

MANUFACTURING PROCESSES
(MECH 2204)

Time Allotted : 3 hrs

Full Marks : 70

Figures out of the right margin indicate full marks.

Candidates are required to answer Group A and any 5 (five) from Group B to E, taking at least one from each group.

Candidates are required to give answer in their own words as far as practicable.

Group – A
(Multiple Choice Type Questions)

1. Choose the correct alternative for the following: **10 × 1 = 10**
- (i) In centrifugal casting, the lighter impurities are
 - (a) uniformly distributed
 - (b) forced towards the outer surface
 - (c) trapped near the mean radius of the casting
 - (d) collected at the centre of the casting.
 - (ii) Metallic chaplets are used in a mould to
 - (a) enhance directional solidification
 - (b) increase the velocity of liquid metal
 - (c) support the core
 - (d) all of these.
 - (iii) The taper provided on pattern for its ease and clean withdrawal from the mould is called
 - (a) distortion allowance
 - (b) draft allowance
 - (c) shrinkage allowance
 - (d) taper allowance.
 - (iv) In which of the following aspects DC welding is better than AC welding?
 - (a) Efficiency
 - (b) Power consumption
 - (c) Arc stability
 - (d) Cost.
 - (v) Resistance welding requires external heat source from
 - (a) thermit welding
 - (b) electric arc
 - (c) oxy-acetylene flame
 - (d) electrical resistance.
 - (vi) Which of the following components is mainly manufactured by performing metal forging?
 - (a) Piston
 - (b) Engine block
 - (c) Connecting rod
 - (d) Crankcase.

- (vii) The important property of a material in all metal forming process is
(a) plasticity (b) elasticity
(c) ductility (d) brittleness.
- (viii) In blanking operation, the clearance is provided on
(a) punch
(b) die
(c) half on the punch and half on the die
(d) either on a punch or die depending upon the designer's choice.
- (ix) Process of forming metal powder by directing molten metal through an orifice after which it is break into small particle using high pressure fluid is known as
(a) atomization (b) reduction
(c) electrolysis (d) crushing.
- (x) Which of the following powder metallurgy parts exhibit a short cutting tool life?
(a) Dense (b) Very dense
(c) Sintered (d) Porous.

Group - B

2. (a) What are the allowances given while making a pattern? Explain draft allowances with proper examples. *[[CO1](Understand/LOCQ)]*
- (b) Find the time taken to fill up a cylindrical casting of 40 cm diameter and 20 cm height by a sprue having gate diameter 2 cm in the case of top gating and bottom gating. The static head available for filling metal in both cases is 25 cm. *[[CO2](Evaluate/HOCQ)]*
(2 + 4) + 6 = 12
3. (a) Write down the advantages of die casting over sand mould casting. Discuss cold shut and misrun related to casting defects along with their causes and remedies. *[[CO2](Remember/LOCQ)]*
- (b) Calculate the size of a cylindrical riser (height and diameter equal) necessary to feed a steel slab casting of dimensions 25 × 25 × 5 cm³ with a side riser, casting poured horizontally into the mould. *[[CO2](Evaluate/HOCQ)]*
(3 + 3) + 6 = 12

Group - C

4. (a) Mention and briefly explain with sketches the various types of flames that are used in gas welding. *[[CO1](Remember/LOCQ)]*
- (b) Two steel sheets of 1 mm thick are resistance welded in a lap joint with a current of 10000 A for 0.10 Sec. The effective resistance of the joint can be taken as 100 micro ohms. The joint can be considered as a cylinder of 5 mm diameter and 1.5 mm height. The density of steel is 0.00786 g/mm³ and heat required for melting is 10 J/mm³. Determine the percentage of heat lost to the surrounding. *[[CO3](Evaluate/HOCQ)]*
6 + 6 = 12

5. (a) Discuss the concept of straight and reverse polarity in arc welding with neat sketches. [[CO3](Analyze/IOCQ)]
(b) Can dissimilar metals be welded by a welding process? If so, explain the process very briefly. [[CO1](Analyze/IOCQ)]
6 + 6 = 12

Group - D

6. (a) In a single flat rolling operation a 400 mm wide steel strip having thickness of 10 mm is reduced to 8 mm by using rolls of diameter 600 mm. Find the contact length of the roll strip with the workpiece. [[CO4](Evaluate/HOCQ)]
(b) What are the common forging defects and the remedial measures to be taken? [[CO4](Understand/LOCQ)]
6 + 6 = 12
7. (a) Briefly explain the process of forward and backward extrusion with a schematic diagram. [[CO4](Understand/LOCQ)]
(b) The flow stress (MPa) of a material is given by $\sigma = 500 \epsilon^{0.1}$, where, ϵ is true strain. Young's modulus of plasticity (E) of the material is 200 GPa. A block of thickness 100 mm made of this material is compressed to 95 mm thickness and then the load is removed. Find the final dimension of the box. [[CO4](Evaluate/HOCQ)]
6 + 6 = 12

Group - E

8. (a) Explain with a neat sketch of a press tool (die and punch) along with its accessories for carrying out blanking operation. [[CO6](Understand/LOCQ)]
(b) Differentiate between extrusion blow moulding and injection blow moulding process with schematic diagram. [[CO5](Analyze/IOCQ)]
6 + 6 = 12
9. (a) Illustrate various differences between thermoplastics and thermosetting plastics. [[CO5](Apply/IOCQ)]
(b) Discuss the powder metallurgy process of making products mentioning the various stages. [[CO5](Remember/LOCQ)]
6 + 6 = 12

<i>Cognition Level</i>	<i>LOCQ</i>	<i>IOCQ</i>	<i>HOCQ</i>
<i>Percentage distribution</i>	44	25	31

Course Outcome (CO):

After the completion of the course students will be able to

- CO 1 Explain the basic idea of different non-machining manufacturing processes.
- CO 2 Investigate different sand casting processes.
- CO 3 Compare different welding processes
- CO 4 Differentiate different forming processes & their specific applications.
- CO 5 Explain powder metallurgy process & different plastic moulding processes.
- CO 6 Describe press working process.

**LOCQ: Lower Order Cognitive Question; IOCQ: Intermediate Order Cognitive Question; HOCQ: Higher Order Cognitive Question.*