

POSTAL Study Package

2021

Production and Industrial Engineering

Objective Practice Sets

Manufacturing Process-I

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Metal Casting

- 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

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)	

Explanations Metal Casting

1. (b)

Chills cause rapid freezing in certain regions of the 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.

3. (d)

Thin sections, sharp corners which are not possible in green sand moulds, can be made by shell mould casting.

4. (c)

In die casting, the mould called as die and is made up of metal.

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 phenolix).

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.

28. (c)

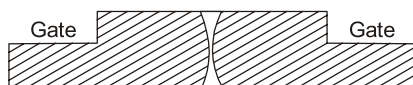
Skim bob is a trap placed in a horizontal gate to prevent heavier and lighter impurities from entering the mould.

29. (b)

Run out is not a gas defect, instead it is a moulding material defect.

30. (a)

Hotspots are a type of metallurgical defect occurs due to the chilling of the casting.

31. (a)**32. (b)**

In centrifugal casting, fine grain structure with high density is obtained due to centrifugal action.

33. (b)

Components with intricate shapes like turbine blades are produced by investment castings.

34. (d)

Slight shaking to facilitate the removal of pattern enlarges the mould cavity, hence a negative allowance called shake allowance is provided to account for this increase.

35. (c)

Centrifuging is a process which is used in order to obtain higher metal pressures during solidification when the shapes of the castings are not axi-symmetrical.

36. (c)

For maintaining proper die temperature, water cooling channels are used near castings through cover and ejector die.

38. (d)

Shape factor = $\frac{(l+w)}{h}$ where l , w and h denotes the maximum length, maximum width and the maximum thickness respectively.

39. (d)

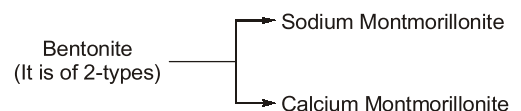
Basically sodium silicate is used as a binder in the CO_2 moulding.

40. (b)

In plaster-mould casting, the mould is made of Plaster of Paris (gypsum, $\text{CaSO}_4 \cdot \frac{1}{2}\text{H}_2\text{O}$) instead of sand.

41. (a)

Antioch process is used in plaster mould casting to improve the permeability of plaster mould. This process involves using about 50% sand mixed with the plaster, heating the mould in an autoclave and then drying.

42. (a)**43. (c)**

By increasing the binder content in the moulding sand, the permeability of the moulding sand gets reduced.