

POSTAL
Book Package

2027

GATE • PSUs

**PRODUCTION AND
INDUSTRIAL ENGINEERING**

Objective Practice Sets

Manufacturing Process-I

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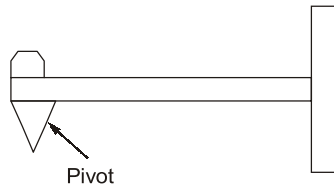
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Metal Casting

MCQ and NAT Questions

- Q.1** Directional solidification in castings can be improved by using
- chills and chaplets
 - chills and padding
 - chaplets and padding
 - chills, chaplets and padding
- Q.2** The main purpose of chaplets is
- to ensure directional solidification
 - to provide efficient venting
 - for aligning the mould boxes
 - to support the cores
- Q.3** Shell moulding can be used for
- producing milling cutters
 - making gold ornaments
 - producing heavy and thick-walled
 - producing thin casting
- Q.4** In which of the following processes, metal moulds are used?
- Green sand mould
 - Dry sand mould
 - Die casting process
 - Loam moulding
- Q.5** Investment casting is also known by which one of the following names :
- fast-payback moulding
 - full-mould process
 - lost foam process
 - lost-wax process
- Q.6** Which one of the following casting metals is most important for commercially purpose?
- Aluminium and its alloys
 - Bronze
 - Cast Iron
 - Cast Steel
- Q.7** In a hot chamber die casting machine
- Melting pot is separate from the machine
 - Melting pot is an integral part of the machine
 - Melting pot may have any location
 - There is no need of melting pot
- Q.8** Cold chamber die casting is suited for
- Aluminium and its alloys
 - Lead and its alloys
 - Tin and its alloys
 - Zinc and its alloys
- Q.9** Compared to others easting processes, investment casting process is the best solution for manufacturing of
- engine blocks
 - gears
 - jewellery
 - pipes
- Q.10** Shell moulding is best described by which one of the following :
- Casting operation in which the molten metal has been poured out after a thin shell has been solidified in the mould.
 - Casting process in which the mould is a thin shell of sand binded by a thermosetting resin.
 - Sand casting operation in which the pattern is a shell rather than a solid form.
 - Casting operation used to make artificial sea shells.
- Q.11** The relationship between total freezing time t , volume of casting V and its surface area A , according to Chvorinov's rule is
- $t = C\left(\frac{V}{A}\right)$
 - $t = C\left(\frac{A}{V}\right)$
 - $t = C\left(\frac{A}{V}\right)^2$
 - $t = C\left(\frac{V}{A}\right)^2$
- Q.12** Which of the following factor is not considered while selecting a kind of pattern?
- Quantity of casting
 - Types of moulding method
 - Shape of the casting
 - Nature of moulding process

Q.13 The following figure represents which pattern?



- (a) Follow board pattern
- (b) Gated pattern
- (c) Match plate pattern
- (d) Segmental pattern

Q.14 The function of a gated pattern is _____.

- (a) to produce small castings in mass production.
- (b) to create castings of a very heavy mass.
- (c) to create castings containing complex design.
- (d) to create symmetrical castings.

Q.15 Which of the following sequence is in the correct order to prepare a cast using the sand casting method?

- (i) Mould making, (ii) Clamping, (iii) Pouring, (iv) Cooling, (v) Trimming, (vi) Removal
- (a) (i), (iii), (ii), (iv), (vi), (v)
- (b) (ii), (i), (iii), (iv), (v), (vi)
- (c) (i), (ii), (iii), (iv), (v), (vi)
- (d) (i), (ii), (iii), (iv), (vi), (v)

Q.16 Which one of the following is not a limitation of wooden pattern?

- (a) Get abraded easily
- (b) Absorb moisture
- (c) Difficult machining
- (d) Poor wear resistance

Q.17 Which of the following patterns has high compressive strength?

- (a) Plastic pattern
- (b) Wax pattern
- (c) Polystyrene pattern
- (d) Plaster pattern

Q.18 In a green sand moulding process, uniform ramming leads to :

- (a) uniform flow of molten into the mould cavity
- (b) less chance of gas porosity
- (c) less same expansion type of casting defect
- (d) greater dimensional stability of the casting

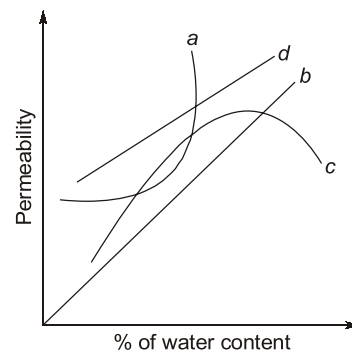
Q.19 Which of the following reasons stand for the crumbling of green sand mould?

- (a) The sand grains are not adequately bonded.
- (b) Excess of water and clay mixture.
- (c) Due to the presence of impurities in the green sand mould.
- (d) Fine grain size

Q.20 Refractoriness of the green sand mould shows _____

- (a) high strength
- (b) high temperature resistant
- (c) toughness
- (d) high porosity

Q.21 In the given below graph, which curve represents the permeability of the green sand mould with the % of the water content?



