

**B.Tech 5th Semester Special
Exam., 2020**

MACHINE TOOLS AND MACHINING

Time : 3 hours

Full Marks : 70

Instructions :

- (i) The marks are indicated in the right-hand margin.
- (ii) There are **NINE** questions in this paper.
- (iii) Attempt **FIVE** questions in all.
- (iv) Question No. 1 is compulsory.

1. Choose the correct answer of the following
(any seven) : 2×7=14

- (a) A flat surface can be produced by a lathe machine, if the cutting tool moves
- (i) parallel to the axis of rotation of workpiece
 - ~~(ii) perpendicular to the axis of rotation of workpiece~~
 - (iii) at an angle of 45°
 - (iv) None of the above

(b) Find the feed from the given data (in mm/revolution)— Cutting speed (cs) = 50 mm/minute, depth of cut (d) = 100 mm, metal removal rate (MRR) = 10 mm³/revolution.

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|-------------|-----------|
| (i) 0.2 | (ii) 0.02 |
| (iii) 0.002 | (iv) 0.04 |

(c) On drilling machine, which process is known as reaming?

- (i) Enlargement of existing hole
- (ii) Hole made by removal of metal along the hole circumference
- ~~(iii) Smoothly finishing and accurately sizing a drilled hole~~
- (iv) All of the above

(d) The function of taper turning process is to

- ~~(i) reduce the diameter of a workpiece along its length~~
- (ii) reduce the diameter by removing material about an axis offset from the axis of workpiece
- (iii) remove the material from end surface of a workpiece
- (iv) All of the above

- (e) The process of bevelling sharp ends of a workpiece is called as
- (i) knurling
 - (ii) grooving
 - (iii) facing
 - ~~(iv) chamfering~~
- (f) Which of the following is a mechanism for mechanized movements of the carriage along longitudinal axis?
- (i) Cross-slide
 - (ii) Compound rest
 - ~~(iii) Apron~~
 - (iv) Saddle
- (g) Which gear arrangement is used to change the circular motion of horizontal to vertical without change in speed ratio?
- (i) Two-spur gear
 - (ii) Two-helical gear
 - ~~(iii) Two-bevel gear~~
 - (iv) Worm and worm gear

- (h) In CNC machine tool, the part program entered into the computer memory
- (i) can be used only once
 - ~~(ii) can be used again and again~~
 - (iii) can be used again but it has to be modified every time
 - (iv) Cannot say
- (i) Part-programming mistakes can be avoided in
- (i) NC (Numerical Control) machine tool
 - ~~(ii) CNC (Computer Numerical Control) machine tool~~
 - (iii) Both (i) and (ii)
 - (iv) None of the above
- (j) Which of the following is not correct about fixture?
- (i) It is used to hold the work
 - (ii) It is used to position the work
 - (iii) It assures high accuracy of parts
 - ~~(iv) It is used to guide the cutting tool~~

2. (a) Explain with a neat sketch the main parts of a capstan lathe. 6
- (b) Discuss with a neat sketch any four machining processes in lathe machine. 8
3. (a) With a neat sketch of a single-point cutting tool, explain cutting tool geometry. 7
- (b) Explain the different types of cutting fluids. 7
4. (a) Write brief notes on the following : 7
- (i) Surface finish
- (ii) Effect of machining parameters on surface finish
- (b) Explain the common mechanism of tool wear. 7
5. (a) Explain the elements of gear metrology with a neat sketch. Also, describe the method of measurement of pitch of gear. 7
- (b) Write short notes on the following : 7
- (i) Computer-aided manufacturing
- (ii) Robotics

6. (a) In a turning operation, it was observed that the tool life was 150 min and cutting speed was 20 m/min. As the speed was increased to 25 m/min, the tool life dropped to 25.2 min and the time required to change the tool was 2 min. If the cost of regrinding the tool was 10 times higher than the cost of turning per minute, calculate—
- (i) the most economical cutting speed;
- (ii) tool life for maximum production. 7
- (b) An aluminium alloy bar of 80 mm diameter is turned on a lathe at a cutting speed of 60 m/min. The feed and depth of cut are set at 0.4 mm/rev and 3.5 mm respectively. The cutting force component is observed to be 750 N. Determine the specific cutting resistance and unit power for the material. 7
7. (a) Describe the different types of tolerance specification methods. Also, compare their specific applications with examples. 7
- (b) Explain the principles of jigs and fixture design. 7

8. (a) Explain different types of abrasives used in grinding wheel. 7
- (b) Differentiate between up milling and down milling, and explain their applications. 7
9. (a) Differentiate between shaping, planning and slotting as regards relative tool and work motions. 7
- (b) Derive the expression for shear angle in orthogonal cutting in terms of rake angle and chip thickness ratio. 7
