



Allowed Tables and Charts (None)

Answer all the following questions

استعن بالرسم كلما امكن ذلك

QUESTION NO. 1 (18 Marks)

- A) Write short notes about the following:- (6 marks)
 - Core Prints - Buoyant Force - Chaplets
- B) Explain, with neat sketch the die-casting in hot chamber process and list its applications. (6 marks)
- C) A cylindrical riser is designed for a sand-casting mold. The casting itself is a steel rectangular plate with dimensions of 7.5x12.5x2.0 cm. Previous observations have indicated that the solidification time for this casting is 1.6 min. The cylinder of the riser has diameter-to-height ratio as 1.0. Determine the dimensions of the riser so that its solidification time equals 2.0 min. (6 marks)

QUESTION NO. 2 (18 Mark)

- A) Explain with neat sketch the Cupola furnace. What are the advantages and limitations of this furnace? (6 marks)
- B) Determine the weight of the metal required for completing the casting process of low carbon steel bush shown in Fig.1. Estimate the rate of pouring and construct the suitable die for casting the steel bush. Take specific weight of melted carbon steel (7.50 grme/cm^3), carbon steel (7.89 grame/cm^3) and the coefficient of friction is 0.36. Take the machining allowances of casting (6 mm for upper surface, 3 mm for normal surface and 3 mm for internal diameter) and the pouring factor $S = 0.50$. (6 marks)

- C) Differentiate with neat sketch between the following:- (6 marks)
 - Flashless and Coining forging
 Forward and backward spinning

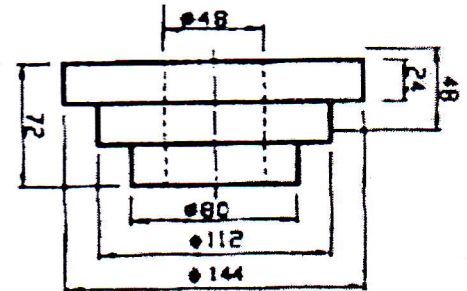


Fig. 1 (Dim. in mm)

QUESTION NO. 3 (18 Mark)

- A) Carbon steel cylindrical workpieces have 100 mm diameter and 300 mm height. The final height after hammering by using impression drop die forging equals 100 mm at temperature of 1200 C. The flow stress is 80 MPA and the coefficient of friction equals 0.4. Calculate the hammering force required to perform this process and heating conditions, if the number of pieces in the furnace equals two. (5 marks)
- B) Explain what is meant by; 'Spring-back' and state how this effect could be overcome (4marks)
- C) State briefly the main advantages and limitations of powder metallurgy. (5 marks)
- D) State briefly methods of powder production in powder metallurgy. (4 marks)

QUESTION NO.4 (18 Mark)

- A) In Factories of rolling, why the forming process stars hot then cold (discuss indetail). (5 marks)
- B) Explain with neat sketch the main defects which happen during flat rolling process. (5 marks)
- C) Calculate the roll force, torque and power required to hot roll a plate from annealed low carbon steel of width 200 mm and thickness of 8 mm to a thickness of 6 mm in one stage. Rolls have diameter of 400 mm and rotate with $N=50 \text{ rpm}$. Take $C=105 \text{ MPa}$ and $m=0.15$. (8 marks)

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QUESTION NO. 5 (18 Mark)

- A) Discuss the friction effect on metals flow during the extrusion process and state the types of lubricant materials. (6 marks)
- B) Explain the defects which happen during extrusion process. (4 marks)
- C) Calculate the extrusion force and power required to extrude a cylindrical bar from Aluminum 1100-0 (K= 180 MPa and n= 0.2) of length 80 mm and diameter of 60 mm to diameter of 50 mm in one stage. The extrusion process is performed at speed of 50 mm/sec. (8 marks)

***** GOOD LUCK*****

This exam measures the following ILOs								
Question Number	Q1	Q2	Q3	Q3	Q4	Q5	Q4	Q5
Skills	a1-1	a3-1	a19-1	b2-1	b11-1	b18-1	c7-1	c15-1
	Knowledge & Understanding Skills			Intellectual Skills			Professional Skills	

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