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**B.TECH.
(SEM V) THEORY EXAMINATION 2018-19
MANUFACTURING SCIENCE & TECHNOLOGY-II**

Time: 3 Hours

Total Marks: 70

Note: 1. Attempt all Sections. If require any missing data, then choose suitably.

SECTION A

1. Attempt all questions in brief.

2x7=14

- a. Write down the properties of cutting tool materials.
- b. What are the different types of flame used in gas welding?
- c. Differentiate between up milling and down milling.
- d. Write down the function of electrolyte.
- e. Define the term glazing and loading of grinding wheel.
- f. Why abrasive is not recycled in AJM.
- g. Define the term chip thickness ratio and chip reduction ratio also write down the relation between shear angle, chip thickness ratio and rake angle.

SECTION B

2. Attempt any three of the following:

7x3=21

- a. The following data relate to orthogonal cutting of mild steel part
Cutting speed = 195 m/min, tool rake angle = 12° , width of cut = 1.75mm, uncut thickness = 0.25 mm, coefficient of friction between chip and tool = 0.52, shear stress of the work material = 385 N/mm². calculate (i) shear angle (ii) cutting and thrust component of machining force.
- b. Classify the milling machines. Explain the working of knee and column type of horizontal milling machine with help of suitable diagram.
- c. It is required to weld a low carbon steel plate by manual metal arc welding process using a linear V.I. characteristics D.C. power source. The following data are available:
Open circuit voltage = 62V, short circuit current = 130A, Arc length = 4 mm, transverse speed of welding = 15 cm/min, voltage = $20 + 1.5L$ (L is arc length), efficiency of heat input = 0.84, calculate the heat input to the workpiece.
- d. Explain abrasive machining process. Also classify abrasive machining process. Explain centerless grinding with the help of neat sketch.
- e. ECM is performed to remove material from an iron surface of 20 mm * 20 mm. under the following condition. Interelectrode gap = 0.2mm, supply voltage = 12 V, specific resistance of electrolyte = 2ohm-cm, atomic weight of iron = 55.85, valency of iron = 2, faraday's constant = 96540 coulomb, find the material removal rate in gm/sec.

SECTION C

3. Attempt any one part

(7*1=7)

- a. State the assumptions made in Earnest and merchant theory. Also derive the following shear angle relationship $2\phi + \beta - \alpha = \pi/2$ Where ϕ = shear angle, β = friction angle and α = rake angle.

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- b. A batch of 1500 steel parts each 120 mm in diameter and 400 mm in length is to be rough then using a feed of 0.7 mm/rev. if the cost of grinding /grind is rupees 75, time required to reset the cutting edge is 2 min, and the total machining cost rate is Rs. 300/hr. if time taken to load and unload component is 2 min. and initial set up time is 3 hrs then for equation $VT^{0.25} = 650$. Calculate
- Optimum cutting speed and corresponding tool life for minimum cost criteria.
 - Total production time and cost for the batch
 - Calculate above values by using maximum production rate criteria.

4. **Attempt any one part** (7*1=7)
- What do you understand by indexing? What are the different methods of indexing? Cut 72 teeth on a blank of 40 mm diameter using compound indexing method.
 - Explain the radial type of drilling machine with suitable example. Also explain various drilling operation with neat sketch.

5. **Attempt any one part** (7*1=7)
- Find the limit sizes, tolerances and allowances for a 100 mm diameter shaft and hole pair, designated by F8h10. Also specify the type of fit that the above pair belongs to. Given: 100 mm diameter lies in the diameter step range of 0-120 mm. The fundamental Deviation for shaft designation 'f' is $-5.5 D^{0.41}$ the values of standard tolerances for grades of IT 8 and IT 10 are 25i and 64i respectively. Also, indicate the limits and tolerance on a diagram.
 - Show that the maximum chip thickness t_m is surface grinding, using grinding wheel diameter.

$$D \text{ is given by } t_m = \frac{2 v_f}{b C V_w} \sqrt{\frac{d}{D}}$$

Where v_f is the table feed, C is the number of abrasive grains per unit area of the grinding wheel surface, V_w is the grinding wheel surface speed, b is the width and d is the depth of cut.

6. **Attempt any one part** (7*1=7)
- Explain the working of submerged arc welding with help of suitable diagram, also write down their specific application and advantages and limitations.
 - Explain the principle of solid-state welding process. Also explain explosive welding with suitable diagram.

7. **Attempt any one part** (7*1=7)
- What is Abrasive jet machining (AJM)? Describe its working with suitable diagram. Also explain the effect of standoff distance and abrasive grit size on material removal rate in the AJM.
 - Derive the expression for the material removal rate of electro discharge machining. Also differentiate between EDM and ECM process.