NTK/KW/15/7430

Faculty of Engineering and Technology

Fifth Semester B.E. (Mechanical Engg.)
(C.B.S.) Examination

MECHANICAL MEASUREMENT AND METROLOGY

Time : Three Hours] [Maximum Marks : 80

INSTRUCTIONS TO CANDIDATES

(1) All questions carry marks as indicated.

(2) Solve **SIX** questions as follows :

Que. No. **1 OR** Que. No. **2**

Que. No. **3 OR** Que. No. **4**

Que. No. **5 OR** Que. No. **6**

Que. No. **7 OR** Que. No. **8**

Que. No. **9 OR** Que. No. **10**

Que. No. **11 OR** Que. No. **12**

(3) Due credit will be given to neatness and adequate dimensions.

(4) Illustrate the answers with necessary figures/ drawings wherever necessary.

(5) Use of Drawing instruments is permitted.

(6) Use of Non programmable Calculator is permitted.

(7) Assume suitable data wherever necessary.

1. (a) What are the basic blocks of a generalised measurement system ? Draw the various blocks and explain their functions. 7

(b) Define errors. Explain different types of errors. 6

OR

2. (a) Derive the equations for time response of a first order system subjected to ramp input. 6

(b) A resistor has a nominal value of 10 $\Omega \pm 1$ %. A voltage is applied across the resistor and the power consumed in the resistor is calculated in two ways :

(i) $P = E^2/R$ and

(ii) $P = EI$

Calculate the uncertainty in power determination in each case when the measured value of E and I are : $E = 100\ V \pm 1$ % and $I = 10\ A \pm 1$ %. 7

3. (a) Explain the construction and principle of working of LVDT. 7

(b) Enlist various non-contact type speed measuring instruments. Explain the inductive type tachometer. 7

OR

4. (a) What are strain gauges ? Describe the principle of operation of a resistance type strain gauge. 7

(b) Explain electrical absorption dynamometer and discuss its salient features. 7

5. (a) Explain the characteristics and working principle of McLeod gauge. 6

(b) How sound is characterised ? Give a brief note on weighting network in sound measurement. 7

OR

6. (a) What are thermistors ? Explain the range and working of thermistor with its advantages and disadvantages. 6

(b) Illustrate the working principle of Total Radiation Pyrometer and mention its characteristics and relative advantages. 7

7. (a) What are line standard instruments ? Compare and contrast line standard with end and wavelength standards. 7

(b) What do you understand by interchangeability of parts ? Also explain the role of selective assembly in manufacturing. 6

OR

8. (a) Discuss the instruments used for flatness measurement. 7

(b) How sine bar is used for angle measurement ? Also explain why it is not preferred for angle above 45°. 6

9. (a) What are fits ? Discuss various types of fits used in assembly. Give mechanical example of each type. 7

(b) What are limit gauges ? Describe the hole basis and shaft fans system ? Also explain which system is commonly used and why. 7

OR

10. (a) Explain Taylor's Principle for GO-NOGO gauges. 4

(b) Design a general type GO-NOGO gauge for a hole and shaft pair designated as 40 H_7 F_8. 10

11. (a) What are comparators ? Describe the constructional features of a Pneumatic Comparator. 7

(b) Give a detailed note on Tool Maker's microscope. 6

OR

12. (a) Explain Two-wire method for thread measurement. 6

(b) Describe the function and use of an Optical profile projector with the help of a neat sketch. 7