

Time: 3 Hours

Full Marks: 70

Answer any Four questions  
The questions are of equal value

1. (a) Based on what principles a gating system is designed. How the various components are designed in casting?  
(b) With schematic diagram discuss the following elements of a gating system: riser, runner, chill, in-gates and pouring basin.  
(c) Write in brief about the following defects in casting: shrinkage cavities, metal penetration, hot tears, slag inclusions, porosity.
2. (a) For what type of product a centrifugal casting process is used. Write the advantages and limitations of centrifugal casting process.  
(b) With schematic diagram discuss in brief the process of centrifugal casting.  
(c) With examples write for what type of materials hot chamber and cold chamber die casting machines are very effective and make a comparison between the two.
3. (a) Classify the various welding techniques. Write in brief about the various defects in welding.  
(b) With schematic diagram, write the effect of electrode extension, shielding gases and power supply on the weld quality in GMAW welding.  
(c) 'Distortion is inevitable in welding' - Justify. Write the various distortions in welding. How it can be reduced.
4. (a) Why filler material and shielding gas is used in GTAW process. Write the effect of gas consumption on weld in GTAW process.  
(b) With schematic diagram, describe in brief the working principle of gas tungsten arc welding.  
(c) Determine the appropriate welding speed to be used to weld 10 mm C40 steel plates with an ambient temperature of  $36^{\circ}\text{C}$  with the welding transformer set at 28V and current passing at 280A. The arc efficiency is 0.85 while the limiting cooling rate for satisfactory performance is  $6^{\circ}\text{C/s}$  at a temperature of  $600^{\circ}\text{C}$ . The possible travel speeds are 6-10 mm/s. Assume thermal conductivity of the base metal is  $0.028 \text{ J/mm.s}^{\circ}\text{C}$ .
5. (a) With the schematic diagram, describe the effect of electrodes and heat balance in resistance welding.  
(b) Calculate the gating requirement for the casting of a cast steel gear blank of size O.D – 4000 mm, I.D – 180 mm and width – 120 mm. There are twelve numbers of identical holes of size  $\phi 60$  in the circumference at a radius of 800mm. Assume there are two castings in the mould. Design the above gating system with proper arrangement of casting in the mould. Assume data if any.  
(c) Why edge preparation is essential in butt welding.