PKOD/V/MACHINING SCIENCE & TECHNOLOGY

Prod
19/05/15

QP Code : **3288**

(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
   (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 dearance angle 'α'. **10**

3. (a) A single point cutting tool has tool signature in M.R.S. as 12-10-8-10-15-1 mm. Find incliration 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 ∅ 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 expressio nfor 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 dimeter $27H_7$ 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 machinisms 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
