

GUJARAT TECHNOLOGICAL UNIVERSITY**BE - SEMESTER-VII • EXAMINATION – WINTER 2013****Subject Code: 172002****Date: 05-12-2013****Subject Name: Automated Manufacturing - I****Time: 10:30 TO 01:00****Total Marks: 70****Instructions:**

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.

- Q.1** (a) With the help of a neat schematic diagram, explain the Turning Cycle (G90) and Facing Cycle (G94). **07**
- (b) Explain with sketch the difference between the following cycles with respect to spindle rotation and tool movements. **07**
Fine Boring Cycle (G76) and Back Boring Cycle (G87)

- Q.2** (a) State the advantages of NC and CNC over conventional machine tools. **07**
- (b) Explain Direct Numerical Control and Distributed Numerical Control with block diagram. **07**

OR

- (b) Evaluate point to point and contouring type of positioning controls used in CNC machines in terms of characteristic capabilities and applications. **07**
- Q.3** (a) Using neat sketches, explain the working principle of Incremental and Absolute Optical Encoders. **07**
- (b) An NC Worktable operates by closed-loop positioning. The system consists of a servomotor, leadscrew, and optical encoder. The leadscrew has a pitch of 5.0 mm and is coupled to the motor shaft with a gear ratio of 4:1 (four turns of the drive motor for each turn of the leadscrew). The optical encoder generates 48 pulses/rev of its output shaft. The table has been programmed to move a distance of 200 mm at a feed rate = 400 mm/min. Determine (a) how many pulses should be received by the control system to verify that the table has moved exactly 200 mm, (b) the pulse rate of the encoder, and (c) the drive motor speed that correspond to the specified feedrate. **07**

OR

- Q.3** (a) Define automation. Explain different types of automations. **07**
- (b) The mechanical inaccuracies in the open loop positioning system are described by a normal distribution with standard deviation of 0.005 mm. The range of worktable axis is 1000 mm, and there are 16 bits in the binary register used by the digital controller to store the programmed position. Other relevant parameters are, pitch = 5.0 mm, gear ratio between motor shaft and lead screw = 4.0 (four turns of the drive motor for each turn of the leadscrew), and number of step angles in the stepper motor = 48. Determine (a) the control resolution, (b) the accuracy, and (c) the repeatability of the positioning system. **07**

- Q.4** (a) What is an automated vehicle guided system (AGVS)? Explain three vehicle guidance technologies. **07**
- (b) Explain Generative computer aided process planning. **07**

OR

- Q.4 (a)** Explain the four categories into which the methods of operating and controlling a CMM can be classified. **07**
- Q.4 (b)** Explain with sketch the principle of optical triangulation sensing. **07**
- Q.5 (a)** Explain dedicated and random storage strategies of AS/RS. Mention advantages and limitations of each. **07**
- (b)** Three point locations on the surface of the drilled hole have been measured by a CMM in the x-y axes. The three coordinates are: (34.41, 21.07), (55.22,30.50), and (50.17,13.18) millimeters. The given coordinates have been corrected for probe radius. Determine: (a) coordinate of the hole center and (b) hole diameter, as they would be computed by the CMM software. **07**
- OR**
- Q.5 (a)** Explain concept of 3D printing with sketch. **07**
- (b)** The oval rail of a carousel storage system has length = 12 m and width =1 m. There are 80 carriers equally spaced around the oval. Suspended from each carrier are 8 bins. Each bin has volumetric capacity=0.026 m³. Carousel speed = 20 m/min. Average P & D time for a retrieval = 20 sec. Determine (a) volumetric capacity of the storage system and (b) hourly retrieval rate of the storage system. **07**
