

MIZORAM PUBLIC SERVICE COMMISSION

COMPETITIVE EXAMINATIONS FOR RECRUITMENT TO THE POST OF INSPECTOR OF LEGAL METROLOGY UNDER FOOD, CIVIL SUPPLIES & CONSUMER AFFAIRS DEPARTMENT, GOVERNMENT OF MIZORAM, DECEMBER, 2018

MECHANICAL ENGINEERING

PAPER - III

Time Allowed : 2 hours

Full Marks : 200

*All questions carry equal marks of two (2) each.
Attempt all questions.*

1. When 1.0% plain carbon steel is slowly cooled from the molten state to 740°C, the resulting structure will contain -
 - (a) Pearlite and cementite
 - (b) Ferrite and cementite
 - (c) Austenite and ferrite
 - (d) Austenite and cementite
2. Increase in carbon content in plain carbon steels raise its -
 - (a) Ductility and UTS
 - (b) Tensile strength and malleability
 - (c) Tensile strength and hardness
 - (d) Ductility and melting temperature
3. The most widely used reinforcement in modern day FRP tennis racket is -
 - (a) Glass
 - (b) Carbon
 - (c) Aluminium
 - (d) Magnesium
4. During heat treatment of steel, the hardness of various structures in increasing order is-
 - (a) Martensite, fine pearlite, coarse pearlite, spherodite
 - (b) fine pearlite, Martensite, spherodite, coarse pearlite
 - (c) Martensite, coarse pearlite, fine pearlite, spherodite
 - (d) Spherodite, coarse pearlite, fine pearlite, Martensite
5. Pearlite is a combination of
 - (a) ferrite and cementite
 - (b) cementite and gamma iron
 - (c) ferrite and austenite
 - (d) ferrite and iron graphite
6. Which of the following has highest specific strength of all structural materials
 - (a) magnesium alloys
 - (b) titanium alloys
 - (c) chromium alloys
 - (d) magnetic steel alloys
7. German silver contains
 - (a) 1% silver
 - (b) 2.5% silver
 - (c) 5% silver
 - (d) 10% silver
8. Addition of silicon to aluminium results in
 - (a) improvement of casting characteristics
 - (b) improvement of corrosion resistance
 - (c) one of the best known age and precipitation-hardening systems
 - (d) improving machinability

9. Hardness of steel greatly improves with -
(a) Annealing (b) Cyaniding
(c) Normalising (d) Tempering
10. The percentage of carbon in grey cast iron is in the range of -
(a) 0.25 to 0.75 percent (b) 1.25 to 1.75 percent
(c) 3 to 4 percent (d) 8 to 10 percent
11. If a particular Fe-C alloy contains less than 0.83% carbon, it is called -
(a) high speed steel (b) hypoeutectoid steel
(c) hypereutectoid steel (d) cast iron
12. The crystal structure of austenite is -
(a) BCC (b) FCC
(c) HCP (d) Body centred tetragonal
13. During normalizing process of steel, the specimen is heated -
(a) Between the upper and lower critical temperature and cooled in still air
(b) Above the upper critical temperature and cooled in furnace
(c) Above the upper critical temperature and cooled in still air
(d) Between the upper and lower critical temperature and cooled in furnace
14. For a ductile material, toughness is a measure of -
(a) Resistance to scratching (b) Ability to absorb energy up to fracture
(c) Ability to absorb energy till elastic limit (d) Resistance to indentation
15. The process of reheating the martensitic steel to reduce its brittleness without any significant loss in its hardness is -
(a) Normalising (b) Annealing
(c) Quenching (d) Tempering
16. The "Jominy test" is used to find -
(a) Young's modulus (b) Hardenability
(c) Yield strength (d) Thermal conductivity
17. Which is false statement about properties of aluminium
(a) modulus of elasticity is fairly low
(b) wear resistance is very good
(c) fatigue strength is not high
(d) creep strength limits its use to fairly low temperatures
18. Which of the following alloys does not contain tin
(a) white metal (b) solder admiralty
(c) fusible metal (d) phosphor bronze
19. Gun metal contains
(a) 70% copper and 30% zinc
(b) 70-78% copper and rest tin
(c) 90% copper and 10% tin
(d) 85-92% copper and rest tin with little lead and nickel

