CLASS: BE   SEMESTER : IV/ADD
BRANCH: PRODUCTION   SESSION : SP/19

SUBJECT: PE4003 METROLOGY

TIME: 3.00 Hrs.   FULL MARKS: 60

INSTRUCTIONS:
1. **The question paper contains 7 questions each of 12 marks and total 84 marks.**
2. **Candidates may attempt any 5 questions maximum of 60 marks.**
3. **The missing data, if any, may be assumed suitably.**
4. **Before attempting the question paper, be sure that you have got the correct question paper.**
5. **Tables/Data hand book/Graph paper etc. to be supplied to the candidates in the examination hall.**

Q.1(a)	What are the limitations of materials standards? How to overcome those limitations?	[2]
Q.1(b)	Differentiate: Deflection method, Differential method and null method of measurement.	[4]
Q.1(c)	Why calibration is important in measurement?	[6]

Four end bars A, B, C, and D are to be calibrated using a calibrated length bar of 400 mm. whose actual length is 399.9998 mm. The bar B is longer than bar A by 0.0004 mm., bar C is longer than bar A by 0.0003 mm., while bar D is shorter than bar A by 0.0001 mm. the four bars together have a combination length of 400.0002 mm. determine the corrected (actual) length of each end bar.

Q.2(a)	How differential gauge unit works as a comparator?	[2]
Q.2(b)	Explain the working principle of Johanson Mikrokator. Represent the magnification of the instrument.	[4]
Q.2(c)	Classify pneumatic comparators. Describe 'Solex gauge' with suitable diagram.	[6]

Q.3(a)	Define: 'local' and 'universal' interchangeability in the context of assembly of parts.	[2]
Q.3(b)	Why gauges are used? Classify 'gauges'.	[4]
Q.3(c)	Design the general type GO and NO-GO gauges for components having 20 H7f8 fit. Given:	[6]

    (i)   Tolerance unit i(micron) = 0.45 $(D)^{1/3}$ + 0.001D
    (ii) upper deviation of 'f' shaft = -5.5$D^{0.41}$
    (iii) 20 mm falls in the diameter step of 18 mm to 30 mm
    (iv) Standard tolerances for IT7 = 16i and IT8 = 25i
    Consider wear allowance to be 10% of gauge tolerance.

Q.4(a)	State the principle of interferometry.	[2]
Q.4(b)	Write one application for each of the instruments: Tool maker's microscope, Autocollimator, Cabinet projector and Interferometer.	[4]
Q.4(c)	What are the different types of fringe patterns obtained in interference of light rays? How optical flats can be used to analyze surface textures?	[6]

Q.5(a)	Why progressive and periodic pitch errors occur in screw threads?	[2]
Q.5(b)	What will be the pitch diameter of a metric thread of 2.5 mm pitch, if the measurement over wires (three-wire system) is 12.632 mm? Suitably assume other parameters for a metric thread.	[4]
Q.5(c)	Derive the expressions for chordal thickness and chordal addendum for a spur gear tooth.	[6]

Q.6(a)	What are the different types of irregularities in a circular part?	[2]
Q.6(b)	How surface texture is represented? Explain various lay designs?	[4]
Q.6(c)	What are the different ways to measure straightness of an object/surface? Explain any one of them.	[6]

Q.7(a)	State the scopes of acceptance test of a machine tool.	[2]
Q.7(b)	How parallelism of tailstock guideways with the movement of carriage in a lathe machine can be checked?	[4]
Q.7(c)	Enlist the parameters to be checked in geometrical test and alignment test. What are the equipment used in geometrical test?	[6]