Ref. No. : Ex/PROD/PC/B/T/226/2022

B.E. PRODUCTION ENGINEERING SECOND YEAR SECOND SEMESTER - 2022

SUBJECT : TECHNOLOGY OF MACHINING SYSTEMS

Full Marks : 100
Time: 3 Hours

Instructions: Use Separate Answer scripts for each Part.

Part – I (50 marks)

Answer for 50 marks.

1. a) Describe the Honing process. 5

b) Describe the Lapping process. 5

2. a) Name the 2 principal methods of coating with the approx. temp. at which these processes are carried out. 3

b) Explain the self-sharpening property of grinding wheels. 2

c) What are the imp. parameters that affect the honing process? 5

3. A 30 cm. long bar with 3 cm. dia. is to be turned on a lathe. The maxm. allowable feed is 0.025 cm./rev. The cost of labour & overheads/min. is Rs. 15.90/- & each re-grinding of the tool involves an expense of Rs. 127.20/-. The time reqd. for every tool change is 1 min. Two alternative matls. A & B can be used. Their cost & tool-life eqn. (for a feed of 0.025 cm./rev.) are as given below:

Matl.	Matl. Cost/piece (Rs.)	Tool life eqn.
A	159	$v.T^{0.1} = 30$
B	190.80	$v.T^{0.16} = 76$

Determine which matl. shd. be used from the cost pt. of view. The setting & idle time involved in each piece is 1 min. Justify your answer. 20

[Turn over

4. a) What are the imp. Technological parameters that affect MRR & surface roughness (R) of Lapping process? 5

b) What are the desirable properties the lap shd. have for Lapping of matls.? 5

5. a) Write shortly on diamonds & carbides as cutting tool matls. 2+5

b) What are the different bonding matls. used in grinding wheels? Explain each. 3

6. a) Write the expression of optimum cutting speed (for minm. cost), for a given value of feed, in a turning operation, explaining each term of the eqn. 2+5

b) Write shortly on HSS as a cutting tool matl. 3

7. a) What are the desirable properties of any cutting tool matl.? 5

b) Sketch schematically:

Internal Cylindrical Grinding, Vertical Surface Grinding. 2+2

c) How much is the solubility of the typical constituents of coatings (of hard metals) in iron? 1

8. a) What are the principal reasons for grinding a work piece? 3

b) Sketch schematically:

External Cylindrical Grinding, Centreless Grinding. 2+2

c) Write the expression of optimum feed (for minm. cost), for a given value of cutting speed, explaining each term. 3

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SUBJECT : TECHNOLOGY OF MACHINING SYSTEMS

Time : Three hours **Full Marks 100**

Use a separate Answer-Script for each part
(50 marks for each part)

No. of questions	PART- II Answer any five questions	Marks
1.	Show cross section of uncut chip and indicate uncut chip thickness. Establish the relation between uncut chip thickness (a1) and feed (f) using necessary figure. How can chip reduction co-efficient be determined in a turning operation using a lathe?	8+2
2.	Show how shear angle (β) can be determined from the chip reduction co-efficient (ξ) and orthogonal rake angle (γ_0) of a single point cutting tool in metal cutting operation.	10
3.	Show all the forces acting on chip with the help of a neat sketch (F.B.D.) of a chip segment being in equilibrium under the action of several forces. Also show forces on tool exerted by chip.	10
4.	During cylindrical turning of a job with a ORS shaped tool , the following observations have been made using a tool force dynamometer: Cutting force (P_z) = 130 kgf, Radial component of thrust force (P_y) = 70 kgf Feed, (f) = 0.1 mm/rev, Depth of cut (t) =1 mm, Chip thickness (a_2) = 0.2 mm Principal cutting edge angle(ϕ)=70 degree, Rake angle(γ)=4 degree. Calculate (i) the friction force (F), at the chip-tool interface (ii) the shear force (P_s), at the shear plane (Deduce all expressions/relations to solve the problem)	10
5.	i) Show tool wear on face and flank surfaces with neat sketches. ii) Show the growth of flank wear with respect to time of machining. iii) Explain how tool life can be estimated from the tool wear information (indicate Tool Life on figure). iv) Show the growth of flank wear with respect to time of machining for various cutting speeds and describe how Taylor's Tool Life equation is derived from the flank wear growth information.	2+2+2+4
6.	Show how incorrect setting of tool with respect to work piece can change the effective rake and clearance angle in a turning operation in a lathe. Use suitable figures to illustrate.	10
7.	Discuss about proper choice of cutting speed, feed and depth of cut in machining. Using suitable figures, show the effect of feed on surface finish of a job machined in a Lathe OR Shaper	8+2