B   06000ME303122001   Pages: 2
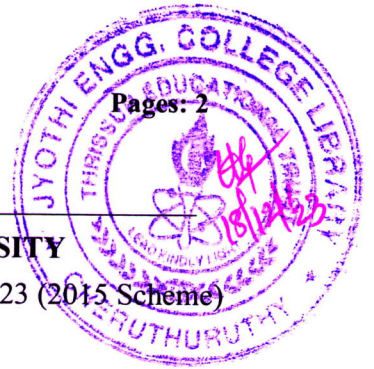
Reg No.:_____   Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY
B.Tech Degree S5 (S, FE) / S3 (PT) (S, FE) Examination December 2023 (2015 Scheme)

Course Code: ME303
Course Name: MACHINE TOOLS AND DIGITAL MANUFACTURING

Max. Marks: 100   Duration: 3 Hours

PART A
Answer any three full questions, each carries 10marks.   Marks

1. a) Explain the mechanism of chip formation in a machining process. List the factors that favour the formation of continuous and discontinuous chips.   (5)

   b) Sketch the Merchant's circle diagram and show the relevant forces and angles in it. Hence define shear angle, rake angle and friction angle.   (5)

2. a) In a machining operation, depth of cut is 0.35mm, chip thickness is 0.95mm, and width of cut is 2.8mm. The tool used has a rake angle of 12°.The tangential force and feed force are measured to be 1000N and 500N respectively. Find the coefficient of friction between tool and chip and also the ultimate shear stress of work material.   (6)

   b) When a work piece is turned using a given cutting tool, the tool life was found to decrease from 80 minutes to 20 minutes on increasing the cutting velocity from 60m/min to 120m/min. If it is desired to have a tool life of 40 minutes, what should be the cutting velocity?   (4)

3. a) Explain the constructional features of the carriage of a lathe   (5)

   b) List the work holding devices used in turning the work in between the centers. Explain the functions of each device.   (5)

4. a) A radial drilling machine can be used to drill medium to large and heavy workpieces. How is it possible?   (5)

   b) Discuss the cutting forces in drilling operation with neat sketch.   (5)

PART B
Answer any three full questions, each carries 10 marks.

5. How is it ensured that there is no metal removal during the return stroke in a shaper? Explain any one quick return motion mechanism used in a shaper.   (10)

6 a) Give the relative merits and demerits of an open sided planer and a double   (5)
        housing planer.

   b) Find the machining time required for machining a surface of dimensions   (5)
        600x800 mm on a shaping machine. The cutting speed is 8 m/min and the feed is
        2 mm/double stroke. The return to cutting time ratio is 1:4 and the clearance at
        each end is 70 mm.

7 a) Explain the constructional features of a horizontal milling machine.   (7)

   b) Sketch any two common attachments used in milling machines   (3)

8 a) Explain the need for indexing mechanism and its components which is used in a   (7)
        milling machine. Give the difference between simple indexing and differential
        indexing.

   b) Compare gang milling and straddle milling operations.   (3)

PART C

Answer any four full questions, each carries 10 marks.

9 a) What are the factors that reduce the cutting ability of a grinding wheel? How can   (7)
        it be retained?

   b) List the factors to be considered in the selection of a grinding wheel.   (3)

10 a) Compare the features of centre type grinding and centreless grinding operations.   (7)

   b) Describe machine lapping process.   (3)

11 a) Explain the principle of broaching process.   (4)

   b) With sketches, compare the features of an engine lathe and capstan and turret   (6)
        lathe.

12 a) What is the role of digital manufacturing in a competitive market environment?   (6)

   b) What are the benefits of digital manufacturing?   (4)

13 a) How are the manufacturing initiatives design for manufacturability (DFM) and   (6)
        computer-integrated manufacturing (CIM) related to digital manufacturing?

   b) Digital manufacturing ensures right data at the right time. Explain.   (4)

14 a) What are the key technologies of a digital manufacturing system?   (5)

   b) Explain the operation reference mode of digital manufacturing.   (5)

****