

Note: This question paper contains two parts A and B.

Part A is compulsory which carries 25 marks. Answer all questions in Part A.

Part B consists of 5 Units. Answer any one full question from each unit.

Each question carries 10 marks and may have a, b, c as sub questions.

PART- A

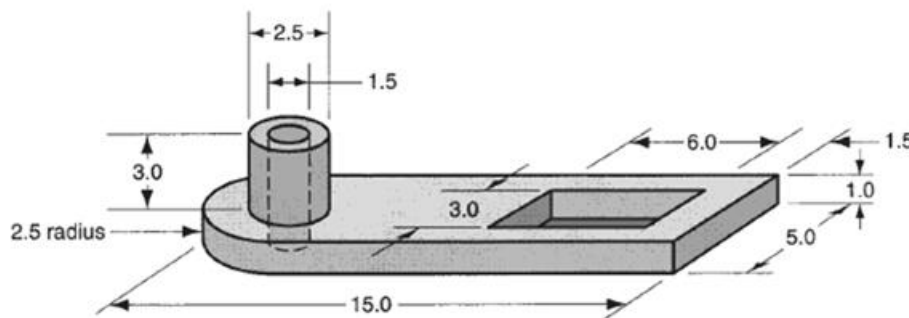
(25 Marks)

- 1.a) Explain briefly about sweep pattern and match plate pattern. [2]
- b) A rectangular block of dimensions $80 \times 50 \times 20$ mm is to be made from cast iron by the casting process. The mould for this job is made using a wooden pattern. Determine the dimensions of wooden pattern if machining allowance is 2mm on each side, shrinkage allowance of 2% and taper allowance of 1° . [3]
- c) In a resistance welding process if the current of 10000 A supplied for 0.1 sec through a $100 \mu\Omega$ resistance joint, what is the heat input required at weld joint? [2]
- d) A rail track was broken at a remote location, which welding technique do you suggest? Given the reason. [3]
- e) Name any two non-destructive tests used for finding welding defects. [2]
- f) What does each term in E-3-2-2-5-411-P in electrode designation represent? [3]
- g) What is strain hardening? [2]
- h) Write three differences between cold working and hot working. [3]
- i) What is fullering and edging in forging operation? [2]
- j) Write any three differences between forward and backward hot extrusion process. [3]

PART-B

(50 Marks)

2. A cylindrical riser with diameter-to-length ratio =1 is to be designed for a sand casting mold. The casting geometry is shown in figure, in which the units are in inches. If the mold constant is Chvorinov's rule (proportionality constant) = 19.5 min/in^2 , $n=2$, determine the dimensions of the riser so that the riser will take 0.5 min longer to freeze than casting itself. [10]



3. Explain the working principle of shell mould casting, hot chamber and cold chamber die casting process. [10]

- 4.a) Why do we do the edge preparation before welding? What are the different ways of edge preparation techniques?
b) Write primary and secondary combustion equations in oxy-acetylene gas welding process. Is it an endothermic process or exothermic process? [6+4]

OR

- 5.a) In a given arc-welding operation, the power source is at 20V and current is at 300 A. If the electrode travel speed is 6 mm/s, calculate the cross-sectional area of the joint. The heat transfer efficiency is 0.8 and melting efficiency is 0.30. Heat required to melt the steel is 10 J/mm².
b) Assume that two 1.5 mm thick steel sheets are being spot welded at a current of 5500 A and current flow time $t=0.15$ s. Using electrodes 6mm in diameter, estimate the amount of heat generated and its distribution in the weld zone. Use an effective resistance of 250 $\mu\Omega$. [5+5]
- 6.a) List any five welding defects and describe the consequences of those defects and remedies.
b) Can we join dissimilar materials? If so give those process names and describe the basic principle of working. [5+5]

OR

- 7.a) Which welding technology out of TIG/MIG welding uses non consumable electrode? Explain that process with neat diagram.
b) Why DC arc welding is more used than AC arc welding in specialized applications? [5+5]
- 8.a) Estimate the force required in punching 25 mm² area square hole with 2 mm thickness and UTS of the material is 1000 MPa.
b) Draw the neat sketches of two high, three high, four high, tandem, planetary rolling mills. [5+5]

OR

- 9.a) A 10 mm deep cylindrical cup with diameter of 15 mm is drawn from a circular blank. Neglect the variation in the sheet thickness, what is the diameter of the blank in mm?
b) Why recovery, recrystallization and grain growth are required after plastic deformation of a metal. Explain these process. [7+3]

10. A cylindrical specimen made of annealed 1112 steel (strength coefficient $K=750$ MPa, strain hardening coefficient $n=0.15$) has a diameter of 225 mm and 125 mm high. It is upset at room temperature, by open die forging with flat dies to a height of 50 mm. Assuming that the coefficient of friction is 0.2, calculate upsetting force required at the end of the stroke. Use average pressure formula. [10]

OR

11. A copper billet 150 mm in diameter and 325 mm long is extruded at 1123 K at a speed of 300 m/s. Using square dies and assuming poor lubrication, estimate the force required in this operation if the extruded diameter is 75 mm, where strength coefficient $C= 240$ MPa and strain rate sensitivity coefficient $m=0.06$. [10]

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