

PKOD / V / MACHINING SCIENCE & TECHNOLOGY

QP Code : **3288**

19/05/15

(3 Hours)

[Total Marks : 80

- N. B. :** (1) Question No. 1 is compulsory.
 (2) Answer any **three** questions from the remaining **five** questions.
 (3) Assume suitable data if required and state them clearly.
 (4) **Figures to the right indicate full marks.**

1. Explain briefly :- 20
 - (a) Effect of cutting variables on surface finish
 - (b) Diamond as a cutting tool material
 - (c) Web thinning of twist drill muADDA.com
 - (d) N.R.S. system of tool nomenclature.

2. (a) The following data pertains to 10
 Orthogonal cutting operation
 cutting speed = 200 mm/min
 Feed = 0.12 mm/rev
 Chip thickness = 0.24 mm
 Chip width = 0.8 mm
 Cutting force = 140 kgf
 Feed force = 65 kgf
 Tool rake angle = 8°
 Determine the following
 - (a) Resultant force
 - (b) Shear angle
 - (c) Friction angle
 - (d) Shear force
 - (e) Shear velocity and
 - (f) Shear stress on shear plane.

- (b) Explain the steps in calculating profile depth analytically for a flat form tool. Assume rake angle ' γ ' and clearance angle ' α '. muADDA.com 10

3. (a) A single point cutting tool has tool signature in M.R.S. as 12-10-8-10-15-1 mm. Find inclination angle, orthogonal rake angle and orthogonal clearance angle in O.R.S. using master line method check the answers analytically also. 10

- (b) Considering the effect of normal stress on shear plane in orthogonal cutting, derive an expression for finding the merchants constant. (Merchants modified Theory) 10

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4. (a) Design a H.S.S. machine reamer with taper-shank for machining a hole to size $\varnothing 30 H_7$. Length of reamed hole is 30 mm and work material is alloy steel. Sketch the reamer and show important dimensions. 10
- (b) Derive an expression for optimum cutting speed and optimum tool life for maximum production rate. 10
5. (a) Calculate the following features needed in designing a round pull type broach for machining a cylindrical hole of diameter $27H_7$ and axial length of 30 mm in a workpiece of carbon steel. Assume cut per tooth in the range of 0.02 to 0.03 mm and broaching force required per mm of cutting edge length to be 120 N/mm. Broach is of H.S.S. and permissible stress not to exceed 200 N/mm^2 10
- (a) Number of broach teeth and teeth lengths
- (b) Teeth element details.
- (c) Stress induced at the root of 1st cutting teeth and at neck section.
- Also sketch the designed tool.
- (b) Explain various wear mechanisms of cutting tools. 10
6. Write short notes on the following :- 20
- (a) H.S.S. as tool material
- (b) Design of Tap
- (c) Drilling tool dynamometer
- (d) Cutting fluids
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