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B. TECH.
FIFTH SEMESTER EXAMINATION 2013-14
EME 503
MANUFACTURING SCIENCE - II

14

Time: 3 Hours Max. Marks: 100

Note:
- Attempt all questions.
- Marks and number of questions to be attempted from the section is mentioned before each section.
- Assume missing data suitably. Illustrate the answers with suitable sketches

1. Attempt any ***Four*** parts of the following: [4×5]
   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
   $$\frac{\tau_s}{U_c} = \frac{(1-\mu r)r}{1+r^2},$$
   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]
   a. What is difference between Capstan and Turret lathe? What are the standard and special tools used on these machines? How these tools are different to engine lathe tools?
   b. A 300 mm long bar with 30 mm diameter is to be turned on a lathe. The maximum allowable feed is 0.25 mm/revolution. The cost of labour and overheads/min is Rs. 0.25 and each regrinding of the tool involves an expense of Rs. 2. The time required for every tool change is one minute. Two alternatives materials X and Y can be used. Their cost and tool life equation (for a feed of 0.25 mm/revolution) are as given below:

Material	Cost/piece	Tool life equation (f = 0.25 mm/revolution)
X	Rs. 2.50	$vT^{0.1} = 30$
Y	Rs. 3.00	$vT^{0.16} = 76$

15

Determine which material should be used from the cost point of view. The setting and idle time involved in each piece is one minute.

   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 ***Four*** parts of the following: [4×5]
   a. What are the various factors to be considered in the selection of a grinding wheel? Discuss each in detail.
   b. Why surface finish is important for many applications? Illustrate your answer.
   c. Explain the Lapping process. State its uses, limitations and advantages.
   d. Justify the common saying that recommends use of hard wheels for soft materials and vice-versa. What is meant by G-ratio?
   e. What is the advantage of centerless grinding? Why is it called centerless? Describe the process.
   f. The cutting and thrust components of the machining during orthogonal machining of an alloy with a rake angle of 8^0 are found to be 400 N and 225 N, respectively.
      (i) Estimate the coefficient of friction between the tool and the chip.
      (ii) If the rake angle is reduced to 0^0, keeping all other parameters the same and if the coefficient of friction also remains unchanged, estimate the new values of F_c and F_t using Lee and Shaffer's solution.

4. Attempt any ***Two*** parts of the following: [2×10]
   a. (i) Give two important limitations of spot welding process. How can these be overcome in projection welding? Describe the process of resistance projection welding.
      (ii) Explain how transfer of metal from the metal electrode to the work takes place in arc welding process.
   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. (i) 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?
16
(ii) Write short notes on any *two* of the following:
(a) Thermit welding and its applications
(b) TIG vs. MIG
(c) Principle of solid phase welding

5. Attempt any *Two* parts of the following: [2×10]

a. (i) What are the main parameters to be considered while selecting a particular unconventional machining process and why?
(ii) How metal removal in EDM is achieved? Discuss any one spark generator used in EDM with the help of neat sketch.

b. (i) Discuss the mechanism of material removal in ultrasonic machining? Why the ductile materials erode less than brittle materials in USM process?
(ii) Compare ECM with EDM. Why isn't ECM as widely used as EDM?

c. (i) Describe the process of explosive welding with the help of a neat sketch. State its advantage, disadvantages and applications of this process.
(ii) Describe the use of Laser beams in welding and machining processes.