B.TECH/ME/3RD SEM/MECH 2105(BACKLOG)/2021

METROLOGY & MEASUREMENT (MECH 2105)

Time Allotted : 3 hrs

Full Marks: 70

Figures out of the right margin indicate full marks.

Candidates are required to answer Group A and <u>any 5 (five)</u> from Group B to E, taking <u>at least one</u> from each group.

Candidates are required to give answer in their own words as far as practicable.

Group – A (Multiple Choice Type Questions)

1.	Choose the correct alternative for the following:			10 × 1 = 10
	(i)	Depth of a hole can be measured by (a) Sine bar (c) Vernier Bevel Protector	(b) Profile projector (d) Vernier Caliper	
	(ii)	If the Fit between a shaft and hole is desig (a) Interference fit (c) Clearance fit	gnated as H7/g6, asse (b) Transition fit (d) Cannot be ascert	mbly will have tained
	 (iii) A sine bar is specified by (a) Length of the sine bar (b) Distance between centres of two rollers (c) Diameter of the rollers (d) Distance between roller centre and top surface 			
	(iv)	Dial Gauge is a (a) Mechanical Comparator (c) Pneumatic Comparator	(b) Electronic comp (d) Electrical compa	arator Irator
	(v)	Which one of the following is NOT a deriv (a) Energy (c) Power	red unit of measurem (b) Force (d) Temperature	ent?
	(vi)	LVDT is usually used for measuring (a) Temperature (c) Density	(b) Pressure (d) Displacement	
	(vii)	The ratio of the infinitesimal change in input is called (a) Sensitivity (c) Threshold	output to the infini (b) Resolution (d) Accuracy	tesimal change in

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- Surface roughness on a drawing is represented by (viii) (a) Circles (b) Triangles
 - (c) Squares

(d) Rectangles

- A 'GO NO GO' plug gauge is used for (ix) (a) Assessing if a shaft will fit into a whole (b) Plugging a hole to stop liquid flow (c) Measuring actual dia. of a hole (d) Checking if the hole is within tolerance
- (x) For Hole based tolerance system
 - (a) hole dia is equal to basic size
 - (b) shaft dia is equal to basic size
 - (c) fundamental deviation of shaft is zero
 - (d) fundamental deviation of hole is zero

Group-B

- The smallest division on the main scale of the vernier instrument is 1mm. Ten 2. (a) divisions on the vernier scale correspond to the nine divisions on the main scale. Determine (i) What is the least count of the instrument? (ii) If the main scale reads 13 mm and the 5th division on the vernier scale coincides with a division on the main scale, what is the value of the dimension being measured?
 - What are the limitations of sine bars? A 100mm sine bar is to be set up to (b) measure an angle of 30, determine the total height of slip gauges needed for the measurement.

(3+3) + (3+3) = 12

- Define the following with suitable sketches: 3. (a)
 - Flatness of a surface (i)
 - (ii) Roundness.
 - (b) Explain with sketch how the following can be measured and by using which instruments for a lathe
 - The machine is levelled with respect to horizontal plane (i)
 - (ii) Radial runout of the headstock spindle.

(3+3) + (3+3) = 12

Group - C

- Explain with sketch the working principle of a Profile Projector for measuring 4. (a) 'Pitch of a Screw'.
 - Explain with a sketch the working principle of a Back Pressure Bourdon Gauge (b) comparator and how it can be used for measuring bore diameter.

6 + 6 = 12

5. A 30 mm diameter hole is made on a turret lathe according to the limits 30.035 (a) mm and 30mm. Shaft with diameter limits 29.055mm and 30.025mm is to be

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fitted in the hole. Indicate the type of fit and maximum & minimum clearance / interference by a sketch.

- (b) i. Calculate the dimension of "GO" end and "NO GO" end of a plug gauge for inspecting the diameter of a hole having dimension 40 +0.025/ +0.005 mm.
 - ii. Calculate the dimension of "GO" end and "NO GO" end of a snap gauge for inspecting the diameter of a shaft having dimension 40 -0.009/ -0.025 mm.

6 + (3 + 3) = 12

Group - D

- 6. (a) Explain the difference between Sensitivity & Threshold of an instrument
 - (b) Define an Active Transducer and a Passive Transducer with specific example of an instrument.

6 + 6 = 12

7. (a) With suitable sketches, explain the following surface roughness measures and write their expression.

(i) Ra (ii) Rrms.

(b) For measurement of surface roughness, absolute value of height/ depth of 10 successive peaks and valleys measured from a datum areobserved as follows:

Peaks: $45, 42, 40, 35, 35 \ \mu m$

Valleys: 30, 25, 25, 24, 18 μm

Determine the "Ten Point Height Average" R_Z value of the surface.

(3+3)+6=12

Group - E

- 8. (a) Explain the working principle of a Strain Gauge
 - (b) What is 'gauge factor'? If gauge factor F = 2, Resistance of the strain gauge = 120 ohm and applied strain is 1 microstrain (0.000001), calculate the change in resistance of the strain gauge due to applied strain.

6 + 6 = 12

- 9. (a) Draw the basic circuit diagram and cross-sectional view of a Linear Variable Differential Transformer and explain how it functions.
 - (b) Explain the working mechanism of a Thermocouple for measuring temperature.

7 + 5 = 12

Department & Section	Submission Link
ME	https://forms.gle/7MFmyykKap2g1AbMA