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17ME35B

Third Semester B.E. Degree Examination, Dec.2018/Jan.2019

Machine Tools and Operations

Time: 3 hrs.

Max. Marks: 100

Note: Answer any FIVE full questions, choosing one full question from each module.

Module-1

- 1 a. Define machine tool. Give classification of machine tool. (06 Marks)
b. Classify lathes. Briefly explain various parts of lathe with neat sketch. (08 Marks)
c. With a neat sketch, explain principal parts of sensitive drilling machine. (06 Marks)

OR

- 2 a. Define broaching. With a neat sketch explain continuous broaching machine. (07 Marks)
b. With neat sketch explain centerless grinding machine. (07 Marks)
c. Differentiate between up milling and down milling. (06 Marks)

Module-2

- 3 a. What is machining? With neat sketch explain relative motion of tool and work piece in grinding. (04 Marks)
b. List the operations performed on a lathe and explain any four operations with neat sketch. (08 Marks)
c. Explain briefly with neat sketches of any four milling machine operations. (08 Marks)

OR

- 4 a. What is indexing? Briefly explain simple indexing with an example. (08 Marks)
b. Write short notes on following with a sketch:
i) Boring ii) Reaming iii) Topping (12 Marks)

Module-3

- 5 a. What are the desirable properties of cutting tool materials? Briefly explain. (07 Marks)
b. With a neat sketch explain geometry of single point cutting tool. (07 Marks)
c. Define cutting fluid and explain the functions of cutting fluid. (06 Marks)

OR

- 6 a. Define surface finish. Explain the parameter affecting surface finish. (08 Marks)
b. In a turning operation following data is observed: $D = 100$ mm, $l = 400$ mm, cutting speed $V = 500$ mm/sec, feed $f = 0.4$ mm/rev. Calculate the machining time. What will be effect on machining time if cutting speed is increased by 50%? (06 Marks)
c. Evaluate cutting speed and machining time for the plain (slab) milling operation for the following data:
Diameter of milling cutter = 100 mm
Cutter speed = 600 rpm
Depth of cut = 5 mm
Table feed = 100 mm/min
Length of work-piece = 50 cm
Number of teeth in the cutter = 8 (06 Marks)



Module-4

- 7 a. Define chip. Explain different types of chips with neat sketches. (08 Marks)
- b. Using Merchant's circle diagram, deduce the equation $F_{ns} = F_R \sin(\phi + \beta - \alpha)$. (12 Marks)

OR

- 8 a. Differentiate between Orthogonal and oblique cutting. (06 Marks)
- b. Derive an equation for shear angle $\phi' = \tan^{-1}\left(\frac{r \cos \alpha}{1 - r \sin \alpha}\right)$. (08 Marks)
- c. In orthogonal cutting of a 50 mm diameter MS bar on a lathe, the following data was obtained. Rake angle = 15°, cutting speed = 100 m/min, feed = 0.2 mm/rev, cutting force = 180 N, feed force = 60 N, chip thickness = 0.3 mm. Calculate:
 - i) The shear plane angle
 - ii) Coefficient of friction
 - iii) Chip flow velocity
 - iv) Shear force(06 Marks)

Module-5

- 9 a. Write a note on: (i) Crater wear (ii) Flank wear. (06 Marks)
- b. Explain tool wear mechanisms. (08 Marks)
- c. Define tool life. Explain parameters affecting tool life. (06 Marks)

OR

- 10 a. Write a short note on the following:
 - i) Choice of feed
 - ii) Choice of cutting speed
 - iii) Tool life for minimum cost(12 Marks)
- b. While turning a steel rod by a given cutting tool at a given machining condition under a given environment, the tool life decreases from 80 min to 20 minutes due to increase in cutting velocity from 50 m/min to 100 m/min. At what cutting velocity the life of the same tool under the same condition and environment will be 40 minutes. (08 Marks)