- (a) a
- (b) b
- (c) c
- (d) d

Q.22 Which of the following gate is also called as 'drop gate'?

- (a) Top gate
- (b) Bottom gate
- (c) Parting gate
- (d) Middle gate

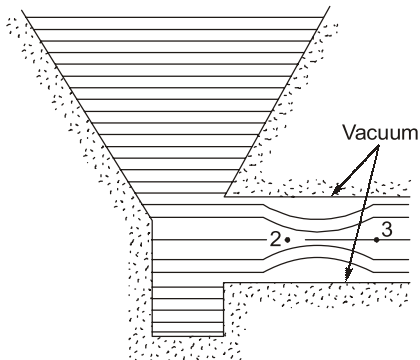
Q.23 For the functioning of the gating system, which of the following factors need not be controlled?

- (a) Type of sprue
- (b) Size of runner
- (c) Temperature of molten metal
- (d) Type of riser

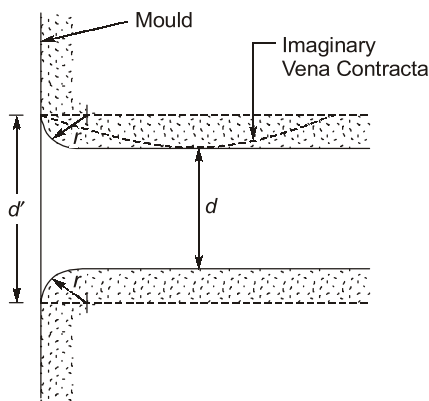
Q.24 Sprue design is made tapered instead of straight because of

- (a) to easy flow of molten metal
- (b) to have smoothness in the metal flow
- (c) to maintain the pressure balance
- (d) to avoid the erosion of mould sand

- Q.25 What is the purpose of strainer in the gating system?
 (a) to make uniform flow
 (b) to make smooth surface finish of the casting
 (c) to remove dross from the molten metal
 (d) to create positive pressure throughout to avoid aspiration effect
- Q.26 In the given below figure of mechanism of vacuum generation, point "2" is the indication of

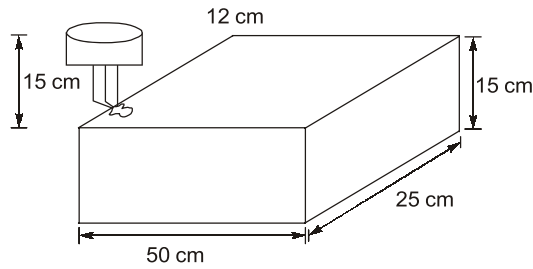


- (a) Poynting point (b) Vena contracta
 (c) Stack point (d) Steric point
- Q.27 In the given below figure of outlet dimensions to prevent vacuum generation, what should be the relation between d' and d where d is runner diameter, and d' is the entrance diameter.



- (a) $\frac{d'}{d} = 1.3$ (b) $\frac{d'}{d} > 2$
 (c) $\frac{d'}{d} = 2$ (d) $\frac{d'}{d} > 2.2$
- Q.28 Which one of the following items is used for trapping impurities from entering the mould?
 (a) Facing sand (b) Core
 (c) Skim bob (d) Pouring basin

- Q.29 Which of the following is not a gas defect?
 (a) Blow holes (b) Run out
 (c) Pinhole porosity (d) Air inclusions
- Q.30 Which one of the following defects is a metallurgical defect?
 (a) Hotspots (b) Shrinkage cavities
 (c) Slag inclusions (d) Metal penetration
- Q.31 Two streams of liquid metal which are not hot enough to fuse properly result into a casting defect known as
 (a) cold shut (b) swell
 (c) sand wash (d) scab
- Q.32 Centrifugally casted products have
 (a) large grain structure with high porosity
 (b) fine grain structure with high density
 (c) fine grain structure with low density
 (d) segregation of slug toward the outer skin of the casting
- Q.33 For casting of turbine blades made of high temperature and high strength alloys, the most suitable process is
 (a) Die casting
 (b) Investment casting
 (c) Centrifugal casting
 (d) Slush casting
- Q.34 Negative allowance is provided on the pattern to take care of
 (a) the distortion allowance
 (b) the draft allowance
 (c) the machining allowance
 (d) the shake allowance
- Q.35 Which of the following types of centrifugal casting process is used for the casting, whose shape of casting is not axi-symmetric?
 (a) True centrifugal casting
 (b) Semi centrifugal casting
 (c) Centrifuging
 (d) Full centrifugal casting
- Q.36 Which of the following ways of cooling is used for the maintaining of die temperature?
 (a) Natural air cooling
 (b) Forced air cooling
 (c) Water channels cooling
 (d) Liquid nitrogen cooling



- (a) The factor C_D is given as 0.71
- (b) The velocity at gate is 122 cm/sec
- (c) The velocity at gate is 109 cm/sec
- (d) The mould filling time is 31 sec

- Q.104** Which of the following defect/s in metal casting can be prevented by providing proper venting and adequate permeability
- (a) Scar
 - (b) Blisters
 - (c) Gas holes
 - (d) Cold shut

- Q.105** Which of the following is/are advantages of die casting?
- (a) Any complex shape can be obtained .
 - (b) Economical for small quantities.
 - (c) Gives better mechanical properties.
 - (d) Very small thickness can be easily filled.



