BRAINWARE UNIVERSITY

Term End Examination 2023-2024
Programme – Dip.ME-2021
Course Name – Principle of Machine Tool
Course Code - DME603
(Semester VI)

Full Marks : 60 **Time : 2:30 Hours**

[The figure in the margin indicates full marks. Candidates are required to give their answers in their own words as far as practicable.]

Group-A

(Multiple Choice Type Question) 1 x 15=15

1. Choose the correct alternative from the following :

(i) Relate the summation of clearance angle, rake angle and cutting wedge angle of any turning tool will be

a) 60º b) 180º
c) 120º d) 90º

(ii) Recall the correct way of specifying a grinding wheel (material) is

a) A-60-V-5-K b) 60-A-V-5-K
c) A-60-K-5-V d) K-60-A-5-V

(iii) Identify the angle between the rake face and plane perpendicular to rake face

a) Side rake angle b) Side relief angle
c) End relief angle d) Back rake angle

(iv) For large positive back rake angle, identify the condition of the tool will be

a) Weaker b) Stronger
c) Smoother d) Harder

(v) For maximum tool life, the optimum value of side cutting edge angle is recorded as

a) 20º b) 22º
c) 225º d) 30º

(vi) State the condition for which the High speed steels are most suitable

a) High Positive rake angle tools b) High Negative rake angle tools
c) Zero Rake angle tools d) For all the options mentioned

(vii) In ASA system, if the tool nomenclature is 8-6-5-5-10-15-2-mm, then the side rake angle is recorded as

a) 5º b) 6º
c) 8º d) 10º

(viii) Write the condition of the tool life in orthogonal cutting from the followings

a) more than the tool life in oblique cutting b) less than the tool life in oblique cutting
c) equal to the tool life in oblique cutting d) cannot say

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(ix) Select which of the following is correct equation for shear force F_S, ϕ is the shear angle

    a) $F_S = F_C\cos\phi - F_t\sin\phi$
    b) $F_S = F_C\cos\phi / F_t\sin\phi$
    c) $F_S = F_C\cos\phi * F_t\sin\phi$
    d) None

(x) Friction at the tool-chip interface can be reduced by _____ (Select correct option from the following)

    a) decreasing the rake angle
    b) increasing the depth of cut
    c) decreasing the cutting speed
    d) increasing the cutting speed

(xi) The unit of metal removal rate (MRR) is related to

    a) mm/revolution
    b) mm^2/revolution
    c) mm^3/revolution
    d) None of these

(xii) A high speed steel (HSS) is designated as "HS6-5-2-5". It is indicated as

    a) Co = 6%, Mo = 5%, V = 2%, W = 5%
    b) Mo = 6%, W = 5%, V = 2%, Co = 5%
    c) Mo = 6%, V = 5%, W = 2%, Co = 5%
    d) W = 6%, Mo = 5%, V = 2%, Co = 5%

(xiii) Identify from which the ratio of cut chip thickness to uncut chip thickness is always more than one

    a) Elastic deformation
    b) Plastic deformation
    c) Exponential heating
    d) Tool profile

(xiv) A steel work-piece of 100 mm length is machined with tool of 15 degree rake angle. If uncut chip thickness is 1.5 mm and chip length obtained is 50 mm then show the shear plane angle (in degree) is

    a) 20
    b) 25.8
    c) 27.4
    d) 29

(xv) State where the negative rake is usually provided on

    a) High carbon steel
    b) High speed steel tools
    c) Cemented carbide tools
    d) All of these

Group-B
(Short Answer Type Questions)
3 x 5=15

2. Write down the differences between orthogonal & oblique cutting. (3)

3. "The chip reduction coefficient is generally greater than 1" – Interpret the reason. (3)

4. Define "Grinding ratio". (3)

5. Classify the different types of milling machine. (3)

6. Illustrate three main reasons of tool failure. (3)

OR

State the name of important tool materials. Describe their distinguishing features. (3)

Group-C
(Long Answer Type Questions)
5 x 6=30

7. Describe the terms normal rake angle, inclination angle, back rake, orthogonal clearance and auxiliary orthogonal clearance angle. (5)

8. In an orthogonal cutting operation, (5)

   Depth of cut = 2 mm

   Width of cut = 15 mm

   Cutting speed = 0.5 m/s

   Rake angle = 0º

   Shear angle = 30º

   Cutting force = 900 N

   Thrust force = 600 N

   Determine - (i) average coefficient of friction between the chip and tool (ii) cutting power in watt

9. In ASA system, the tool signature (designation) is expressed as 7-8-6-6-12-20-2. Describe it (5) in your own word.

10. Illustrate the term Heat zones in cutting with diagram. (5)

11. Classify the different types of control systems in Numeric Control. (5)

12. For a machining experiment, tool life was found to vary with the cutting speed in the (5) following manners.

SL No	Cutting Speed (m/min)	Tool Life (min)
1	70	81
2	90	49

   Evaluate the exponent (n) and constant (C) of the Taylor's tool life equation.

OR

Distinguish between CNC and DNC and also between NC and DNC machine tools. (5)

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