**B.E. MECHANICAL ENGINEERING THIRD YEAR SECOND SEMESTER - 2024**

**ADVANCED PRODUCTION PROCESSES**

Time: **3 hour**                                           Full Marks: **100**

Answer any *five* questions
Assume suitable data if necessary.

1. a) What is automation and production system?
   b) Name and briefly define the different categories or level of production system.
   c) Explain briefly three different manufacturing systems based on human participations.
   d) Explain briefly three different automations.
   e) What are the elements in open loop control system and closed loop control system?

   $(2+4+6+6+2)$

2. Derive the following expression for USM

   $$Q \propto \frac{dF^{\frac{3}{4}}A^{\frac{3}{4}}C^{\frac{1}{4}}}{HW^{\frac{3}{4}}(1+\lambda)^{\frac{3}{4}}}V$$

   Notations bear usual meanings.

   $(20)$

3. a) Discuss the basic principle and general features of generative manufacturing processes

   b) Explain the steriolithography with photo polymerization.

   c) Discuss laminated object manufacturing process

   $(6+7+7)$

4. a) What is micromanufacturing process? State the dimensional magnitudes of different micromanufacturing processes

   b) Describe diamond micromachining process

   c) What are the steps and sequences for micromachining using lithography?

   $(5+10+5)$

5. a) Explain electron beam machining process

   b) Explain laser beam machining process

   c) What are the criteria for selecting electrode material in EDM?

   d)What are the basic requirements of dielectric fluid in EDM?

   $(8+8+2+2)$

[ Turn over

6. a) Differentiate between ECM and EDM processes. During an electric discharge drilling of 10-mm square-hole in a low carbon steel plate of 5 mm thickness, brass tool and Kerosene is used. The resistance and capacitance in the relaxation circuit are 50 Ω and 10μF, respectively. The supply voltage is 200 volts and the gap is maintained at such a value that the discharge (sparking) takes place at 150 volts. Estimate the time required to complete the drilling operation.

b) Discuss working principle of ECM process with necessary equations

(10+10)

7. a) What are the basic components of NC system

b) State the difference between absolute vs. incremental positioning system in NC

c) The part in below Fig.1 is to be drilled on a turret type drill press. The part is 15.0 mm thick. There are three drill sizes to be used: 8 mm, 10 mm, 12 mm. These drills are to be specified in the part program by tool turret positions T01, T02 and T03. All tooling is high speed steel. Cutting speed= 75 mm/min and feed=0.08 mm/rev. Use the lower left corner of the part as origin in the x-y axis system. Write the part program in the word address format using absolute positioning. All the dimensions in Fig. are in mm.

(5+5+10)