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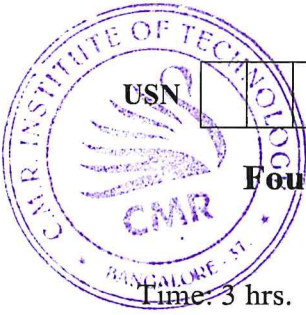
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Fourth Semester B.E. Degree Examination, July/August 2022
Machine Tools and Operations

Time: 3 hrs.   Max. Marks: 100

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

Module-1

1   a. How are milling machines classified? Explain with sketch, the construction of horizontal milling machine. **(10 Marks)**
    b. Explain with sketch the construction of shaping machine. **(10 Marks)**

OR

2   a. Sketch and label the engine lathe. Write the specifications of lathe. **(10 Marks)**
    b. How are grinding machines classified? Explain the principle of centreless grinding. **(10 Marks)**

Module-2

3   a. Briefly explain with sketch, the types of motions in turning, facing, groove cutting and threading. **(10 Marks)**
    b. Explain the types motions in any 4 drilling related operations with sketch. **(10 Marks)**

OR

4   a. Differentiate up milling and down milling with sketch. Sketch slab milling and gang milling operations. **(10 Marks)**
    b. Explain machining parameters and related quantities in drilling operations. **(10 Marks)**

Module-3

5   a. Draw single point tool geometry indicating various features. What are the different elements in the tool with signature 5, 6, 8, 10, 12, 15, 0.8? **(10 Marks)**
    b. A nickel base alloy rod of 120mm diameter is machined to 116mm with a feed of 0.4mm/rev using carbide tool. Determine the time of machining a length of 300mm if tool setting time is 15sec and loading unloading takes 30sec. Assume a cutting speed of 300m/min. **(10 Marks)**

OR

6   a. List the characteristics of cutting tool materials and functions of cutting fluids. **(10 Marks)**
    b. A workpiece of 80mm diameter and 120mm length is held between centers and turned in 2 passes. If the approach length is 10mm and over travel is 6mm, find machining time. Assume cutting speed as 0.4m.s and feed of 0.4mm/rev. **(10 Marks)**

Module-4

7   a. Explain the machines of chip formation with sketch. Explain the 3 types of chips obtained in machining briefly with necessary sketch. **(10 Marks)**
    b. Derive expression for shear plane angle in terms of chip thickness ratio and rake angle of the tool. **(10 Marks)**

OR

8 a. Draw Merchant circle diagram indicating various force components and write expression for them. **(10 Marks)**

   b. In an orthogonal cutting operation on a material with the shear yield strength of $250N/mm^2$ the following data is obtained.

   Rake $\angle^k$ of the tool $= 15°$
   Uncut chip thickness $= 0.25mm$
   Width of the chip $= 2mm$
   Chip thickness ratio $= 0.46$
   Friction $\angle^k$ B $= 40$

   Determine the shear $\angle^k$ ϕ, the cutting force component and resultant force on the tool.
   (10 Marks)

Module-5

9 a. What are different tool wear mechanisms? Explain any 2 with sketch. **(10 Marks)**

   b. Mild steel bars of 50mm diameter are to be turned over a length of 160mm with a depth of cut of 1.5mm, feed of 0.2mm/rev at 230rpm by HSS tools. If the tool life equation is given by $VT^{0.2} f^{0.3} d^{0.12} = 50$, determine how many components may be turned before regrinding the tool. **(10 Marks)**

OR

10 Write short notes on :
   a. Machinability
   b. Tool life equation
   c. Choice of feed for machining
   d. Choice of speed for machining. **(20 Marks)**

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