Q.2a. **Explain the following characteristics:**
      (i) Accuracy
      (ii) Precision
      (iii) Resolution   **(2×3)**

Answer:
Refer Page Numbers 32 - 33 from **Text Book No. I**
(2 Marks each for every part)

     b. Differentiate between the terms "Dead Time and Dead Zone".   **(5)**

Answer:
Refer Page Numbers 41 from **Text Book No. I**
(2.5 Marks each for each definition)

     c. A 0 - 150 V voltmeter has a guaranted accuracy of 1 % of Full Scale Reading. The voltage measured by this instrument is 75 V. Calculate the (i) Relative Error (ii) Limiting Error in percent.   **(5)**

Answer:
The magnitude of limiting error of the instrument is: $\delta A = \varepsilon_r A_s = 0.01 X 150 = 1.5V.$ **1**

But as per the given data, the magnitude of the voltage being measured is 75 V.

Therefore, the **relative error** at this voltage is :

$$\varepsilon_r = \frac{\delta A}{A_s} = \frac{1.5}{75} = 0.02.$$

2

Hence, the voltage being measured is between the limits of :
$$A_a = A_s\left(1 \pm \varepsilon_r\right)$$ **1**

$$= 75\left(1 \pm 0.02\right)V = 75 \pm 1.5V$$ **1**

The **Percentage Limiting Error is:** $\%\varepsilon_r = \frac{1.5}{75} X 100 = 2\%$ **1**

 Q.3   **a. Draw the circuit diagram of a Wheatstone bridge and derive the conditions of balance and bridge sensitivity with equal arms.**   **(10)**

Answer:
Refer Page Numbers 520 - 522 from **Text Book No. I**
(Circuit diagram – 2 Marks, Condition for balanced – 4 Marks, Condition for bridge sensitivity – 4 Marks)

     b. Enlist the difficulties in measurement of high resistance.   **(6)**

Answer:
Refer Page Numbers 538 & 539 from **Text Book No. I**
(1 Mark each for every point)

Q.4   a.   What are the various effects of frequency on the calibration of a thermocouple? Explain briefly.   **(6)**

Answer:
Refer Page Numbers from 70 & 71 from **Text Book No. II**
(2 Marks each for every factor)

b.   A basic D'Arsonval movement with a Full Scale Deflection of 50 μA and internal resistance of 500 Ω is used as a voltmeter. Determine the value of the multiplier resistance needed to Measure a voltage range of 0 – 10 V.   **(3)**

Answer:
Solution: Given data: Voltage Range (V) = 0 – 10 V.
Full Scale Deflection Current: $I_m = 50\mu A$

and Internal Resistance: $R_m = 500\Omega$

Therefore, the value of the **multiplier resistance** needed to measure the above range of voltage of 0 to 10V is:

2 Marks

$$R_s = \frac{V}{I_m} - R_m = \frac{10}{50\mu A} - 500 = 199.5 K\Omega$$

1 Marks

c.   Explain working of Digital pH meter with neat block diagram.   **(7)**

Answer:
Refer Page Numbers 152 - 153 from **Text Book No. II**
(Block diagram – 4 Marks, Explanation – 3 Marks)

Q.5   a.   Discuss the working principle and applications of the following:-

     (i)   Digital Phase Meter
     (ii)   Voltage to Time Conversion using Dual Slope Integrating Type DVM   **(6+6)**

Answer:
     (i)   Refer Page Numbers 158 & 159 from **Text Book No. II**
         (Block diagram – 4 Marks, Theory – 2 Marks
     (ii)   Refer Page Numbers 116 & 119 from **Text Book No. II**
         (Block diagram – 3 Marks, Derivation and theory – 3 Marks)

b.   Write the working principle and applications of Output Power Meter. (4)

Answer:
Refer Page Numbers 266 & 267 from **Text Book No. II**
(Principle Applications – 2 Marks, Block diagram – 4 Marks)

Q.6   a.   What are the major components of a CRT? Explain the working of Triggered Sweep CRO using block diagram and output waveform.   **(8)**

Answer:
Refer Page Numbers 165 & 177 from **Text Book No. II**
(CRT block diagram – 2 Marks, Explanation of parts of CRT – 2 Marks, Triggered

sweep CRO block diagram 2 Marks, Output waveform and explanation – 2 Marks)

     b. Draw the block diagram of a Function Generator and explain the method of producing
       (i) Square Waves
       (ii) Sine Waves   **(8)**

Answer:
Refer Page Numbers from 226 to 228 from **Text Book No. II**
(Block diagram – 4 Marks, 2 Marks each for Part (i) & (ii))

Q.7 a. Draw the block diagram of Hetrodyne Wave Analyser and explain its working. Give its applications.   **(8)**

Answer:
Refer Page Numbers from 250 to 252 from **Text Book No. II**
(Heterodyne wave analyzer – 4 Marks, Explanation of working – 2 Marks, Applications – 2 Marks)

     b. What is a Bolometer? Explain the working of Bolometer Mount with the help of a neat diagram.   **(8)**

Answer:
Refer Page Numbers from 687 to 690 from **Text Book No. II**
(Definiaion – 2 Marks, Block diagram – 4 Marks, Working – 2 Marks)

Q.8 a. What is the basic difference between a Strip Chart Recorder and an X-Y Recorder? Explain the working of basic X-Y Recorder with the help of neat diagram. Also give its applications.   **(10)**

Answer:
Refer Page Numbers from 341, 352 to 354 from **Text Book No. II**
(Difference between strip chart and X-Y recorder – 4 Marks, Working and block diagram of X- Y recorders – 4 Marks, Applications – 2 Marks)

     b. List a minimum of six specifications that should be considered while selecting a recording instrument.   **(6)**

Answer:
Refer Page Numbers 363 – 364 from **Text Book No. II**
(1 Mark each for specifications)

Q.9 a. Define electrical transducer. What is the difference between active and passive transducers?   **(8)**

Answer:
Refer Page Numbers from 375 to 376 from **Text Book No. II**
(Electrical transducer – 2 Marks, Active transducer – 3 Marks, Passive Transducers – 3 Marks)

     b. Explain Multi Channel Data Acquisition System in brief.   **(8)**
Answer:
Refer Page Numbers 602 & 603 from **Text Book No. II**
(Block diagram – 5 Marks, Explanation – 3 Marks)

TEXT BOOKS

1. A Course in Electrical and Electronic Measurements and Instrumentation, A.K Sawhney, Dhanpat Rai & Co., New Delhi, 18th Edition 2007

2. Electronic Instrumentation, H.S Kalsi, Tata McGraw Hill, Second Edition 2004