Total No. of Questions – [09] Total No. of Printed Pages: 03

G.R. No.	

P118-153 (ESE)

DECEMBER 2018 / END-SEM

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

COURSE NAME: DESIGN FOR MANUFACTURING AND ASSEMBLY

COURSE CODE: MEPA11183B

(PATTERN 2018)

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

OR

b) One of the inspectors in the quality control department has frequently used the Brinell and Rockwell hardness tests, for which equipment is available in the company. He claims that the Rockwell hardness test is based on the same principle as the Brinell test, which is that hardness is measured as the applied load divided by the area of the impression made by an indentor. Is he correct? If not, how is the Rockwell test different? [3 marks]

Q.2 a) Investment casting is preferred in the places with parts involving contoured surfaces, undercuts, other intricate shapes, places where machining is difficult or unfeasible. Comment on the statement. [3 marks]

OR

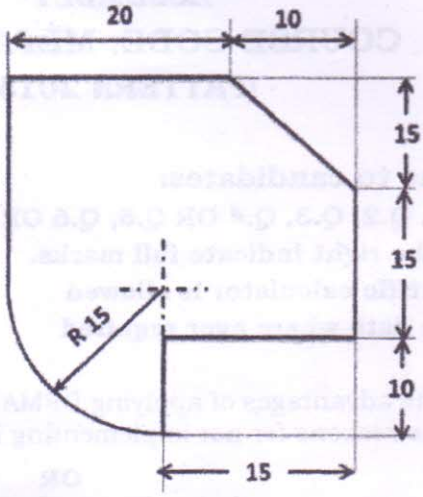
b) Abrupt section changes, sharp corners and wall at an acute angle to one another need to be avoided during die casting. Comment on the statement. [3 marks]

Q.3 a) Achieving close dimensional limits in turning operation are inversely related to the size and length of workpiece. Comment on the statement. [2 marks]

OR

b) Design recommendations for machining suggest that as far as machining of hardened or difficult-to-cut materials is to be avoided unless and until their functional properties are essential for the part to be machined. Comment on the statement. [2 marks]

Q.4 a) A part shown below is to be made from mild steel sheet 2 mm thick. Ultimate shear strength of M.S. is 200 N/mm2. Determine (a) Strip layout and percent utilization, b) Punch and die dimensions (c) Centre of Pressure and (d) Total cutting force required if no shear is provided either on the punch or the die. (All dimensions mentioned in Figure are in mm). [6 marks]



b) State the process variations and quality issues of forging. [4 marks]

c) With a sketch of ram pressure versus ram stroke explain why friction is a factor to be considered in determining the ram force in direct extrusion but not a factor in indirect extrusion? Also, state the expressions to compute ram pressure in direct and indirect extrusion. [4 marks]

OR

Q.5 a) A billet 75 mm long and 25 mm in diameter is to be extruded in a direct extrusion operation with extrusion ratio = 4.0. The extrudate has a round cross section. The die angle (half-angle) = 90°. The work metal has a strength coefficient = 415 MPa, and strain hardening exponent = 0.18. Use the Johnson formula with a = 0.8 and b = 1.5 to estimate extrusion strain. Determine the ram pressure at billet length of 75 mm (starting value), L = 50 mm, L = 25 mm, and at L = 0. [6 marks]

b) State the typical characteristics, applications and materials suitable for forging process. Also, state the design guidelines for forging process. [4 marks]

c) State the materials suitable and the design guidelines for rolling process. Also, state various factors that are responsible for dimensional variation in rolling process. [4 marks]

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 marks]

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

c) List the situations where adhesive bonding is considered to be more appropriate than other joining methods. [4 marks]

OR

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

b) Whenever possible, welding should be done horizontally, with the stick or electrode holder pointing downward during welding. Comment on the statement. [4 marks]

c) State design recommendations that need to be followed for providing proper thermal spray coatings. [4 marks]

Q.8 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 marks]

b) The basic approach in design for assembly is to reduce the number of parts without disturbing the functionality of the part. State Some important principles to reduce the number of parts. [4 marks]

c) Why eyelets and tubular rivets are recommended whenever they provide sufficient holding power for the application. [4 marks]

OR

Q.9 a) Identify some of the general principles and guidelines that apply specifically to automated assembly. [6 marks]

b) How buckling of rivets can be avoided when riveting thick materials. [4 marks]

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