

b) Find the bilinear transformation which maps the points $z = 1, i, -1$ into the points $w = i, 0, -i$. Hence find the image of $|z| < 1$.

Unit - V

5. a) Expand $\frac{1}{z(z^2 - 3z + 2)}$ in Laurent series for the region :

i) $0 < |z| < 1$

ii) $1 < |z| < 2$

iii) $|z| < 2$

b) Determine the poles of the function $f(z) = \frac{z^2}{(z+2)(z-1)^3}$ and the residue at each pole. Hence evaluate $\int_c f(z) dz$, where c is the circle $|z| = 1.5$

OR

5. a) Expand cosz about the point $z=\frac{\pi}{2}$ by Taylor's theorem.

b) Evaluate the following integral by contour integration $\int_{-\infty}^{\infty}\frac{x^2-x+2}{x^4+10x^2+9}dx$

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3E1641

3E1641

B.Tech. III Semester (Main/Back) Examination, Dec. - 2016
Applied Elect. & Inst. Engg.
3AI2 Electronic Devices & Circuits
EC, EIC, EE, EX, AI, BM

Time : 3 Hours **Maximum Marks : 80**
Min. Passing Marks : 26

Instructions to Candidates:

*Attempt any **five** questions, selecting one question from **each unit**. All questions carry **equal** marks. (Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used/calculated must be stated clearly.)*

Unit - I

1. a) Explain Fermi - dirac distribution function. **(8)**

   b) A sample of germanium is doped to the extent of 10^{14} donor atoms/cm^3 and 7×10^{13} acceptor atoms/cm^3. At the room temperature of the sample the resistivity of pure (intrinsic) germanium is 60 $\Omega-cm$. If the applied electric field is 2v/cm, find the total conducting current density. **(8)**

OR

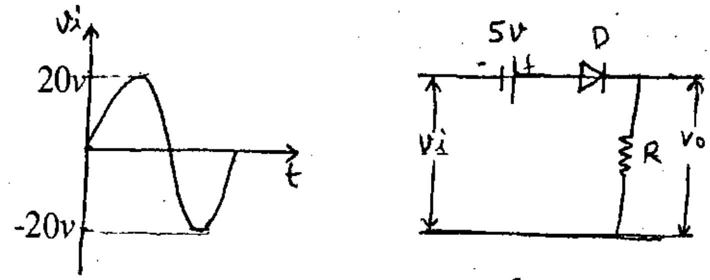
1. a) Explain Hall - Effect and its applications. **(8)**

   b) A uniform silver wire has resistivity = $1.54\times10^{-8}\ \Omega-m$ at room Temperature. Electric field E = 1.2 v/m is applied along the wire. Find average drift velocity and mobility of electrons. Electron density = 6×10^{28}/m^3. **(8)**

Unit - II

2. Draw the output of following circuits :

   Assume diodes are ideal in Fig (A), Fig (B) & Fig (C).

   a) 

   (5)

fig (A)

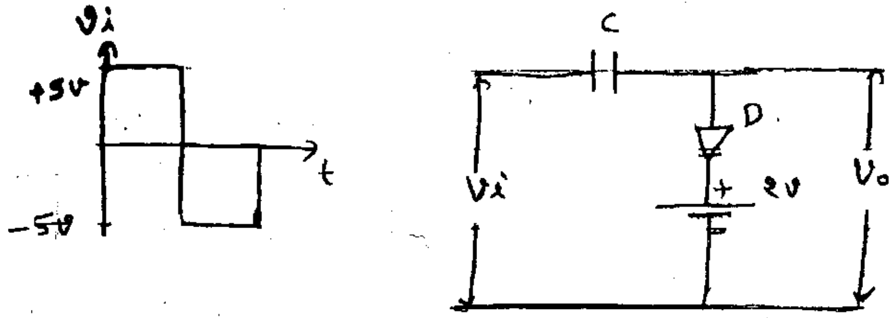
b) 

Fig (B)

(5)

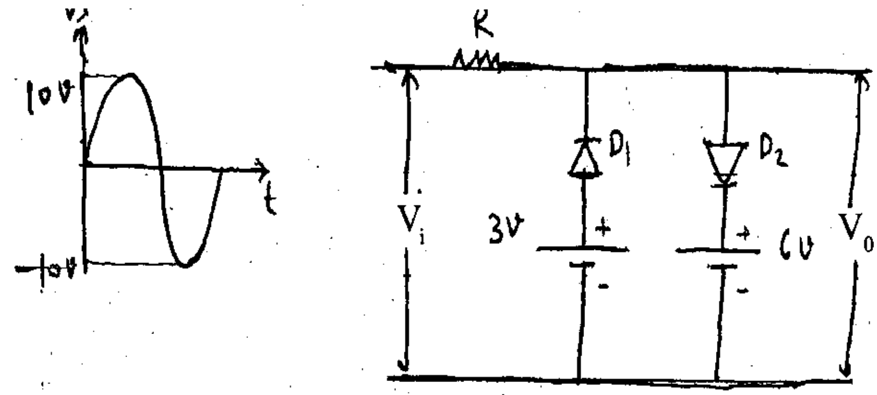
c) 

Fig (C)

(6)

OR

2. a) Draw & explain the working of voltage multiplier circuits? (8)

   b) Draw the characteristics of UJT and explain its working? (8)

