(Following Paper ID and Roll No. to be filled in your Answer Book)

PAPER ID : 2103   **Roll No.** ☐☐☐☐☐☐☐☐☐☐☐

B.Tech.

(SEM. V) ODD SEMESTER THEORY
EXAMINATION 2013-14

MANUFACTURING SCIENCE—II

Time : 3 Hours   *Total Marks : 100*

Note :— Attempt **all** questions. All questions carry equal marks.

1. Attempt any **four** parts of the following :   **(4×5=20)**

    (a) What are the various types of chips ? Under what conditions is each formed ?

    (b) Explain the Merchant's force circle diagram and derive the shear angle relationship $2\phi + \beta - \alpha = \pi/2$, where ϕ is the shear angle, β is the friction angle and α is the rake angle. State the assumptions made in the developments of such a diagram.

    (c) What are cutting fluids ? Discuss some of the cutting fluids used during machining.

    (d) When the rake angle is zero during orthogonal cutting, show that $\dfrac{\tau_s}{U_c} = \dfrac{(1-\mu r)r}{1+r^2}$

    Where symbols have their usual meanings.

    (e) Draw the tool geometry of a single point cutting tool and show the different angles.

2. Attempt any **two** parts of the following : (2×10=20)

(a) What is the difference between Capstan and Turret lathe ? What are the standard and special tools used on these machines ? How are these tools different to engine lathe tools ?

(b) Discuss the various criteria used for optimizing the cutting conditions. A cylindrical bar is to be turned. The maximum allowable feed is 0.2 mm/revolution and at this feed rate Taylor's tool life equation for a tool-work combination is found to be $VT^{0.25} = 75$. The labor cost involved in each regrinding of the tool is Rs. 5.00. On the average, it takes about 2 minutes to change the tool. Find the cutting speed that will lead to maximum production rate. Derive the formula used.

(c) What are the main differences between a shaper and a planer ? Discuss the different drive mechanisms used in shaper with the help of suitable diagram.

3. Attempt any **two** parts of the following : (2×10=20)

(a) What are the various factors to be considered in the selection of a grinding wheel ? Discuss each in detail.

(b) (i) Why surface finish is important for many applications ? Illustrate your answer.

(ii) Explain the Lapping process. State its uses, limitations and advantages.

(c) Explain the factors which affect the surface finish in plain milling operations.

A steel block of 20 mm width is being milled using a straight slab milling cutter with 20 teeth, 50 mm diameter, and $10°$ radial rake. The feed velocity of the table is 15 mm/min and the cutter rotates at 60 rpm. If a depth of cut of 1 mm is used, what will be the power consumption ? Assume shear-strength (k) of steel is 250 N/mm² and tool-chip interface friction $\mu = 0.3$.

4. Attempt any **two** parts of the following : **(2×10=20)**

   (a) Explain with neat sketch the working and applications of the following :

   (i) Coated and uncoated electrode welding

   (ii) Atomic hydrogen welding.

   (b) (i) Describe the submerged arc welding process with the help of a suitable diagram. What are the advantages and applications of this process ?

   (ii) Compare electro-slag welding process with that of submerged arc welding from standpoint of heat liberated, joint preparation and welding position.

   (c) Describe the oxy-acetylene welding equipments. Draw the different types of flames used in gas welding. How would you identify these flames ? What are the specific uses of each of these flames ?

5. Attempt any **two** parts of the following : **(2×10=20)**

   (a) What are the main parameters to be considered while selecting a particular unconventional machining process and why ?

(b) (i) How metal removal in EDM is achieved ? Discuss any one spark generator used in EDM.

(ii) Draw a neat sketch of the Electrode feeding mechanism used in EDM.

(c) (i) What are the applications of ultrasonic machining ? Why can very hard material be better cut by the ultrasonic process than soft ones ?

(ii) Compare ECM with EDM. Why isn't ECM as widely used as EDM ?