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## Third Semester B.E. Degree Examination, Dec.2024/Jan.2025 Metal Cutting and Forming

Time: 3 hrs.

Max. Marks: 100

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

### Module-1

- 1 a. Explain the mechanics of chip formation and types of chips in orthogonal cutting. (09 Marks)
- b. Derive an expression for a shear angle in orthogonal cutting in terms of rake angle and chip thickness ratio. (06 Marks)
- c. Following data refers to the orthogonal cutting process. Chip thickness ratio 0.60 mm, feed 0.2 mm, rake angle  $15^\circ$ , calculate chip reduction coefficient and shear angle. (05 Marks)

OR

- 2 a. Describe the Merchant's circle diagram. List the assumptions made. (10 Marks)
- b. Differentiate between orthogonal and oblique cutting. (05 Marks)
- c. List and explain essential properties of cutting tool material. (05 Marks)

### Module-2

- 3 a. Explain classification of milling machines. (05 Marks)
- b. With a neat sketch, explain vertical spindle milling machine. (10 Marks)
- c. Differentiate between drilling and boring. (05 Marks)

OR

- 4 a. Explain radial drilling machine with a neat sketch. (10 Marks)
- b. Explain shaping operations with a neat sketch. (06 Marks)
- c. Explain principle of centreless grinding machine with a neat sketch. (04 Marks)

### Module-3

- 5 a. Define tool wear. Explain crater wear and flank wear. (07 Marks)
- b. Explain different tool wear mechanisms. (06 Marks)
- c. A certain cutting tool during turning gave a tool life of 1 hour at a cutting speed of 30 m/min. What will be the life of the tool when it is used at the same cutting speed for finish turning? Take  $n = 0.125$  for rough cut, and  $n = 0.1$  for finish cut. (07 Marks)

OR

- 6 a. Discuss the effects of machining parameters on surface finish. (06 Marks)
- b. Explain choice of cutting speed for minimum cost and maximum production. (06 Marks)
- c. Determine the optimum cutting speed for an operation carried on a lathe using the following data : tool change time 4 min, tool regrind time 3 min, machine running cost 20 paise per min, tool depreciation cost 1 rupee. Assume values of C and n of Taylor's tool life equation as 60 and 1/5 respectively. (08 Marks)

### Module-4

- 7 a. Classify metal forming processes. (06 Marks)
- b. Write note on forging equipments. (08 Marks)
- c. Explain different defects in forging. (06 Marks)

OR

- 8 a. Explain different types of rolling mills. (08 Marks)  
b. Explain drawing process of pipe. (06 Marks)  
c. With a neat sketch, explain Indirect extrusion process. (06 Marks)

Module-5

- 9 a. Explain following sheet metal operation :  
(i) Blanking (08 Marks)  
(ii) Punching (04 Marks)  
b. Write a note on drawing ratio in sheet metal operation. (08 Marks)  
c. Explain variables affecting in sheet metal drawing.

OR

- 10 a. Explain embossing and coining operations. (08 Marks)  
b. Explain following dies with neat sketches :  
(i) Progressive die.  
(ii) Compound die. (12 Marks)

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