

**II B.Tech. I Semester Supplementary Examinations, May -2005**  
**ELECTRICAL AND ELECTRONICS MEASUREMENTS**  
**(Instrumentation & Control Engineering)**

**Time: 3 hours**

**Max Marks: 80**

**Answer any FIVE Questions**  
**All Questions carry equal marks**

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1. Explain the voltmeter sensitivity and measuring method with loading effect.
2. Explain with suitable diagram a three-phase measurement application using an Instrument Transformer.
3. Draw the block diagram of a dual-slope digital volt meter and explain how it is advantageous to use dual slope A/D converter in DVM?
4. (a) Compute the value of self-capacitance of a coil when the following measurements are made; at  $f_1 = 2\text{MHz}$ , the tuning capacitor is set at 450 pf. When the frequency is increased to 5 MHz, the tuning capacitor is tuned to 60 pf.  
(b) Draw the block diagram of the RF milli voltmeter. Explain its working.
5. (a) With neat circuit diagram, explain the function of associated circuits that are used for CRT operation.  
(b) Explain how the light is emitted on the screen of a CRO.
6. (a) Explain the working function of any one active probe.  
(b) Compare the performance characteristics of different types of CRO probes.
7. (a) Explain the different types of distortions caused by amplifiers.  
(b) Describe the Engineering applications of wave analyzers.
8. (a) Explain an automated frequency counter using block diagram.  
(b) If the internal time base of a frequency counter is 15MHz, what frequency range is best measured by a period measurement and why.

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1. Derive the expression for  $R_h$  in shunt type ohm-meter. Also prove with an example its suitability for very low resistance measurement.
2. (a) With neat diagram explain the principle and working of AC voltmeter.  
(b) An AC voltmeter calibrated for sine wave is used to measure a ramp voltage waveform rising to a peak value of 6 V in 3 m.sec. Determine the percentage error.
3. Draw the block diagram of a dual-slope digital volt meter and explain how it is advantageous to use dual slope A/D converter in DVM?
4. Explain the working of a vector voltmeter in detail. Draw the schematic. Mention its applications.
5. (a) With neat block diagram explain the working function of each block of general purpose oscilloscope.  
(b) Mention the advantages of general purpose oscilloscope.
6. (a) How much voltage is required across two deflection plates separated by 2 cms to deflect an electron beam  $1.5^\circ$  if the effective length of deflection plates is 2 cms and the accelerating potential is 900 volts?  
(b) What is an oscilloscope Probe compensation? How is this adjusted? What effects are noted when the compensation is not correctly adjusted?
7. (a) Mention different types of signal generators and explain their working principles.  
(b) Explain in detail about conventional standard signal generator.
8. (a) Explain with the help of a block diagram how the period can be measured?  
(b) What is meant by time base error and explain a calibration method to improve the accuracy of it.

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1. Explain in detail the analog type multimeter, with moving coil mechanism with relevant diagram.
2. (a) With neat diagram explain the principle and working of AC voltmeter.  
(b) An AC voltmeter calibrated for sine wave is used to measure a ramp voltage waveform rising to a peak value of 6 V in 3 m.sec. Determine the percentage error.
3. Draw the block diagram of a dual-slope digital volt meter and explain how it is advantageous to use dual slope A/D converter in DVM?
4. (a) How is 'Q' meter measurement of a high impedance component in the parallel connection done? Draw the circuit and explain.  
(b) Explain the sources of error in the measurements of 'Q' of a coil?
5. (a) With neat block diagram explain the working function of each block of general purpose oscilloscope.  
(b) Mention the advantages of general purpose oscilloscope.
6. (a) Explain the working function of secondary emission circuit with a secondary emission curve of storage oscilloscope.  
(b) Explain the working function of secondary emission circuit with floating target with a secondary emission curve of storage oscilloscope.
7. (a) Distinguish between Fixed frequency AF oscillator and Variable AF oscillator.  
(b) Explain the different front panel controls of a function generator.
8. (a) Explain with the help of a block diagram how the period can be measured?  
(b) What is meant by time base error and explain a calibration method to improve the accuracy of it.

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1. Derive the expression for  $R_h$  in shunt type ohm-meter. Also prove with an example its suitability for very low resistance measurement.
2. (a) Explain in detail the measurement of power using electro-dynamometer.  
(b) Write short notes on watt-hour meter.
3. (a) Explain a ramp type digital volt meter using voltage to time conversion principle.  
(b) A dual slope integrating type of A/D converter has an integrating capacitor of  $0.1 \mu\text{F}$  and a resistance of  $100 \text{ K}\Omega$  if the reference voltage is 2 volt and the output of the integrator is not to exceed 10 volts, what is the max time the reference voltage can be integrated.
4. (a) What are the constituent elements of a Digital Multimeter?  
(b) For measuring small values of capacitance, a 60 MHz source is to be used in a capacitance meter. What value of series resistance is required if the phase shift is to be kept below  $5.7^\circ$  for full scale capacitance reading of 1, 10, and 100 PF.
5. (a) With neat circuit diagram, explain the function of associated circuits that are used for CRT operation.  
(b) Explain how the light is emitted on the screen of a CRO.
6. (a) What are the relationships between the period of a waveform and its frequency? How is an oscilloscope used to determine frequency?  
(b) How are the effects of direct current on the flux density of the current probe minimized?
7. Describe the basic circuit of spectrum analyzer. Explain how the spectra of the following is displayed
  - (a) continuous wave signal
  - (b) amplitude modulated signal
  - (c) frequency modulated signal
  - (d) pulse modulated signal.

8. (a) With the help of a block diagram explain the multiplexed display technique used in a frequency counter.
- (b) A voltmeter has a working coil of copper in series with an invariable swamp resistance. What must be the ratio of swamp resistance to coil resistance if the error introduced by a temperature rise between 15 to 250<sup>0</sup>C, is not to exceed 1% of the indication.

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