WEST BENGAL UNIVERSITY OF TECHNOLOGY

ME-602

MACHINING PRINCIPLES & MACHINE TOOLS

Time Allotted: 3 Hours | Full Marks: 70

The questions are of equal value.
The figures in the margin indicate full marks.
Candidates are required to give their answers in their own words as far as practicable. All symbols are of usual significance.

GROUP A
(Multiple Choice Type Questions)

1. Answer *all* questions. $10 \times 1 = 10$

(i) The relationship between the shear angle ϕ, friction angle β, cutting rake angle α and machining constant c for the work material is

(A) $2\phi + \beta - \alpha = c$ (B) $2\alpha - \phi + \beta = c$
(C) $2\beta - \phi + \alpha = c$ (D) $2\phi - \beta - \alpha = c$

(ii) A taylors tool life equation is designated as

(A) $VT^n = c$ (B) $V^nT = C$
(C) $VT = C$ (D) None of these

(iii) During machining of ductile material the chip is

(A) Continuous (B) Discontinuous
(C) Continuous with BUE (D) Fine cured chip

(iv) A grinding wheel is specified by

(A) Grain size (B) Grit size
(C) Grade (D) All of these

(v) Forces due to metal cutting is measured by

(A) Rota meter (B) Tachometer
(C) Dynamometer (D) Micrometer

(vi) Tool wear in carbide tool takes place due to

(A) diffusion (B) adhesion
(C) abrasion (D) all of these

(vii) Tool life is most affected by

(A) cutting speed (B) tool geometry
(C) feed (D) cutting fluid

(viii) Back rake of a turning tool is measured on its

(A) machine longitudinal plane
(B) machine transverse plane
(C) orthogonal plane
(D) normal plane

(ix) Normal rake and orthogonal rake of a turning tool will be same when its

(A) $\varphi = 0°$ (B) $\varphi_1 = 0°$
(C) $\lambda = 0°$ (D) $\varphi_1 = 90°$

(x) A cutting tool can never have its

(A) rake angle -positive (B) rake angle - negative
(C) clearance angle - positive (D) clearance angle – negative

GROUP B
(Short Answer Type Questions)

Answer any *three* questions. 3×5 = 15

2. What is centreless grinding? Explain the operation with a neat sketch. 2+3

3. (a) Explain the different mechanisms of tool wear? 3
   (b) What are the desirable properties of cutting tool materials? 2

4. How is the geometry of single-point cutting tool designated in ASA system and ORS system? 5

5. What is meant by machinability? What factors govern machinability characteristics of any work material? 2+3

6. State the advantages of CNC machine tools conventional machine tools. 5

GROUP C
(Long Answer Type Questions)

Answer any *three* questions. 3×15 = 45

7. (a) How are centre lathes specified? 5
   (b) How much time(min) will approximately be required to reduce the diameter of a rod from 120 mm to 80 mm over a length of 100 mm by turning in a lathe at cutting speed of 600 rpm, feed of 0.24 mm/rev. and depth of cut of 4.0 mm? 10

8. (a) Distinguish between drilling machine and vertical boring machine w.r.t. 5
   (i) tool-work motions
   (ii) product quality
   (iii) application.
   (b) With the help of a suitable diagram, explain how cutter speed (rpm) is physically changed, when so required, in conventional milling machine. 10

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9. (a) State the purposes of measuring the magnitude of the machining forces. 5
   (b) During turning a mild steel rod of 100 mm, diameter by a carbide tool geometry 0°, 6°, 8°, 7°, 15°, 90°, 0(mm) at the speed of 400 rpm and feed of 0.20 mm/rev. the followings were observed 10
   tangential force component = 1200 N
   axial force component = 600 N
   chip thickness = 0.5 mm
   Determine the values of the frictional force and normal force acting at the chip-tool interface during the aforesaid machining.

10. (a) A centre lathe has 6 spindle-speeds ranging from 40 rpm to 320 rpm. What will be the values of the four other intermediate spindle-speeds? 5
   (b) Classify lathes and state their general applications. 10

11. Draw schematically the kinematic diagram of a conventional milling machine or a hobbing machine. 15

12. (a) Why and how is the sintered carbide tools coated with TiC, TiN etc? 5
   (b) Describe briefly with the help of suitable diagrams, the bar feeding mechanism or turret indexing mechanism used in single spindle automatic lathe. 10

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