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F. Y. M. TECH. (DESIGN ENGINEERING) (SEMESTER - I)

COURSE NAME: DESIGN FOR MANUFACTURING AND ASSEMBLY

COURSE CODE: MEPA11183B

(PATTERN 2018:R1)

Time: [3 Hour] [Max. Marks: 50]

(*) Instructions to candidates:

1) **Answer Q.1, Q.2, Q.3, Q.4 OR Q.5, Q.6 OR Q.7, Q.8 OR Q.9**
2) **Figures to the right indicate full marks.**
3) **Use of scientific calculator is allowed**
4) **Use suitable data where ever required**

Q.1 a) Explain why a direct conversion cannot be made between the ductility measures of elongation and reduction in area using the assumption of constant volume. [3]

OR

b) Write the advantages of applying DFMA during product design. Also, state the reasons for not implementing DFMA. [3]

Q.2 a) Why it is recommended to avoid use of cores in sand casting. In case, if it is unavoidable, suggest design recommendations that need to be considered while designing the sand casted products. [3]

OR

b) Assuming suitable dimensions for height of the pouring basin and height (length) of sprue, calculate the diameter of the sprue base for avoiding aspiration. Also obtain velocity of the molten metal at the base of the sprue, volume rate of flow and time to fill the mould. [3]

Q.3 a) A drilling operation is performed on a steel part using a 12.7-mm-diameter twist drill with point angle = 118°. The hole is a blind hole with a depth of 60 mm. Cutting speed = 15 m/min and feed = 0.20 mm/rev. Determine (a) cutting time of the operation and (b) metal removal rate after the drill bit reaches full diameter. [2]

OR

b) Design recommendations for machined parts suggest avoiding machining operations if possible in comparison to processes like casting or forming. Comment on the statement. [2]

Q.4 a) State the process variations and quality issues of rolling. [6]

b) State the typical characteristics, applications and materials suitable for hot working process. [4]

c) During forging die design parting line is located in such a manner that metal will flow horizontally being parallel to the parting line. Comment on the statement. [4]

OR

Q.5 a) State the guidelines for the following tolerances applied to impression die forging: i) Length and width tolerances, ii) Die-wear tolerances, iii) Die-closure tolerances, iv) Match tolerances, v) Straightness tolerances, vi) Flash-extension tolerances. [6]

b) A cylindrical workpiece of diameter 45 mm and initial height 35 mm is upset forged in open die. The height of the workpiece after forging is 20 mm. The material has flow curve defined Yf = 600 ε0.12. If forging force at the end of the stroke is 950 kN. Calculate the coefficient of friction for the process. [4]

c) Why sharp corners are avoided for both internal and external corner of extruded part. State minimum corner radii for Aluminum, magnesium, and copper alloys. [4]

Q.6 a) The arc-length characteristic of a D.C. arc is given by the equation: V = 24 + 4L, where V is the voltage in volts and L is arc length in mm. The static volt-ampere characteristic of the power source is approximated by a straight line with a no load voltage of 80 V and a short circuit current of 600 A. Determine the optimum arc length for maximum power. [6]

b) State design recommendations for electron and laser beam weldments. [4]

c) State the typical characteristics of electroplating process and name various equipments available for electroplating processes. [4]

OR

Q.7 a) Name the commonly used adhesives for aluminium and its alloys, copper and its alloys and glass respectively. [6]

b) State the typical characteristics of soldered and brazed joints. [4]

c) State the dimensional factors and recommended tolerances for arc weldments. [4]

Q.8 a) State the design rules that need to be referred for the economical use of rivets which are used to provide strength and performance to a joint. [6]

b) How does mechanical assembly differ from the other methods of assembly discussed in previous chapters (e.g., welding, brazing, etc.)? [4]

c) Identify some of the general principles and guidelines for design for assembly. [4]

OR

Q.9 a) An alloy steel shaft is to be inserted into a collar of the same metal using an expansion fit. At room temperature (20°C), the outer and inner diameters of the collar = 50.00 mm and 30.00 mm, respectively, and the shaft has a diameter = 30.015 mm. The shaft must be reduced in size for assembly into the collar by cooling to a sufficiently low temperature that there is a clearance of 0.03 mm. Determine (i) the temperature to which the shaft must be cooled for assembly, (ii) the radial pressure at room temperature after assembly, and (iii) the maximum effective stress on the collar. [6]

b) What is the difference between a shrink fit and expansion fit in assembly? [4]

c) State the benefits for design for assembly. [4]