



# 17528

**15162**

**3 Hours / 100 Marks**

Seat No.

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- Instructions :** (1) *All questions are compulsory.*  
(2) *Illustrate your answers with neat sketches wherever necessary.*  
(3) *Figures to the right indicate full marks.*  
(4) *Assume suitable data, if necessary.*  
(5) *Use of Non-programmable Electronic Pocket Calculator is permissible.*  
(6) *Use of Steam tables, logarithmic, Mollier's chart is permitted.*

**Marks**

**1. Solve any five of the following.**

- a) Define sensitivity drift and zero drift. What factors can cause sensitivity drift and zero drift in instrument characteristics? **4**
- b) List the advantages and disadvantages of capacitive transducers. **4**
- c) Compare Diaphragm gauge and Bellows gauge on the basis of
- i) Construction
  - ii) Material
  - iii) Pressure range
  - iv) Application. **4**
- d) Explain with a neat sketch, working of variable area flow meter. **4**
- e) List various considerations in selection of thermocouples for temperature measurement. **4**
- f) Explain the construction and bonding technique for an electrical resistance strain gauge. **4**
- g) Draw the block diagram of a feedback control system and describe it in brief. **4**

**2. Solve any four of the following :**

- a) Explain the working of LVDT with a neat sketch. **4**
- b) Explain the working of bimetallic thermometer with the help of a neat sketch. **4**
- c) The turbocharger speed is to be measured by stroboscope. Calculate the speed when the synchronisation of highest rate of flashing and subsequent flashing rate is achieved at 3600, 1800, 1200, 900 and 720 rpm. **4**

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- d) Explain the components of an automatic domestic air conditioning system, with the help of a block diagram. 4
- e) Explain Proportional and Derivative (PD) controller and state its advantages (any two). 4
- f) Explain the working of vortex-type flow meter with a neat sketch and state its advantages. 4

**3. Solve any four of the following :**

- a) Differentiate between deflection and null-output type measurement instruments and give its appropriate examples. 4
- b) Explain the different sources of errors in measurements and measuring instruments. 4
- c) Explain the working of variable capacitor pressure transducer with neat sketch and mention its advantages (any two). 4
- d) List two advantages and two limitations of resistance thermometer. 4
- e) Explain the working of Hot-wire Anemometer for the measurement of rate of fluid flow also mention its limitations. 4
- f) What is psychrometer ? Explain its use for measuring humidity with a neat sketch. 4

**4. Solve any four of the following :**

- a) Explain with a neat sketch, working of float type gauge for measuring liquid level of tank. 4
- b) A resistance wire strain gauge with a gauge factor  $F = 2.1$  is bonded to a steel member subjected to a stress of  $100 \text{ mN/m}^2$ . Calculate the percentage change in the value of gauge resistance due to applied stress. For steel  $E = 2006 \text{ N/m}^2$ . 4
- c) Explain the feed forward control system with the help of a neat sketch. 4
- d) Differentiate between active instruments and passive instruments on the basis of
- i) Working principle
  - ii) Construction
  - iii) Resolution
  - iv) Example. 4
- e) Explain with a neat sketch, working of optical pyrometer for temperature measurement. 4
- f) List various advantages of electromagnetic flowmeter. 4

**5. Solve any four of the following :**

- a) What are thermistors ? State its advantages and limitations with its applications. 4
- b) Explain with a neat sketch, working of Bourdon-Tube pressure gauge. 4



- c) In a lathe cutting test, the following data has been obtained :
- i) Tangential force = 795 N
  - ii) Axial force = 88 N
  - iii) Speed of spindle = 300 rpm
  - iv) Feed Rate = 0.8 mm per resolution
  - v) Mean diameter of cut = 0.1 m and
  - vi) Power input to 3 phase motor = 875 watt/phase
- Calculate :
- 1) Power absorbed in rotating the work piece
  - 2) Power absorbed in feeding the tool along the work piece
  - 3) Calculate over all efficiency. 4
- d) Explain proportional control action with a neat diagram. 4
- e) Differentiate between Hydraulic controller and pneumatic controller. 4
- f) Explain working of D.C. position control system. 4
- 6. Solve any four of the following :**
- a) Explain the working of optical Encoder with its neat sketch of construction. 4
  - b) Explain strain measurement method using load cell with a neat sketch. 4
  - c) Explain the working of piezoelectric type pressure transducer for pressure transducer with a neat sketch. 4
  - d) Explain working of turbine meter for flow measurement with a neat sketch. 4
  - e) List advantages and disadvantages of inductive-type transducer. 4
  - f) Explain working of Bi-metallic thermometers with a neat sketch and state its applications. 4
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