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17M E45B/17MA45

# Fourth Semester B.E. Degree Examination, June/July 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. With an illustration explain construction of engine lathe. **(10 Marks)**

b. Differentiate between the following:

i) Shaper and Planner

ii) Multiple spindle and gang drilling machines. **(10 Marks)**

**OR**

2 a. With an illustration explain column and knee type milling machine. **(10 Marks)**

b. Give a broad classification of grinding machines. Explain horizontal spindle reciprocating table surface grinder. **(10 Marks)**

### Module-2

3 a. With an illustration explain the following:

i) Thread cutting operation

ii) Horizontal and vertical shaping operations. **(10 Marks)**

b. Differentiate between the following:

i) Drilling and boring operating

ii) Reaming and milling operations. **(10 Marks)**

**OR**

4 Explain the following operations:

a) Planning b) Slotting c) Gear cutting d) Grinding e) Turning. **(20 Marks)**

### Module-3

5 a. Explain the desirable properties of cutting tool materials. **(05 Marks)**

b. With an illustration explain geometry of single point cutting tool. **(10 Marks)**

c. What are cutting fluids and mention its characteristic? **(05 Marks)**

**OR**

6 a. Define the following: i) Speed ii) Feed iii) Depth of cut. **(06 Marks)**

b. A brass pin is of 500mm length and 40mm diameter. Find the turning time to reduce the pin to 38.8mm in one pass, when cutting speed is 60 metres/minute and feed is 0.8 mm/min. **(06 Marks)**

c. Find the time required for taking a complete cut on a plate 600 x 900mm, if the cutting speed is 9 metre/minute. The return time to cutting time ratio is 1:4, and the feed is 3mm. The clearance at each end is 75mm. **(08 Marks)**

## Module_4

7 a. With an illustration explain orthogonal and oblique cutting process. (10 Marks)

b. With an illustration explain Merchants circle model for orthogonal cutting process. (10 **Marks)**

**OR**

8 a. In a orthogonal cutting process following data were observed, chip thickness ratio is 0.4 and rake angle used was 20° and depth of cut 0.5mm. The horizontal and vertical component of cutting forces FH and hi where 2000N and 200N respectively. Determine the shear plane angle, chip thickness, angle of friction and resultant cutting force. (10 **Marks)**

b. An experiment was conducted on a mild steel tube of 200mm diameter and 3mm thick. An orthogonal cut was taken with a cutting speed of 80mm and 0.15mm per revolution feed with a cutting tool having back rake angle of -10°. It was determined that cutting force = 150N, feed force = 40N. Net horse power for cutting was 3hp and chip thickness was 0.25mm. Calculate the shear strain and strain energy per volume. (10 **Marks)**

## Module_5

9 a. Define tool life and explain tool life equation by Taylor relationship between cutting spee( _ and tool life. (10 **Marks)**

b. Using Taylarian tool-life equation for machining C-40 steel with 18-4-1 HSS cutting tool at a feed of 0.2mm/rev and depth of cut of 2mm. The following V and T observations have been noted.

| V s eed), m/min | 25 | 35 |
|---|---|---|
| T (Time), min | 90 | 20 |

Calculate :

i) n and C in Taylorian equation

ii) Hence recommend the cutting speed for a desired tool life of 60 minutes. **(10 Marks)**

**OR**

10 a. Discuss the variation of cost elements with cutting speed in a single cut, single pass machining operation. **(10 Marks)**

b. Explain the following in connection with machining process:

i) Tool life for minimum cost

ii) Minimum production time

iii) Machining at maximum efficiency. (10 Marks)