BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(END SEMESTER EXAMINATION)

CLASS: BE **SEMESTER : IV**
BRANCH: PRODUCTION **SESSION : SP/18**

SUBJECT: PE4003 METROLOGY

TIME: 3.Hours **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 is meant by 'transposition method' and 'complementary method' of measurement. Give example. [2]
Q.1(b) Differentiate between line standard and end standard. [4]
Q.1(c) Define 'airy point'. Calculate the distance between the two supports of an end bar of 1000 mm. length considering (i) minimum central deflection (ii) airy point. Further, estimate the position of the support from the end of the end bar in both the cases. [6]

Q.2(a) What are the different components of electronic gauging system? [2]
Q.2(b) Explain the utility of differential gauge units with example. [4]
Q.2(c) With suitable diagram, explain the working of a sigma comparator. [6]

Q.3(a) Show how to represent compound tolerance by taking a diagram of any component. [2]
Q.3(b) Explain clearance fit, interference fit and transition fit. [4]
Q.3(c) Design limit gauges to inspect the components of the fit 40H7/p6, providing gauge tolerance and wear allowance. Given IT7=16i, IT6=10i and $i=0.45(D^{1/3})+0.001D$. 40 mm diameter is in the range of 30 and 50 mm. [6]

Q.4(a) Enlist the light sources for interferometry. [2]
Q.4(b) Discuss the use of optical flats in checking surface texture. [4]
Q.4(c) Explain the working of autocollimator with neat sketch. [6]

Q.5(a) What are the various methods used for measuring the minor diameter of screw threads? Explain any of them. [2]
Q.5(b) When measuring the effective diameter of an external metric screw thread of 3.5 mm pitch, a30 mm diameter cylindrical standard and 2 mm wires were used. The micrometer reading over the standard and wires and over the screw thread and wires were 13.376 and 12.242 mm respectively. Calculate the effective diameter of the screw thread. [4]
Q.5(c) What are the various methods used for measuring the gear tooth thickness? Explain them with neat sketches. [6]

Q.6(a) What do you mean by waviness and roughness? [2]
Q.6(b) Determine the Ra index no. of a surface for which the graph was drawn to a vertical magnification of 15,000 and a horizontal magnification of 100, and the areas above and below of the datum line were- [4]

Above	160	90	180	50	mm^2
Below	95	65	170	150	mm^2

Q.6(c) Explain the working of Taylor – Hobson instrument for surface roughness measurement. [6]

Q.7(a) Enlist the instruments used for alignment testing of machine tools. [2]
Q.7(b) Distinguish between alignment test and performance test of a machine tool. [4]
Q.7(c) With neat sketch, explain the procedure for checking 'parallelism of spindle axis' and 'parallelism of tailstock guideways with the movement of carriage' in a lathe machine. [6]

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