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B. Tech
CPEC 5303

Fifth Semester Examination – 2008

**ELECTRONICS MEASUREMENTS AND
MEASURING INSTRUMENTS**

Full Marks – 70

Time – 3 Hours

*Answer Question No. 1 which is compulsory
and any five from the rest.*

*The figures in the right-hand margin
indicate marks.*

1. Answer the following questions : 2×10
- (a) Distinguish between Reliability and Repeatability.
 - (b) Give two examples of the types of standard capacitors used in schering bridge.

P.T.O.

- (c) Why Wagner Ground connection is used in a.c. bridges ?
- (d) Draw the circuit diagram of a peak reading voltmeter and write the working of the voltmeter in two to three sentences.
- (e) What is the purpose of Delay Line in the vertical amplifier section of an oscilloscope ?
- (f) Explain the types of probes required for a.c. voltage and d.c. voltage measurement in an oscilloscope.
- (g) Draw the block diagram of a Phase-locked-Loop.
- (h) What is the dynamic range of a spectrum analyzer with a third-order intercept point of +25 dBm and a noise level of -85 dBm ?

- (i) Suggest a transducer for the measurement of displacement in the order of one-tenth of millimeter. Write the basic principle of measurement using two to three sentences.
- (j) Why the Service Request (SRQ) signal is used by a device in IEEE-488 GPIB bus ?

2. (a) Show the Probability Distribution Curve along with the True value and Mean value for the following types of instruments : 5

- (i) Accuracy is Good and Precision is Good
- (ii) Accuracy is Poor and Precision is Good
- (iii) Accuracy is Good and Precision is Poor
- (iv) Accuracy is Poor and Precision is Poor.

- (b) Why the error distribution is Gaussian ?
Calculate the percentage of observations lie within the following ranges : 5
- (i) Mean value \pm Standard Deviation
 - (ii) Mean value \pm 2 (Standard Deviation)
 - (iii) Mean value \pm 3 (Standard Deviation)
3. (a) Explain briefly why 5
- (i) Maxwell's bridge is limited to the measurement of medium Q coils ($1 < Q < 10$) ?
 - (ii) Hay bridge is suitable for the measurement of high Q coils ($Q > 10$).
- (b) Draw a basic d.c. voltmeter circuit with FET input. The voltmeter has an attenuator having 0.5 V – 5 V – 50 V range selection. Explain how ZERO and CALIBRATION adjustments are made in the circuit ? 5

4. (a) Derive and show that the path of an electron, travelling through an electric field of constant intensity and entering the field at right angles to the lines of flux, is parabolic in the x-y plane. 5
- (b) What are the advantages of an oscilloscope as compared to the electronic voltmeters ? Explain the terms "Deflection Sensitivity" and "Deflection Factor" of an oscilloscope. Why CRT is called a "Linear voltage-indicating Device" ? 5
5. (a) Describe the working of a stable or free-running multivibrator for the generation of pulses. Derive the expressions for the ON time and OFF time in terms of circuit components. Hence, explain how the Duty cycle is adjusted. 5

- (b) Draw a block diagram showing basic elements of a function generator. Explain how sine, triangular, square and saw-tooth waves are generated. 5
6. (a) Explain, in brief, the causes and remedies of the following types of measurement errors in frequency meter : 5
- (i) Gating Error
 - (ii) Time-Base Error
 - (iii) Trigger-Level Error.
- (b) Define the sensitivity of a Strain Gauge. Draw the circuit of measurement of strain and derive the expression of the output voltage in terms of strain. 5
7. (a) List the important features of Instrumentation amplifier and draw the circuit diagram. Derive the expression of the output voltage and explain how the GAIN is adjusted. 5

- (b) Explain, in brief, the architecture and operation of IEEE-488 GPIB Bus. 5
8. Write notes on any two : 5+5
- (a) Vector voltmeter
 - (b) Comparison between Ramp type and Dual slope type DVM
 - (c) Extending the Frequency Range of the counter.

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