Unit - III

3. a) Draw the circuit of Transistor in common emitter configuration & sketch the output characteristics, also indicate the cut off, active and saturation region. (8)

   b) A germanium transistor used in voltage divider bias has V_{cc}=20v, $R_C = 2k\Omega$. The nominal operating point is at V_{CE} = 10 V and I_C = 4mA. If h_{fe} = 50, calculate R_1, R_2, R_E if stability factor S = 10 is desired. (8)

OR

3. a) Draw & explain the circuits of various compensating techniques for a BJT. (8)

   b) The following h - parameters are given for a CE Transistor Amplifier :-

   $h_{ie} = 1100\Omega,\ h_{fe} = 50,\ h_{oe} = 25\mu A/v,\ h_{re} = 2.5\times10^{-4}$ if $R_L = 1k\Omega$ the find : -

   i) Current gain

   ii) Input Impedance

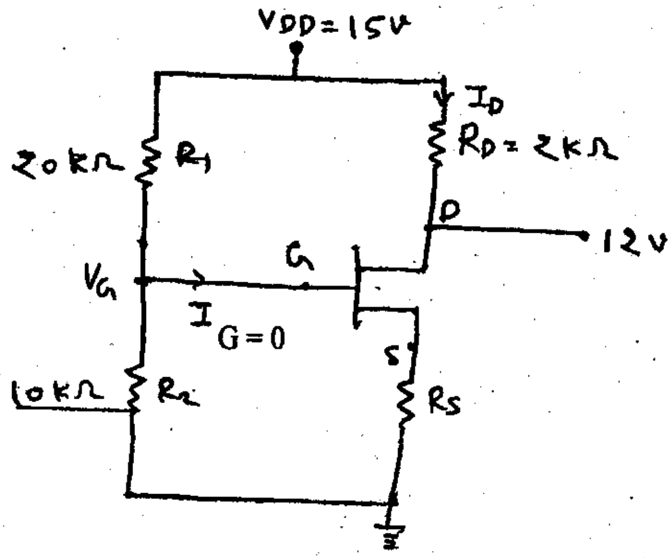
   iii) Voltage gain

   iv) Power gain (8)

Unit - IV

4. a) Draw & explain low frequency small signal model of FET. **(8)**

   b) For circuit shown in fig below with $V_D = 12v$ & $V_{GS} = -2v$ calculate the value of R_s.



(8)

OR

4. a) Explain the working of FET as a Voltage Variable Resistor (VVR) and give its application. **(8)**

   b) An FET follows the following relation :

$$I_D = I_{DSS}\left[1 - \frac{V_{GS}}{V_P}\right]^2$$

$I_{DSS} = 8.4$ mA, $V_P = -3v$, what is the value of I_D. For $V_{GS} = -1.5$ v? Find g_m at this point. **(8)**

Unit - V

5. a) Draw a Darlington emitter follower and explain why the input impedance is higher than that of a single stage emitter follower. **(10)**

   b) Explain Milter's theorem with the aid of a circuit diagram. **(6)**

OR

5. a) Draw and analyse the differential amplifier using BJT. **(8)**

   b) Role of Bootstrapping in darlington Pair. **(8)**

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3E1494

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3E1494

B.Tech. III Sem.(Main&Back) Examination,Dec. - 2016

Electronics & Communication Engg.

3BM4 Electronic Measurements & Instrumentation

Time : 3 Hours

Maximum Marks : 80
Min. Passing Marks : 26

Instructions to Candidates:

*Attempt any **five** questions, selecting one question from **each unit**. All questions carry equal marks. (Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used/calculated must be stated clearly.*

Unit - I

1. a) Defirle the following for Gaussian distribution of data :
   i. Precision index.
   ii. Probable error **(8)**

   b) Write short notes on :
   i. Systematic error
   ii. Normal error **(8)**

OR

1. a) A set of current measurements were taken and readings were taken and readings were recorded as 11.3 mA, 11.6 m, 10.9 mA, 12.1 mA, 11.0 mA, 12.5 mA, and 11.9 mA. Calculate :
   i. Arithmetic mean
   ii. Deviations from the mean **(8)**

   b) Define the following with suitable examples.
   i. Accuracy
   ii. Drift related to the instruments. **(8)**

Unit - II

2. a) What do you mean by the term 'Q-factor'? Explain the working of Q-meter. **(8)**

   b) Explain the construction and working principle of Digit voltmeter with neat sketch. **(8)**

OR

2. a) How will you measure RF power and voltage? What are the problems encountered in such measurements. **(8)**

b) Define the following terms :

i. Shielding.

ii. Grounding

Discuss the techniques to protect the measuring instruments. (8)

Unit - III

3. a) Derive the expression for vertical deflection and deflection sensitivity of an electron beam in a CRT. (8)

b) Explain the following in details :

i. Multibeam and multirace oscilloscope.

ii. Dual storage CRO. (8)

OR

3. a) Explain the working of free running and triggered mode CRO with suitable diagram. (8)

b) Explain the following terms of CRO:

i. Z-axis modulation

ii. Sources of synchronization (8)

Unit - IV

4. a) What is meant by distortion factor? How can distortion factor be measured? (8)

b) What are the various applications of spectrum analyser in an electronic laboratory? Explain in brief. (8)

OR

4. a) Explain the working of frequency synthesized signal generators with neat sketch. (8)

b) Explain the Construction and working of Heterodyne wave analyser. (8)

Unit - V

5. a) Explain the construction details and working principle of LVDT. How displacement is measured by LVDT? (8)

b) What are the thermistors? Explain their different form of construction. Give the characteristics curve with applications of thermistor. (8)

OR

5. Write short notes on the following :

a. Ultrasonic flow meters (8)

b. Thermocouples (8)