B.TECH/ME/5TH SEM/MECH 3104/2021

MACHINING & MACHINE TOOLS
(MECH 3104)

Time Allotted : 3 hrs   **Full Marks : 70**

Figures out of the right margin indicate full marks.

Candidates are required to answer Group A and
<u>any 5 (five)</u> from Group B to E, taking <u>at least one</u> from each group.

Candidates are required to give answer in their own words as far as practicable.

Group – A
(Multiple Choice Type Questions)

1. Choose the correct alternative for the following: **10 × 1 = 10**

(i)   Positive rake angle on the cutting tool is provided for. (CO1)
        (a) reducing cutting forces
        (b) improving dimensional accuracy
        (c) strengthening cutting tool
        (d) to improve surface finish

(ii)   Cutting forces are measured by (CO2)
        (a) Rotameter   (b) Dynamometer
        (c) Tachometer   (d) Piezometer

(iii)   Formation of built-up-edge in machining (CO2)
        (a) raises magnitude of cutting forces
        (b) reduces tool life
        (c) increases surface roughness
        (d) all of the above

(iv)   A cutting tool can never have its (CO1)
        (a) rake angle – positive   (b) rake angle – negative
        (c) clearance angle – positive   (d) clearance angle – negative

(v)   The maximum amount of heat that is generated at the cutting zone during turning goes to the (CO3)
        (a) Cutting tool   (b) Chip
        (c) Workpiece   (d) Chuck

(vi)   Life of any cutting tool depends upon (CO4)
        (a) tool geometry   (b) tool material
        (c) application of cutting fluid   (d) all of these

(vii) Machinability is judged and evaluated by (CO4)
(a) magnitude of cutting forces
(b) magnitude of cutting temperature
(c) tool life
(d) all of the above

(viii) When a grinding wheel becomes blunt after usage for some length of time, it is (CO5)
(a) replaced
(b) sharpened in another grinding machine
(c) dressed using a diamond tool
(d) chemically treated to regain sharpness

(ix) Dividing head is one of the most important attachments used with (CO5)
(a) drilling machine   (b) milling machine
(c) sawing machine   (d) grinding machine

(x) What speed distribution in the headstock gear box of a conventional lathe is preferred (CO6)
(a) Any distribution that matches the cutting speed range
(b) Arithmetic progression
(c) No speed distribution is preferred
(d) Geometric Progression

Group - B

2. (a) With Suitable sketch explain the geometry of a single point cutting tool in Orthogonal Rake System (ORS).   [(CO1) (Apply /IOCQ)]
    (b) A turning tool is specified in ASA system by parameters such as 10^0, 8^0, 7^0, 6^0, 15^0, 30^0, 0.1 (inch). Name those parameters and identify each of those in a neat sketch of the turning tool.   [(CO1) (Remember/LOCQ)]

    6 + 6 = 12

3. (a) Explain the mechanism of chip formation for ductile and brittle materials and also state the types of chip formed with suitable diagrams.
    [(CO1) (Understand /LOCQ)]
    (b) During machining of C-20 steel with a carbide cutting tool 0^0, 10^0, 6^0, 6^0, 8^0, 75^0, 0 (mm) configuration shape with a feed of 0.2 mm/rev. and depth of cut of 2mm at a cutting speed of 140m/min, a chip thickness of 0.36 mm has been obtained. Determine the chip reduction coefficient and shear angle.
    [(CO2) (Evaluate/HOCQ)]

    6 + 6 = 12

Group - C

4. (a) During turning a steel rod of diameter 160mm at a cutting speed of 560 rpm, feed 0.32 mm/rev, and depth of cut 4.0 mm by a ceramic cutting tool insert of

geometry 0^0, -10^0, 6^0, 6^0, 15^0, 75^0, 0 (mm) the followings were observed : P_Z=1600 N, P_X=800 N and chip thickness= 1mm. Determine with the help of MCD the possible values of F, N, Ps, Pn, cutting power and specific energy consumption. [(CO2) (Evaluate/HOCQ)]

(b) Discuss on the causes, location with suitable diagram and effects of heat generation in machining. [(CO3) (Understand /LOCQ)]

6 + 6 = 12

5. (a) The following equation for tool life is given for a turning operation $VT^{0.13} f^{0.77} d^{0.37}$=Constant. A 60 minute tool life was obtained while cutting at V=30 m/min, feed =0.3 mm/rev and depth of cut = 2.5 mm. Evaluate the change in tool life if the cutting speed, feed and depth of cut an increased by 20% individually and also taken together. [(CO4) (Evaluate/HOCQ)]

(b) Draw a neat sketch of a 'Strain Gauge type dynamometer' for measuring cutting forces in turning and explain how it works. Show in the sketch where and how the strain gauges are pasted. Which strain gauges measure which component of the cutting force? [(CO4) (Remember/LOCQ)]

6 + 6 = 12

Group - D

6. (a) Show the generation of a flat surface in shaping machine with the help of generatrix and directrix.   [(CO5) (Remember/LOCQ)]

(b) Construct a kinematic structure and explain power transmission from motor to spindle of a centre lathe to rotate it in variable speed with suitable diagram. [(CO5) (Create/HOCQ)]

6 + 6 = 12

7. (a) State the different types of lathe operations. Describe the basic specifications of a lathe machine.   [(CO5) (Understand /LOCQ)]

(b) Differentiate between simple and complex kinematic structures with figure. [(CO5) (Analyse/IOCQ)]

6 + 6 = 12

Group - E

8. (a) A lathe having 12 spindle speeds has been designed for machining jobs diameter ranging from 40 mm to 120 mm at cutting speed in between 50m/min and 200m/min. What should be the lowest and the highest spindle speed of the lathe. [(CO6) (Analyse/IOCQ)]

(b) A shaper is operated at 120 cutting strokes per minute and is used to machine a workpiece with a 250 mm length and 120 mm width. Use a feed of 0.6 mm per stroke and a depth of cut 6 mm. Estimate total machining time to machine the component. Take approach and overrun distance = 25 mm. [(CO6) (Analyse/IOCQ)]

6 + 6 = 12

9. (a) The designation of a grinding wheel is given as 51 A 36 L 5 V 23. State the significance of the various elements of the codes.
[(CO5) (Remember/LOCQ)]

   (b) Which one will you recommend between NC and CNC?State three reasons in support of your recommendation.   [(CO6) (Apply/IOCQ)]

6 + 6 = 12

Cognition Level	LOCQ	IOCQ	HOCQ
Percentage distribution	43.75%	31.25%	25%

Course Outcome (CO):

After the completion of the course students will be able to

CO 1	Explain the basic principle and purpose of machining, familiarization with tool geometry and to designate a single point cutting tool.
CO 2	Analyze mechanism of machining, mechanics of machining.
CO 3	Identify sources and effects of Heat generation in machining and control of cutting temperature.
CO 4	Detect tool failure mechanisms, assess tool life and select an appropriate cutting tool material, assessing machinability.
CO 5	Identify purpose, general constructional features and kinematic structures of different machine tools, selection of grinding wheels and application
CO 6	Carry out the use of different power drives, gear layout, gear box etc., control of speed and feed of machine tools, estimation of machining time, NC & CNC system

*LOCQ: Lower Order Cognitive Question; IOCQ: Intermediate Order Cognitive Question; HOCQ: Higher Order Cognitive Question

Department & Section	Submission Link
ME - A	https://classroom.google.com/c/NDA1MzcxMjI1NDcx/a/NDY0MTU5OTc3NDUz/details
ME - B	https://classroom.google.com/c/MzQ1NjkwOTA3NTQ1?cjc=zj6r5eo