

Total Number of Questions : 32

Time : 3.00 Hours

Max. Marks : 200

1. Write four assumptions in Euler's column theory. (2 Marks)
2. Write Grashof's law for four bar chain mechanism. (2 Marks)
3. What is fin effectiveness and fin efficiency ? (2 Marks)
4. Draw pressure-temperature diagram of a substance that expand on freezing. Indicate triple point and critical point. (2 Marks)
5. Name the basic components of a robot. (2 Marks)
6. An inventor claims that he has developed a refrigerator having refrigerating capacity of 120 W at  $-23^{\circ}\text{C}$ . The input power requirement is 20W. The ambient temperature is  $27^{\circ}\text{C}$ . Check the validity of his claim. (4 Marks)
7. State the first law of thermodynamics for a closed system undergoing a cycle. What is PMMI ? Why it is impossible ? (4 Marks)
8. A solid uniform metal bar of diameter 'D' and length 'l' is hanging vertically from its upper end. If 'r' is the specific weight and 'E' is the Young's Modulus of the bar, obtain an expression for the total elongation of the bar due to its own weight. (4 Marks)
9. A flow field is characterised by stream function  $\Psi = x^3y$ . Determine the velocity potential  $\phi$  for the flow if the flow is irrotational. (4 Marks)
10. Discuss the differences between motion study and time study on the basis of purpose, scope and procedure. (4 Marks)
11. State fundamental law of gearing. Name two types of profiles that satisfy this law. What is pressure angle ? (5 Marks)
12. Define DBT, WBT, DPT and relative humidity of moist air. What is wet bulb depression ? What does it indicate ? (5 Marks)
13. List down any four assumptions for the analysis of air standard cycles. Write the thermal efficiency in terms of highest temperature  $T_H$  and lowest temperature  $T_L$  for an engine working on (1) Carnot cycle (2) Stirling cycle with perfect regeneration. (5 Marks)
14. What are the different modes in which a material can fail ? What is factor of safety ? Why is it necessary to provide factor of safety (any two reasons) ? (5 Marks)
15. Distinguish between internal combustion engines and external combustion engines (any five). (5 Marks)
16. Write the components and % composition of components in the following alloys. (5 Marks)
  - 1) Muntz metal
  - 2) Constantan
  - 3) Inconel
  - 4) Tin babbitt
  - 5) Commercial Bronze

17. ASHRAE designation of commonly used refrigerants are given below. Write the chemical formula of these refrigerants.
- 1) R - 22
  - 2) R - 134a
  - 3) R - 290
  - 4) R - 410A
  - 5) R - 717
- (5 Marks)
18. How a lathe is specified? List the components of a lathe. List out atleast eight cutting operations that can be performed on a lathe. (7 Marks)
19. Draw the bending moment and shear force diagrams of a simply supported beam subjected to uniformly distributed load. (7 Marks)
20. The yearly demand for an item is 3200 units. The unit cost is Rs. 6 and the holding charges amounts to be 25% per annum. If the cost of one procurement is Rs. 150. Determine :
- a) Economic order quantity
  - b) No. of orders per year
  - c) Time between two consecutive orders
  - d) The optimum inventory system cost
- (7 Marks)
21. What are the four basic steps that are usually involved in making products by powder metallurgy? What are the limitations of powder metallurgy parts? State any two applications of powder metallurgy. (7 Marks)
22. Draw ideal vapour compression refrigeration on Pressure-enthalpy (P-h) or Temperature-entropy (T-s) chart. How an actual vapour compression system is different from ideal? Use P-h or T-s diagram to explain the difference. (7 Marks)
23. Draw P-v and T-s diagram of the Brayton cycle. Derive an expression for the efficiency of the cycle in terms of pressure ratio. (10 Marks)
24. Draw Iron-Carbon equilibrium diagram and indicate key phases and structures. (10 Marks)
25. Show that velocity profile in a fully developed laminar pipe flow must be a paraboloid of revolution. (10 Marks)
26. Compare two stroke and four stroke engines (Atleast eight different aspects). (10 Marks)
27. Compare soldering, brazing and welding operations (Atleast five different aspects). (10 Marks)
28. Discuss any four theories of failure. (10 Marks)
29. Establish the equivalence of Kelvin-Planck and Clausius statements of the second law of thermodynamics. (10 Marks)
30. State the advantages and disadvantages of using CNC system (Atleast five advantages and disadvantages). (10 Marks)
31. Derive an expression for one-dimensional heat flow in radial direction through a hollow cylinder. What is critical radius of insulation? Derive critical radius of insulation in the case of circular pipe. (10 Marks)
32. List out the different types of plant layout. Explain the features of each. (10 Marks)