Instructions: (1) All questions are compulsory. 
(2) Illustrate your answers with neat sketches wherever necessary. 
(3) Figures to the right indicate full marks. 
(4) Assume suitable data, if necessary.

1. A) Answer any three of the following: 

   i) State the principle of EDM. With a neat sketch explain the process of metal removal. 

   ii) Give any four applications of PAM. 

   iii) Compare closed loop CNC system with open loop CNC system. 

   iv) Define part program. Explain the terms ‘preparatory functions’ and ‘miscellaneous functions’ in the context of CNC programming. 

   B) Answer any one of the following: 

   i) What are non-traditional machining processes? Compare traditional and non-traditional machining processes. 

   ii) What is lasing action? Differentiate between EDM and LBM processes.
2. Answer any **four** of the following: 
   (4x4=16)
   i) What are the advantages of CNC machines?
   ii) How are linear and rotary axes identified in CNC machines?
   iii) Give the classification of broaching machines.
   iv) Compare capstan and turret lathes.
   v) Explain the construction of planomiller.

3. Answer any **two** of the following: 
   (2x8=16)
   i) Describe the working principle of AJM. State the advantages, limitations and applications of AJM.
   ii) Prepare a part program to machine the workpiece shown in figure 1 on CNC lathe machine.
   iii) Explain the cutting parameters in milling. How is the machining time calculated on a milling machine?
4. **A) Answer any three of the following:**

   i) Differentiate between pull broach and push broach.

   ii) Draw a neat labelled sketch of horizontal broaching machine.

   iii) Give the specifications of horizontal boring machine.

   iv) Explain with sketches ‘up milling’ and ‘down milling’.

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**B) Answer any one of the following:**

   i) Write the importance of maintenance. Differentiate between breakdown maintenance and preventive maintenance.

   ii) What are precision grinders? Explain with a neat sketch the working of centerless grinding machine.

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5. **Answer any four of the following:**

   i) Give the maintenance practice for bearings and chains of a machine.

   ii) What is maintenance record? What are contents of maintenance record?

   iii) Explain repair complexity.

   iv) How grinding wheel is designated?

   v) What are safety precautions to be observed while using grinding machines?

   vi) Differentiate between honing and lapping (at least four points).
6. Answer **any four** of the following:

   (4×4=16)

   i) What is burnishing? What are its advantages?

   ii) Describe the construction and working of plain milling machine with a neat sketch.

   iii) What are the different methods of manufacturing gears?

   iv) Explain gear hobbing process with a neat sketch.

   v) Why gear shaving process is employed? Explain the process.

   vi) What is the function of dividing head? Sketch the internal mechanism of universal dividing head.