Instructions:  
1. All questions are compulsory.  
2. Answer each next main question on a new page.  
3. Illustrate your answers with neat sketches wherever necessary.  
4. Figures to the right indicate full marks.  
5. Assume suitable data, if necessary.  
6. Use of Non-programmable Electronic Pocket Calculator is permissible.  
7. Mobile Phone, Pager and any other Electronic Communication devices are not permissible in Examination Hall.

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1. A) Attempt any six:  
   a) Define the term ‘accuracy’ and ‘sensitivity’.  
   b) State the types of standards of measurement.  
   c) List four application of CRO.  
   d) List four dynamic characteristics.  
   e) State two advantages of moving coil instrument.  
   f) What is the requirement of shunt in multirange ammeter?  
   g) What is the role of delay line in CRO?  
   h) State the need of signal generators (any two).

B) Attempt any two:  
   a) Draw the circuit diagram of DC ammeter using basic ‘D’ Arnoval movement and derive the expression for shunt resistance.  
   b) Give significance of calibration.  
   c) List different types of errors and its source of generation/occurrence.

2. Attempt any four:  
   a) Describe the construction of PMMC instrument.  
   b) Explain the working of rectifier type of AC voltmeter with neat diagram (any one).  
   c) State the reason for voltmeter never connected in series with source of emf.  
   d) Explain the block diagram of DFM (Digital Frequency Meter).  
   e) Compare DSO with CRO (any four points).  
   f) Explain the concept of time domain and frequency domain.

P.T.O.
3. Attempt any four:

   a) What is loading effect and sensitivity of multirange voltmeter?

   b) How does electron beam generate horizontal ref line on CRT screen?

   c) Write the steps (and procedure) for measurement of frequency and phase of signal by CRO.

   d) How does Half wave rectifier type AC analog voltmeter use to measure unknown voltage.

   e) Calculate the value of multiplier, if basic movement having \( I_{fad} \) full scale deflection current of 10 mA and Internal resistance \( R_m \) of 50 \( \Omega \) is used to measure 400 volts.

   f) Describe the block diagram of Ramp type of voltmeter.

4. Attempt any four:

   a) Compare analog instruments with digital instruments.

   b) A 2mA meter with internal resistance of 100 \( \Omega \) is to be converted to 0 – 150 mA ammeter. Calculate the value of Shunt resistance required.

   c) State two advantages and two disadvantages of PMMC meter.

   d) Calculate the vertical input frequency if horizontal frequency is 1500 Hz for fig. (a) and fig. (b).

   e) Explain the block diagram of function generator.

   f) Explain the working principle of wave analyser with neat block diagram.
5. Attempt any four:
   a)  i) What is the resolution of 4½ DMM.
       ii) Write two uses of Video pattern generator.
   b) Find the phase relation for following fig. (c) and fig. (d).

   c) Draw the block diagram of DSO.
   d) Draw and explain RF signal generator.
   e) Explain the block diagram of spectrum analyser.
   f) What is the use of Q meter? Draw its neat diagram.

6. Attempt any four:
   a) Draw dual trace CRO and explain the function of Alt/Chop mode.
   b) How diode and transistor are tested with help of (i) DMM (ii) CRO?
   c)  i) Draw characteristics of pulse and label it.
   d) Explain the block diagram of Dual slope DVM.
   e) List the specification of DMM.
   f) Give the functions any four knob of following:
      i) X-shift on CRO. 1
      ii) CT MODE Button on CRO. 1
      iii) Symmetry knob on function generator. 1
      iv) Level knob on function generator. 1
      v) V/div on CRO. 1
      vi) Mono/Dual Button on CRO. 1