

6E3115

B.Tech VI Sem. (Main/Back) Examination, May, 2012

Electrical Engineering

6EE6.2 POWER SYSTEM INSTRUMENTATION

Time: 3 Hours

Maximum Marks: 80

Min. Passing Marks: 24

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.

Use of following supporting material is permitted during examination. (Mentioned in form No. 205)

1. _____ Nil _____

2. _____ Nil _____

Unit-I

Q.1 (a) Define the following terms in the context of normal frequency distribution of data:

- (i) Mean Value
- (ii) Deviation
- (iii) Average Deviation
- (iv) Standard Deviation
- (v) Variance

[10]

(b) A4-dial decode box has:

Decade a of $10 \times 100\Omega \pm 0.1\%$

Decade b of $10 \times 100\Omega \pm 0.1\%$

Decade c of $10 \times 10\Omega \pm 0.5\%$

Decade d of $10 \times 1\Omega \pm 1.0\%$

It is set at 4639Ω . Find the percentage limiting error and the range of resistance value.

[6]

OR

- Q.1 (a) Differentiate accuracy and precision with an example. [4]
- (b) A resistance is determined by voltmeter ammeter method. The voltmeter reads 100V with a probable error of $\pm 12V$ and ammeter reads 10A with a probable error of $\pm 2A$. Determine the probable error in the commutated value of resistance. [8]
- (c) A circuit was tuned for resonance by eight different students, and the value of resonant frequency in KHz were recorded as 532, 548, 543, 535, 546, 531, 543 and 536. Calculate:
- Deviations from mean
 - The average deviation [4]

Unit-II

- Q.2 (a) Write the advantages, disadvantages and uses of LVDT. [10]
- (b) Draw and describe the following for thermistors:
- Resistance-Temperature characteristics
 - Voltage-Current characteristics
 - Current-Time characteristics [6]

OR

- Q.2 (a) A platinum thermometer has a resistance of 100Ω at $25^\circ C$.
- Find its resistance at $65^\circ C$ if the platinum has a resistance temperature coefficient of $0.00392/^\circ C$.
 - If the temperature has a resistance of 150Ω , calculate the temperature. [6]
- (b) Draw the equivalent circuit of piezo-electric transducers. Derive the expression for magnitude of voltage across the load by making simplifying assumptions. Prove that for medium and high frequencies, the magnitude of the voltage across the load is independent of frequency. [10]

Unit-III

- Q.3 (a) Describe the circuit of a 3 amplifier configuration of an Instrumentation amplifier. This amplifier is divided into two stages. Describe how the first stage offers a very high impedance to both the input signals and the gain to be set and the second stage acts as a difference amplifier. Derive the expression for output voltage in terms of the two input voltages. [12]
- (b) Define shielding and grounding [4]

OR

- Q.3 (a) Draw the neat and clean block diagram of function generator to explain the basic element of it. [8]
 (b) With the help of a neat circuit diagram, explain the working of frequency to voltage converter. [8]

Unit-IV

- Q.4 (a) Describe the construction details and working of a single phase induction type energy meter. [10]
 (b) Explain the different type of tariffs used. [6]

OR

- Q.4 (a) When two wattmeter method is used for measurement of power in a three phase balanced circuit, comment upon the readings of the two wattmeter under following conditions. Support your answer by drawing phasor diagrams. Assume that the system is star (Wye) connected
 (i) When PF is unity [9]
 (ii) When PF is zero lagging [9]
 (b) Explain the construction and working of the Ratiometer type frequency meter. [8]

Unit-V

- Q.5 (a) Describe the working of capacitive voltage transformer. [6]
 (b) Draw the equivalent circuit and phasor diagram of a current transformer. Derive the expressions for ratio and phase angle errors. [10]

Or

- Q.5 (a) Explain the effect of the following on the performance of current transformers:
 (i) Change of primary winding current [6]
 (ii) Change of secondary circuit burden. [4]
 (ii) Change of frequency. [4]
 (b) Discuss the major errors in current transformers. [4]
 (c) What are the major characteristics of current transformers? [6]