MIZORAM PUBLIC SERVICE COMMISSION

TECHNICAL COMPETITIVE EXAMINATIONS FOR JUNIOR GRADE OF MIZORAM ENGINEERING SERVICE (COMBINED) UNDER VARIOUS DEPARTMENT, GOVERNMENT OF MIZORAM, JULY-2024

MECHANICAL ENGINEERING

PAPER-III

Time Allowed : 3 hours FM : 200

SECTION - A *(Multiple Choice questions) (100 Marks)*

All questions carry equal mark of 2 each. Attempt all questions.

*This Section should be answered only on the **OMR Response Sheet** provided.*

1. Amorphous solids have _____ structure.

(a) regular (b) irregular

(c) linear (d) dendritic

2. What is the atomic packing factor of BCC structure?

(a) 0.54 (b) 0.72

(c) 0.68 (d) 0.94

3. IZOD test measures

(a) hardness (b) ductility

(c) impact-strength (d) grain size

4. Advantage of cold working is

(a) better dimensional accuracy (b) better surface finish

(c) higher strength (d) all of these

5. "Alligatoring" is a defect associated with

(a) forging process (b) casting process

(c) extrusion process (d) rolling process

6. The line above which the alloy is liquid is called

(a) solidus line (b) tie line

(c) liquidus line (d) lever line

7. Which of the following alloying element can be used to deoxidize steels?

(a) Phosphorous (b) Carbon

(c) Cerium (d) Selenium

8. Which of the following material in the final structure of steel increases the strength of steel?

(a) Martensite (b) Pearlite

(c) Ledeburite (d) Austenite

9. Wrought iron can be manufactured by
   (a) cementation processes
   (b) puddling processes
   (c) duplex processes
   (d) none of these

10. Green sand is a mixture of
   (a) 30% sand and 70% clay
   (b) 50% sand and 50% clay
   (c) 70% sand and 30% clay
   (d) 90% sand and 10% clay

11. A casting defect which results in general enlargement of casting is known as
   (a) Shift
   (b) Sand wash
   (c) Swell
   (d) Scab

12. The extra metal which settles down in the gutter is known as?
   (a) Flash
   (b) Slag
   (c) Barreling
   (d) Flux

13. Powder metallurgy is the branch of metallurgy in which parts are produced by
   (a) solidification of liquid metal
   (b) solidification of gas metal
   (c) sintering of powder
   (d) none of these

14. Fuel used in a cupola consists of
   (a) hard coke
   (b) furnace oil
   (c) electricity
   (d) Steam coal

15. Carburising flame is normally used to weld
   (a) Copper alloys
   (b) Stainless steel
   (c) Phosphor bronze
   (d) Stellite

16. For ship vessel industry which of the following layout is best suited
   (a) process layout
   (b) product layout
   (c) plant layout
   (d) fixed position layout

17. In Zinc Blende structure, each atom is surrounded by four atoms of the opposite kind which are located at the corners of which one of the following?
   (a) Tetrahedron
   (b) Hexahedron
   (c) Cube
   (d) Orthorhombic

18. Which gases are used in gas welding process?
   (a) Oxygen and hydrogen
   (b) Acetylene and oxygen
   (c) Acetylene and LPG
   (d) Helium and oxygen.

19. Amount of voltage required to generate the arc under no load condition is called-
   (a) Open circuit voltage
   (b) Closed circuit voltage
   (c) Short circuit voltage
   (d) Off voltage

20. In which of the following gas welding process a non-consumable electrode is used?
   (a) TIG welding
   (b) MIG welding
   (c) Metal core arc welding
   (d) Stud welding

21. A major difference between plasma arc welding and TIG welding.
   (a) Flux is not used
   (b) Construction of torch is different
   (c) Gas is not used
   (d) Tungsten electrode is not used

22. Atomic packing factor (APF) in the case of copper crystal is
    (a) 0.52 (b) 0.68
    (c) 0.74 (d) 1.633

23. Eutectoid reaction occurs at
    (a) 600°C (b) 723°C
    (c) 1147°C (d) 1493°C

24. Carburized machine components have high endurance limit because carburization
    (a) raises the yield point of the material
    (b) produces a better surface finish
    (c) introduces a compressive layer on the surface
    (d) suppresses any stress's, concentration produced in the component.

25. Globular form of cementite in the structure of steel is obtained through
    (a) Normalizing (b) Malleabilising
    (c) Spheroidizing (d) Carbonizing

26. Which electrode material is used for welding of wrought iron?
    (a) Cast iron rods (b) Low carbon steel rod
    (c) Mild steel copper coated rod (d) Drawn brass rod

27. One of the assumptions behind orthogonal cutting is,
    (a) that the rake angle is positive
    (b) that the tool is only cutting with one edge and one point
    (c) the shear plane is a function of before and after chip thickness
    (d) none of these

28. The central processing unit in CNC consists of which of the following parts?
    (a) Operating system unit (b) Secondary memory
    (c) Arithmetic Logic Unit (d) Read only memory

29. Computer will perform the data processing functions in
    (a) NC (b) CNC
    (c) DNC (d) none of these

30. Directional solidification in castings can be improved by using
    (a) chills and chaplets (b) chills and padding
    (c) chaplets and padding (d) chills, chaplets and padding.

