R18 Regulation *Subject code:* 2E7CA

TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

(Autonomous, Accredited by NAAC with 'A' Grade)

B.Tech VII Semester Regular/Supplementary Examinations, November 2022

INSTRUMENTATION AND CONTROL SYSTEMS

(Professional Elective)

(Mechanical Engineering)

Maximum Marks: 70 Date:07.12.2022 Duration: 3 hours

Note: 1.This question paper contains two parts A and B.
2. Part A is compulsory which carries 20 marks. Answer all questions in Part A.
3. Part B consists of 5 Units. Answer any one full question from each unit which carries 10M.
4. Each question carries 10 marks and may have a, b, c, d as sub questions.

Part-A

All the following questions carry equal marks (10x2M=20 Marks)

1 Distinguish between Accuracy and Precision.
2 State desirable and undesirable dynamic characteristics.
3 List out active transducers.
4 State the characteristics of manometer fluid.
5 List out contactless electrical tachometers.
6 What is the relationship between the rotational speed and the flashing rate of stroboscope directed onto a single radial mark on the rotating wheel?
7 Explain strain gauge rosettes.
8 What is a servo mechanism?
9 Differentiate Open and closed loop control systems with a suitable example.
10 List out various principles used for stress and strain measurement.

Part-B

Answer All the following questions. (5X10M=50Marks)

11 a) Draw the generalized scheme of a typical measurement system and explain about various components of it.
b) State and explain various types of errors in measurements. [5+5]

OR

12 a) Draw the block diagram of first order system. Derive the equation of transfer operator for the first order system.
b) Derive the steady-state responses of first order system with respect to:
i) Step input and ii) Ramp input. [4+6]

13 Explain the construction and principle of LVDT with a neat diagram and compare it with capacity pickup transducer. [10]

OR

14 a) Explain the working principle of Bimetallic thermometer with a neat diagram.

b) A platinum resistance thermometer has a resistance of 140.5 and 100.0 Ω at 100 and 0^0C respectively. If its resistance becomes 305.3 Ω when it is in contact with a hot gas, determine the temperature of the gas. Take the temperature coefficient of platinum as 0.0039^0C^{-1}. [5+5]

15 Explain with a neat sketch the functioning of displace type liquid level measuring instrument. [10]

OR

16 Explain construction and the working principle of a Rotameter with a neat diagram. [10M]

17 How does a mechanical load cell work? Explain the principle of measuring shaft torque using strain gauge torsion meter. [10]

OR

18 Describe the functioning of a stroboscope and explain how speed of a rotating shaft can be measured using a single pattern and multi-pattern disc. [10]

19 Draw a block diagram of closed loop control system. Describe its working for motor speed control. [10]

OR

20 What is a block diagram? Explain the steps involved in the preparation of block diagrams. [10M]