

Reg No.: _____

Name: _____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY
FIFTH SEMESTER B.TECH DEGREE EXAMINATION, DECEMBER 2017

Course Code: ME303

Course Name: MACHINE TOOLS AND DIGITAL MANUFACTURING (IE, ME)

Max. Marks: 100

Duration: 3 Hours

PART A

Answer any three full questions, each carries 10 marks.

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|---|--|-------|
| 1 | a) Define tool signature. How is it related to tool geometry? | (4) |
| | b) Sketch the top view, front view and end view of a 25-mm square bit having tool signature of 15-15-10-10-15-10-3 and label all parts. | (6) |
| 2 | a) Clearly explain the utility of Merchant's Circle Diagram. How it can be plotted? | (4) |
| | b) A lathe while running consumes 2000W when cutting a steel specimen at 30m/min. Determine the cutting force and torque at the spindle running at 120 rpm. Also determine the specific power consumption if the depth of cut is 4 mm and feed is 0.25 mm/rev. | (6) |
| 3 | a) Discuss the relative merits and demerits of the different methods for machining external taper on lathe. | (4) |
| | b) State any six advantages of using cutting fluids during machining. | (6) |
| 4 | a) Sketch a fully labelled schematic diagram of a Radial Drilling Machine. List any four key design features that make it popular. | (6) |
| | b) Identify the possible causes for the following problems in drilling: | (4) |
| | i) Drill breakage ii) Oversized hole | |
| | iii) Rough hole iv) Breakage of outer corners of cutting edges. | |

PART B

Answer any three full questions, each carries 10 marks.

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|---|--|------|
| 5 | a) With the help of a fully labelled schematic diagram, explain the kinematic system provided in shaping machine for transmitting power and motion from the motor to the tool and job at desired speeds and feeds. | (6) |
| | b) With the help of neat sketches explain any two operations (other than machining of flat surfaces) that can be carried out using a shaping machine. | (4) |
| 6 | a) Compare and contrast (differentiate) shaping machine, slotting machine and planing machine. | (10) |
| 7 | a) Differentiate between up-milling and down milling operations. | (5) |
| | b) Show that the mean cross-sectional area of chip in plain milling is given by | (5) |
| | $A_m = \frac{fW}{Nm} \sqrt{\frac{d}{D}}$ Where f = feed in mm/m; N = cutter rpm; D = milling cutter diameter; d = depth of cut; m = No of tooth in cutter; W = Width of work piece. | |

- 8 a) With the help of simple sketches, explain any three common attachments used in Milling Machines. (6)
- b) Estimate the machining time that will be required to finish a vertical flat surface of length 120 mm and depth 15 mm by an 8 teeth HSS end mill cutter of 32 mm diameter and 60 mm length in a milling machine. Assume, cutting velocity = 30 m/min, feed = 0.12 mm/tooth. (4)

PART C

Answer any four full questions, each carries 10 marks.

- 9 a) With suitable sketches, clearly explain the similarities and differences between cylindrical grinding and centreless grinding. (6)
- b) The base of a brass bracket has to be rough ground to remove the unevenness. Suggest the most suitable grinding wheel for this purpose. Justify the choice of the wheel also. (4)
- 10 a) Differentiate between truing and dressing of a grinding wheel (5)
- b) Write a short note on the self-sharpening characteristic of a grinding wheel. (5)
- 11 a) Explain the basic principle of broaching. (4)
- b) Explain the kinematic system and operating principle of a swiss type automatic lathe with the help of a line diagram. (6)
- 12 a) With the help of a suitable illustration explain the concept of Digital Manufacturing. (5)
- b) With the help of a block diagram explain the Architecture of Digital Manufacturing System. (5)
- 13 a) Briefly outline the system modelling principle, modelling methods and modelling steps followed to create an abstract model of the digital manufacturing system. (6)
- b) Formulate the general mathematical model of the digital manufacturing system. (4)
- 14 a) Write short notes on the following models of digital manufacturing system: (8)
- i) Organization Model ii) Function model
- iii) Information model iv) Operation & Control Model
- b) Explain the role of Bionic Mechanics and Manufacturing Intelligence in Digital Manufacturing. (2)
