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SE-7465

B. E. - IV (Sem. VII) (Mech.) Examination

May / June – 2011

Production Technology - I

Time : **3** Hours] [Total Marks :

Instructions :

(1)

નીચે દર્શાવેલ ☛ નિશાનીવાળી વિગતો ઉત્તરવહી પર અવશ્ય લખવી.
Fillup strictly the details of ☛ signs on your answer book.

Name of the Examination :

☛ **B. E. - 4 (Sem. 7) (Mech.)**

Name of the Subject :

☛ **Production Technology - 1**

☛ Subject Code No. : **7 4 6 5** ☛ Section No. (1, 2,.....) : **Nil**

Seat No. :

Student's Signature

(2) Attempt **all** questions.
(3) Assume data if necessary giving reasons.
(4) Figures to the right indicate full marks.
(5) Use of non-programmable calculator is permitted.

1 (a) Write the answers in brief : **16**

(i) What is the effect of rake angle on shear plane angle ? Show variation of cutting speed with shear plane angle.

(ii) Why cutting forces are measured ? What are the three components of cutting force in turning a cylindrical job ?

(iii) Explain the conditions that promote formation of continuous chip with B.U.E. Give chemical composition of H.S.S.

(iv) Why hob shifting is required ? Explain.

(v) Why chip breakers are used ? List various types of chip breakers.

(vi) Give classification of tool wear.

(vii) What are the properties of good tool dynamometer ?

(viii) How does rake angle affect the life of the cutting tool ?

(b) Select the correct option : **4**

(i) The following parameter determines the model of continuous chip formation.

(a) Trace speed

(b) Cutting velocity

(c) Chip thickness
(d) Rake angle

(ii) In machining aluminium parts, the chips produced are in the form of
(a) fragements
(b) snarls
(c) helix
(d) closed spirals

(iii) The primary cutting force used in calculating the total power consumption in machining is
(a) radial force
(b) tangential force
(c) axial force
(d) frictional force

(iv) Which is a single point cutting tool of the following ?
(a) Milling cutter
(b) Grinding wheel
(c) Tool used in slotting machine
(d) Hacksaw blade

2 Answer any **three** : **12**

(a) Explain the indicators of tool wear.
(b) Explain with neat sketch thread rolling process.
(c) Differentiate between ASA system and ORS system for tool designation.
(d) Explain the principle of gear hobbing.
(e) What is shear strain ? Derive formula for it for orthogonal cutting.

3 Attempt any **three** : **18**

(i) In an orthogonal cutting operation, the following data have been observed :
Uncut chip thickness = 0.127 mm
Width of cut = 6.35 mm
Cutting speed = 2 m/s
Rake angle = 10^{o}
Cutting force = 567 N, Thrust force = 227 N
Chip thickness = 0.228 mm
Determine shear angle, the friction angle, shear stress along the shear plane and the power for the cutting operation.

(ii) The following data relate to an orthogonal turning process :
chip thickness = 0.62 mm
feed = 0.2 mm/rev
Rake angle = 15^{o}

(i) Calculate cutting ratio and chip reduction coefficient.
(ii) Calculate shear angle.
(iii) Calculate the dynamic shear strain involved in the deformation process.

(iii) Draw kinematic diagram of gear hobbing machine and derive the formula to calculate machining time for spur gear in axial hobbing.

(iv) Explain with neat sketch methods for the measurement of chip-tool interface temperature.

4 (a) Answer the following : **10**

(i) Explain wear ratio in EDM process.
(ii) What are maskants or resists ?
(iii) Plot the variation of MRR with abrasive flow rate in AJM process.
(iv) What is the mechanism of metal removal in EBM process ?
(v) Define packing density.
(vi) Why servo systems are used in EDM process ?
(vii) What are indirect expenses ?
(viii) State the functions of slurry used in USM ?
(ix) Electrolyte is conducting medium. True or False ?
(x) Name various power supply circuits used in EDM process.

(b) Answer the following : **10**

(i) What are the factors that affect tool life ? Briefly describe their influence.
(ii) Explain different types of cost in brief.

5 Attempt any **three** : **18**

(a) During an ECM operation on an iron workpiece with a square-face copper tool (using brine as the electrolyte), both having a flat surface, a feed rate of 2 mm/min is used. The dc voltage used is 10 V and the total over voltage is 1.5 V. The dimension of the tool face is 25.4 mm $\times$ 25.4 mm. Find out the equilibrium gap and current density from the following data, for iron A = 55.85 g, Z = 2, ang ρ = 7.86 g/cm^3
Viscosity of electrolyte = 0.870×10^{-3} kg/m-sec
Density of electrolyte = 1.088 g/m^3

Conductivity of electrolyte = $0.2\ \Omega^{-1}\ cm^{-1}$

(b) It is required to drill a hole of 1.69 mm dia to a depth of 7.32 mm in steel sheet using R-C circuit by electro-discharge machining method using a brass electrode.

The surface finish required is to be 20 micron. Determine the source voltage to be set up for a condenser and resistance setting 120 micro-farads and 100 ohms respectively. Also find out the time required for drilling. Assume sparking period of 100 μ sec.

Given that

(i) surface roughness = $K_1\left(\frac{1}{2}CU^2\right) K_2\ t_p\ K_3$ microns

where K_1, K_2 and K_3 are constants and their values are 13, 0.45 and 0.22 respectively.
C = capacitance of the condenser in farads
U = voltage across the capacitor
t_p = pulse duration in μ – sec

(ii) Material removal rate = 1.42 $t_c U^2$ mm^3/sec t_c = charging time.

(iii) Explain the function of horn in USM and compare USM with conventional grinding.

(iv) Derive the equation for evaluation of MRR for an alloy in ECM process.

6 Attempt any **three** : **12**

(i) If the relationship for H.S.S. tools is $VT^{1/8} = C_1$ and for tungsten carbide tools $VT^{1/5} = C_2$ and assuming that at a speed of 25 m/min the tool life was 3 hours in each case, compare their cutting lives at 32 m/min.

(ii) Following data relate to a manufacturing organisation :
Annual sales (8000 units at the rate of Rs. 10 per unit) = Rs. 80000
Variable expenses = Rs. 64,000
Contribution = Rs. 16,000
Fixed expenses = Rs. 24,000
Losses = Rs. 8,000
(a) What sales are needed for break even ?
(b) What should be the selling price per unit if B.E.P. is to be brought down to 10,000 units ?

(iii) Derive the equation for optimum speed for minimum cost in turning.

(iv) Why the existing equipment has to be replaced ? Define "economic life" of an asset.

(v) What is meant by "Depreciation" ? Explain any two methods to account for it.