Answers		Metal Casting							
1. (b)	2. (d)	3. (d)	4. (c)	5. (d)	6. (c)	7. (b)	8. (a)		
9. (c)	10. (b)	11. (d)	12. (b)	13. (c)	14. (a)	15. (d)	16. (c)		
17. (d)	18. (d)	19. (a)	20. (b)	21. (c)	22. (a)	23. (d)	24. (c)		
25. (c)	26. (b)	27. (a)	28. (c)	29. (b)	30. (a)	31. (a)	32. (b)		
33. (b)	34. (d)	35. (c)	36. (c)	37. (d)	38. (d)	39. (d)	40. (b)		
41. (a)	42. (a)	43. (c)	44. (d)	45. (a)	46. (d)	47. (d)	48. (d)		
49. (c)	50. (c)	51. (a)	52. (a)	53. (a)	54. (a)	55. (a)	56. (b)		
57. (b)	58. (c)	59. (b)	60. (178.4 N)	61. (c)	62. ($10^5 \times 10^5$)	63. (10.18 kg)	64. (b)		
65. (19.082)	66. (1.35)	67. (539.53)	68. (2.49)	69. (2.85)	70. (74.22)	71. (1.0)	72. (47.50)		
73. (10)	74. (b)	75. (a)	76. (b)	77. (86.53 and 55.93)	78. (87.58, 46.38, 37.08)				
79. (879, 675 and 95.82)	80. (b)	81. (d)	82. (b)	83. (a)	84. (2738.77)	85. (a)			
86. (c)	87. (197.98)	88. (b)	89. (8.72)	90. (a)	91. (c)	92. (a)	93. (d)		
94. (b)	95. (a)	96. (70.80)	97. (2.39)	98. (23.124)	99. (b)	100. (d)	101. (a, d)		
102. (a, b, c, d)	103. (a, b, d)	104. (a, b, c)	105. (a, c, d)						

Explanations		Metal Casting	
1. (b)	Chills cause rapid freezing in certain regions of the casting.		possible in green sand moulds, can be made by shell mould casting.
2. (d)	Actually chaplets are used to support core inside the mould cavity to take care of its own weight and overcome the metallostatic forces.	4. (c)	In die casting, the mould called as die and is made up of metal.
3. (d)	Thin sections, sharp corners which are not	7. (b)	Melting pot is an integral part of the hot chamber die casting machine but it is separate part for cold chamber casting machine.

8. (a)

Cold chamber die casting → Aluminium and its alloys

Hot chamber die casting → (i) Lead and its alloys
(ii) Tin and its alloys (iii) Zinc and its alloys

9. (c)

Investment casting is the best solution for manufacturing of jewellery.

10. (b)

Shell moulding is a casting process in which the mould is a thin shell of sand and sand is mixed with the thermosetting resin binder (usually with phenolic).

11. (d)

According to Chvorinov's rule

$$t = C \left(\frac{V}{A} \right)^2$$

12. (b)

Nature of moulding process is a factor which is not used for selecting a kind of pattern.

13. (c)

In the following figure, we see there is a pivot. This pivot rotates in two directions namely clockwise and anti-clockwise directions. A pattern with such an apparatus is called as segmental pattern.

14. (a)

Gated pattern manufactures huge number of products using single time casting using a common gating inlet system. Hence, the casting needs to be small and simple and is only justified for mass production, as the pattern is used for 1-2 times only.

15. (d)

Correct order is :

(i) Moulding Making → (ii) Clamping → (iii) Pouring
↓
(v) Trimming ← (vi) Removal ← (iv) Cooling

16. (c)

Wooden patterns are the easiest to get machined than all the other materials which are used for

making patterns and hence is counted as one of its advantage and not limitation.

17. (d)

Plaster pattern has the highest compressive strength. The calculated compressive strength is as high as upto 285 kg/cm².

18. (d)

Uniform ramming of sand during mould preparation improves mould strength, and makes it dimensionally stable. It is done to obtain a smooth and hard casting surface which prevents break out.

19. (a)

- Sand mould crumbles because moulding sand is not adequately compacted in the flask.
- Clay with water acts as a bonding agent and the organic additives also save the mould from crumbling by burning out at high temperatures.

20. (b)

Refractoriness is the ability of the material to withstand the high temperatures of the molten metal to be poured so that it does not get fused with the metal.

22. (a)

Top gate is also known as drop gate because the molten metal simply gets dropped down through this gate on the sand beneath.

24. (c)

To avoid the negative pressure (to ensure positive pressure anywhere in the liquid column), the sprue should be tapered.

25. (c)

Strainer in the sprue removes dross and prevent slag from entering to the castings.

26. (b)

A sudden change in the flow direction cause the aspiration effect and thus vacuum as the liquid metal stream contracts around a sharp corner due to the momentum effect. To avoid vacuum, the mould is made to fit the vena contracta.