* S E - 6 2 6 9 / 3 0 0 *

SE-6269

B. E. II (Sem. III) Examination

April / May – 2011

Mechanical Measurements

Time : Hours] [Total Marks : **100**

Instructions :

(1)

નીચે દર્શાવેલ ☛ નિશાનીવાળી વિગતો ઉત્તરવહી પર અવશ્ય લખવી.
Fillup strictly the details of ☛ signs on your answer book.

Name of the Examination :

☛ **B. E. 2 (Sem. 3)**

Name of the Subject :

☛ **Mechanical Measurements**

☛Subject Code No. : **6 2 6 9** ☛Section No. (1, 2,.....) : **Nil**

Seat No. :

Student's Signature

(2) Attempt all the questions.
(3) Assume suitable data if necessary.
(4) Figures to the right indicate full marks.

1 (a) Answer the following questions. **10**

(1) The information collected from the instrumentation system (output) is known as _____ and the variable quantity being measured (input) is known as _____.

(2) The measurement of static pressure by bourdon tube gauge is a _____ instrumentation system.

(3) The damping ratio is defined on the basis of _____ damping to _____ damping.

(4) Errors that caused by the influence of measuring instrument upon the measured variables are known as _____ error.

(5) For low pressure difference _____ type U tube manometers are used.

(6) The pitot static tube measures the _____ velocity.

(7) Define uncertainty.

(8) Define sensitivity.

(9) Define vacuum pressure.

(10) Define measurand in measurement system.

(b) Explain generalized measurement system and its functional elements. **5**

(c) Define pressure. Explain atmospheric, gauge and absolute pressure. What is the relation between them ? **5**

2 (a) (1) Explain diaphragm gauge. **5**

(2) List different variable head meter and explain any one of them in detail. **5**

(b) A pitot static probe with a thermometer attached is used to measure the velocity of air in a duct and a differential 10 cm of water is recorded. The thermometer shows an air temperature of 300k in the duct and a separate static tapping shows that the air pressure in the duct is 10 kN/m^2. The local barometer reads 760 mm of mercury. Calculate the air velocity if the velocity coefficient for the pitot static probe is 0.98. Take the gas constant R as 287 J/kg K for air and the relative density of mercury as 13.6. **5**

OR

(a) Explain liquid in glass thermometer **5**

(b) Explain construction of venturimeter **5**

(c) A U tube manometer employs a special oil having a specific gravity of 0.82 for the manometer fluid. One side of the manometer is open to atmospheric pressure of 745 mm of Hg and the difference in column heights is measured as 20 cm $\pm$ 1.0 mm when exposed to an air source at 25^0C. The standard acceleration of gravity is present. Calculate the pressure of the air source in pascal. **5**

3 Attempt any three. **15**

(1) Method of primary, secondary and tertiary measurement.

(2) Pirani pressure gauge.

(3) Orifice meter

(4) Thermodynamic temperature scale.

4 (a) Answer the following. **10**

(1) Speed of a sealed compressor unit can be measured by a

(A) Stroboscope

(B) Vibrating reed tachometer

(C) Capacitive pick-up tachometer

(D) Techoscope

(2) Mechanical strain gauges can measure :
(A) Static strains only
(B) Dynamic strains only
(C) Static and quasi-static strains
(D) Static and dynamics strains

(3) The gauge factor of a resistance gauge depends upon
(A) The gauge material
(B) The configuration of gauge wire
(C) The mechanical loading
(D) All of the above

(4) For the semi-conductor gauge, most of the resistance change due to applied strain comes from
(A) Length change
(B) Area change
(C) Resistivity change
(D) All of the above

(5) In using capillary tube viscometer corrections have to be made for
(A) Change in density
(B) Change in temperature
(C) Change in gravitational constant
(D) Losses in head

(6) In a saybolt viscometer, the viscosity can be measured by measuring the time to fill a flask with liquid volume equal to
(A) 50 ml
(B) 200 ml
(C) 60 ml
(D) 10 ml

(7) The seismic mass transducer for the measurement of acceleration and vibration is
(A) Zero order instrument
(B) First order instrument
(C) Second order instrument
(D) None of these

(8) Proving ring is used to measure
(A) Force
(B) Vibration
(C) Velocity
(D) None of the above

(9) Following is a grid material for electrical resistance strain gauge
(A) Copper
(B) Nichrome
(C) Cobalt
(D) Iron

(10) Tachometers are used to measure
(A) Displacement
(B) Angular velocity
(C) Vibration
(D) Time

(b) Write short notes : **10**
(1) Stroboscope
(2) L.V.D.T.

5 (a) Derive necessary expression for determination of gauge factor of strain gauge. **5**

(b) Explain rope brake dynamometer with neat sketch. **5**

OR

(b) A strain gauge is bonded to a beam 0.1 m long having cross-sectional area of $4cm^2$ the young's modulus for steel = 207 GN/m^2 strain gauge has an unstrained resistance of 240 Ω. and gauge factor = 2.2. When load is applied resistance of gauge changes by 0.013 Ω. Calculate change in length of beam and amount of force. **5**

(c) Explain piezoelectric accelerometer. **5**

OR

(c) Explain with neat sketch working of proving ring. **5**

6 Attempt any three : **15**
(1) Orsat apparatus
(2) Measurement of CO_2
(3) Thermal conductivity measurement
(4) Optical pyrometer
(5) Tachometer.
