

Time : 3 Hours

Max. Marks : 60

The candidates shall limit their answers precisely within the answer-book (40 pages) issued to them and no supplementary/continuation sheet will be issued.

Note: Attempt Five questions in all, selecting one question from each Section A, B, C and D. Section E is compulsory.

SECTION-A

1. (a) Explain investment casting. Also, write its advantages and disadvantages (5)
- (b) Two gating design for a mould of 50 cm × 25 cm × 15 cm with $h_f = 15$ cm. The cross-sectional area of the gate is 5 cm². Determine the filling time (t_f). (5)
2. Determine the solidification time of the following two iron castings when both are poured, with no superheats, into sand moulds at the initial temperature 28°C.
 - (i) A slab-shaped casting 10 cm thick
 - (ii) A sphere 10 cm in diameterThe data for iron is $\theta_i = 1540^\circ\text{C}$, $L = 272\text{kJ/kg}$, $\rho_m = 7850\text{ kg/m}^3$
And for sand is $c = 1.17\text{kJ/kg-K}$, $k = 0.8655\text{ W/m-K}$,
 $\rho = 1600\text{ kg/m}^3$ (10)

SECTION B

3. Explain the various forming processes with the help of neat sketch. (10)

4. A circular aluminium blanks with 25 mm diameter and 3 mm thickness are to be produced as the starting material for the toothpaste tube extrusion. The press has a capacity of 500 kN. The fracture strain and stress of the material are 2 and 80 N/mm². No shear is provided to the punch. Determine
 - (i) the optimum clearance between the die and the punch,
 - (ii) the maximum number of the blanks which can be punched simultaneously per stroke, and
 - (iii) the power required if the punch speed is 60 cycles/min. (10)

SECTION C

5. (a) Describe the working principle of resistance welding process. (5)
- (b) In a resistance welding process, the applied voltage is 5V. Determine the rate of heat generated per unit area with 25 bridges/cm², each bridge having a radius of 0.1 mm. the resistivity of the material is given to be 2×10^{-5} ohm-cm. (5)
6. (a) Explain the working & elements of friction stir welding process giving a neat sketch. (5)
- (b) Define welding defects. Write causes and remedies of following welding defects; i) Spatter ii) Overlap iii) Undercut. (5)

SECTION D

7. Explain the different types of compression moulding process with neat sketches and applications. (10)

8. Explain the injection moulding die mechanism with the help of neat sketch. Also, discuss the cycle time breakdown curve for the injection moulding process. (10)

SECTION E

9. a) Explain the selection criteria for manufacturing processes.
b) Why the section of a spruce reduces downwards?
c) What are the common allowances provided on pattern?
d) What is the difference between direct and indirect extrusion?
e) What is meant by explosive forming?
f) What is meant by yield criterion?
g) What is "Arc blow"? How can it be avoided?
h) Explain the functions of using fluxes on welding electrodes.
i) Distinguish between "brazing" and "soldering" processes
j) Differentiate destructive and non-destructive testing.

(10×2=20)