Paper code – U 239-152 (ESE)

Total No. of Questions – [6] Total No. of Printed Pages: 02

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S. Y. B.TECH. (MECHANICAL ENGINEERING) (SEMESTER – III)

COURSE NAME: MANUFACTURING PROCESSES

COURSE CODE: MEUA21182

(PATTERN 2018)

Time: [2 Hours] [Max. Marks: 50]

(*) Instructions to candidates:
1) All questions are compulsory.
2) Figures to the right indicate full marks.
3) Use of scientific calculator is allowed.
4) Assume suitable data where ever required.

Q.1) Attempt any **one**

a) A disk-shaped part is cast out of aluminum. Diameter of the disk is 650 mm and thickness is 16 mm. If the mold constant is 2.2 sec/mm2 in Chvorinov's rule, how long will it take the casting to solidify? [4]

b) Explain moisture content test with a neat sketch. Also, state the importance of this test. [4]

Q.2) Attempt any **one**

a) A hot upset-forging operation is performed in an open die. Initial diameter of the cylindrical work part is 30 mm, and its height is 50 mm. The part is upset to an average diameter as 45 mm. The work metal at this elevated temperature yields at 90 MPa. Coefficient of friction at the die–work interface is 0.40. Determine the final height of the part and the maximum force in the operation. [4]

b) Why is friction a factor in determining the ram force in direct extrusion but not a factor in indirect extrusion? [4]

Q.3) Attempt any **one**

a) Describe with sketch Gas Tungsten Arc Welding (GTAW) process and sate its applications. [6]

b) A shielded metal arc-welding operation is performed on low carbon steel plates at a voltage 25 volts and a current 200 amps. The heat transfer factor is 0.90, and the melting factor is 0.75. Find the unit melting energy for low carbon steel and determine rate of heat generation at the weld and volume rate of metal welded. [6]

$T_m = 1760\ K$

$U_M = 3.33 \times 10^{-6}$

Q.4) Attempt any **one from (a) or (b)**

a)
- Explain the most appropriate manufacturing process for manufacturing of plastic buckets with neat sketch. [10]
- With a neat sketch explain the working principle of pressure thermoforming.

b)
- Describe with neat sketch compression moulding process and state its applications. [10]
- With a neat sketch explain the sheet extrusion process.

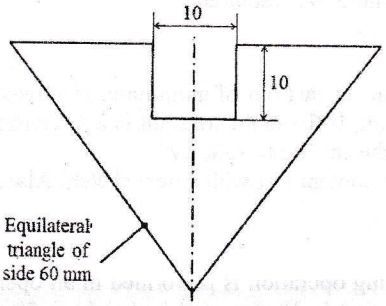
Q.5) Attempt any **one from (a) or (b)**

a)
- A cup of internal diameter 30 mm, height 45 mm is to be drawn from a 1.3 mm cold rolled steel with ultimate tensile strength of 320 MPa. The corner radius for cylindrical cup is 1.2 mm. Percentage reduction permitted in the first draw is 50% and in the second, third and fourth draw is 35%, 20% and [13]

15% respectively. Consider trimming allowance of 3.2 mm for each 25 mm of cup diameter. Find size of the blank, number of draws required, punch and die dimensions and drawing pressure for each draw. Consider value of die constant 'c' as 0.7 and value of punch and die clearance as 1.15 times thickness of sheet.

- A hole of 65 mm diameter is to be produced in steel plate of 3 mm thick. The ultimate shearing strength of the plate material is 450 MPa. Find the amount of shear on the punch if the punching force is to be reduced to half of the force required when operation carried using a punch without shear. Take percentage penetration of 45%.

b) A part shown below is to be made from mild steel sheet 1.12 mm thick. Ultimate shear strength of M.S. is 210 N/mm^2. 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). [13]



Q.6) Attempt any **one from (a) or (b)**

a)
- The following observations were made during an orthogonal cutting operation: Tool rake angle = 10°, Coefficient of friction = 0.85, Chip thickness = 2.5 mm, Width of cut = 15 mm, Cutting speed = 40 m/min, Feed = 1.5 mm/rev, Shear strength = 650 N/mm^2. Determine: a) Chip thickness ratio, b) Shear angle, c) Shearing force, d) Friction angle, e) Cutting force, f) Power consumed at the cutting tool. [13]
- Calculate the change gears for cutting two start left hand threads of 2.4 mm pitch on a lathe having 6 mm pitch lead screw. Available gears are 20 to 120 teeth in steps of 5. Sketch the gear train and suggest what modification is required for cutting right hand threads?

b)
- Low carbon steel having a tensile strength = 300 MPa and a shear strength = 220 MPa is turned at a cutting speed = 2.5 m/s. Feed = 0.20 mm/rev, and depth of cut = 3.0 mm. The rake angle = 5° in the direction of chip flow. The resulting chip ratio = 0.45. Using the orthogonal model to approximate turning, determine the cutting force and feed force. [13]
- Peripheral milling is performed on the top surface of a rectangular work part that is 400 mm long by 50 mm wide. The milling cutter is 70 mm in diameter and has five teeth. It overhangs the width of the part on both sides. Cutting speed = 60 m/min, chip load = 0.25 mm/tooth, and depth of cut = 6.5 mm. Determine (a) machining time of the operation and (b) maximum material removal rate during the cut.