31. Which of the following engineering materials is the most suitable candidate for hot chamber die casting?
    (a) Low carbon steel (b) Titanium
    (c) Copper (d) Tin

32. Which type of motor is NOT used in axis or spindle drives of CNC machine tools?
    (a) Induction motor (b) DC servo motor
    (c) Stepper motor (d) Linear servo motor

33. Which one of the following processes does not cause tool wear?
    (a) Ultrasonic machining (b) Electrochemical machining
    (c) Electric discharge machining (d) Anode mechanical machining

34. The mechanism of material removal in EDM process is

(a) Melting and Evaporation
(b) Melting and Corrosion
(c) Erosion and Cavitation
(d) Cavitation and Evaporation

35. A robot's arm is also known as its

(a) actuator
(b) end effector
(c) manipulator
(d) servomechanism

36. Which of the following tool material will offer lower friction and higher resistance to cracks and wear?

(a) HSS
(b) TiC
(c) WC
(d) TiCN

37. Which of the following is not a phase of project management?

(a) Project being
(b) Project scheduling
(c) Project controlling
(d) Project planning

38. Which of the following functions of an organization consists of all activities directly related to the production of a good or service?

(a) Operations
(b) Marketing
(c) Accounting
(d) finance

39. In drop forging, forging is done by dropping

(a) the work piece at high velocity.
(b) the hammer at high velocity.
(c) the die with hammer at high velocity.
(d) a weight on hammer to produce the requisite impact.

40. For sales forecasting, pooling of expert opinions is made use of in

(a) statistical correlation
(b) delphi technique
(c) moving average method
(d) exponential smoothing

41. Which one of the following methods can be used for forecasting when a demand pattern is consistently increasing or decreasing?

(a) Regression analysis
(b) Moving average
(c) Variance analysis
(d) Weighted moving average

42. In PERT, the distribution of activity times is assumed to be:

(a) Normal
(b) Gamma
(c) Beta
(d) Exponential

43. Dummy activities are used in a network to:

(a) Facilitate computation of slacks
(b) Satisfy precedence requirements
(c) Determine project completion time
(d) Avoid use of resources

44. In inventory control theory, the economic order quantity (E.O.Q.) is:

(a) Average level of inventory
(b) Optimum lot size
(c) Lot size corresponding to break-even analysis
(d) Capacity of a warehouse

45. Which one of the following techniques is used for determining allowances in time study?

(a) Acceptance sampling
(b) Linear regression
(c) Performance rating
(d) Work sampling

46. Break even point is the point, where

(a) fixed and variable cost lines intersect
(b) fixed and total cost lines intersect
(c) variable and total cost line intersect
(d) sales revenue and total cost line intersect

47. Which one of the following is not a technique of inventory control?

(a) ABC analysis
(b) FSN analysis
(c) GOLF analysis
(d) LTS analysis

48. Product Design combines _____ with product and business knowledge to generate ideas and concepts and convert them into physical and usable objects or services

(a) productivity
(b) ergonomics
(c) reflection
(d) operationality

49. In a transportation problem, the method of penalties is called

(a) Least cost
(b) South east corner
(c) Vogel's approximation
(d) north west corner

50. The term value in value engineering refers to-

(a) depreciation
(b) selling price
(c) cost
(d) utility

SECTION - B *(Short answer type question) (100 Marks)*

All questions carry equal marks of ***5*** *each.*

This Section should be answered only on the ***Answer Sheet*** *provided.*

1. What is the difference between crystalline and non-crystalline structures in materials? How do grain boundaries contribute to the strain-hardening phenomenon in metals?

2. Name three basic categories of composite materials. How are traditional composites distinguished from synthetic composites?

3. Write short notes on the following: (a) Malleability (b) Brittleness (c) Yield point (d) Ductility and (e) Toughness

4. Write short notes on: (a) Normalizing (b) Aus-tempering (c) Case hardening.

5. Define the following? (a) Core prints (b) Shrinkage allowance (c) Chaplets and (d) Chills.

6. Define arc welding. Distortion is a serious problem in fusion welding, particularly arc welding. What are some of the techniques that can be taken to reduce the incidence and extent of distortion? What are the factors that affect weldability?

7. What are the two principal aspects of cutting-tool technology? Name three modes of tool failure in machining. Explain the mechanism of tool wear during machining.

8. Discuss briefly the causes and remedies of the following casting defects: (a) Blow holes (b) Hot tears (c) Scabs and (d) Penetration.

9. Explain TIG welding and MIG welding with its merits, demerits and application.

10. Explain the two aspects of product quality. What are the three main goals in total quality management (TQM)? What is the difference between external and internal customers in TQM?

11. Differentiate PERT (Program (Project) Management and Review Technique) and CPM (Critical Path Method) project management techniques.

12. State the factors which affect tool life. Provide a brief description of each factor.

13. What is ABC inventory analysis? How does ABC analysis simplify work for inventory managers? What are the limitations of ABC analysis?

14. What do you mean by "Direct Numerical Control (DNC)"? Explain briefly. State its advantages and disadvantages also.

15. What is the Annealing process and how to control the Annealing process? Differentiate Recrystallization and Recovery processes in heat treatment.

16. Write short notes on: (a) Punching (b) Piercing (c) Blanking (d) Slitting and (e) Lancing.

17. What is a critical path? Why is the critical path of such importance in large project scheduling and control? Can a critical path change during the course of a project?

18. What is meant by green strength and dry strength as applied to mold sand? How will you test the moisture content and clay content in molding sand?

19. Explain the role of Decision making and problem-solving skills in Total Quality Management. How do short-term and long-term planning help achieve the TQ movement?

20. How do you define an industrial robot? What are the basic components of a robotic system? What are the different types of robots depending on their configurations?

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