20. The machinability of steel is increased by
- (a) silicon and sulphur
 - (b) phosphorous, lead and sulphur
 - (c) sulphur, graphite and aluminium
 - (d) phosphorous and aluminium
21. Cupola produces following material
- (a) cast iron
 - (b) pig iron
 - (c) wrought iron
 - (d) malleable iron
22. Melting point of iron is
- (a) 1539°C
 - (b) 1601°C
 - (c) 1489°C
 - (d) 1712°C
23. Which of the following pipes is least corrosion resistant
- (a) brass
 - (b) mild steel
 - (c) cast iron
 - (d) wrought iron
24. Tungsten in high speed steel provides
- (a) hot hardness
 - (b) toughness
 - (c) wear resistance
 - (d) sharp cutting edge
25. Chromium in steel
- (a) improves wear resistance, cutting ability and toughness
 - (b) refines grain size and produces less tendency to carburisation, improves corrosion and heat resistant properties
 - (c) improves cutting ability and reduces hardenability
 - (d) gives ductility, toughness, tensile strength and anticorrosion properties
26. An example of amorphous material is
- (a) zinc
 - (b) lead
 - (c) silver
 - (d) glass
27. Eutectoid steel contains following percentage of carbon
- (a) 0.02%
 - (b) 0.3%
 - (c) 0.63%
 - (d) 0.8%
28. Railway rails are normally made of
- (a) mild steel
 - (b) tungsten steel
 - (c) alloy steel
 - (d) high carbon
29. Chilled cast iron has
- (a) no graphite
 - (b) a very high percentage of graphite
 - (c) a low percentage of graphite
 - (d) graphite as its basic constituent of composition
30. Ductility of a material can be defined as
- (a) ability to undergo large permanent deformations in compression
 - (b) ability to recover its original form
 - (c) ability to undergo large permanent deformations in tension
 - (d) all of these
31. Isotropic materials are those which have the same
- (a) elastic properties in all directions
 - (b) stresses induced in all directions
 - (c) thermal properties in all directions
 - (d) electric and magnetic properties in all directions

32. Charpy test is conducted to find-
- (a) Fluidity
 - (b) Microhardness
 - (c) Toughness
 - (d) Formability
33. Mild steel belongs to the following category-
- (a) Low carbon steel
 - (b) Medium carbon steel
 - (c) High carbon steel
 - (d) Alloy steel
34. Delta iron occurs at temperature of-
- (a) Room temperature
 - (b) Above melting temperature
 - (c) Between 1400°C and 1539°C
 - (d) Between 910°C and 1400°C
35. The temperature at which ferromagnetic alpha iron transforms to paramagnetic alpha iron is-
- (a) 770°C
 - (b) 910°C
 - (c) 1050°C
 - (d) None of these
36. The unique property of cast iron is its high-
- (a) Malleability
 - (b) Ductility
 - (c) Surface finish
 - (d) Damping characteristics
37. Cast iron is characterised by minimum of following percentage of carbon-
- (a) 0.2%
 - (b) 0.8%
 - (c) 1.3%
 - (d) 2%
38. In grey cast iron, carbon is present in the form of-
- (a) Cementite
 - (b) Free carbon
 - (c) Flakes
 - (d) Spheroids
39. A reversible change in the atomic structure of the steel with a corresponding change in the properties is known as-
- (a) Allotropic change
 - (b) Recrystallisation
 - (c) Heat treatment
 - (d) Austempering
40. Basic constituents of Monel metal are-
- (a) Nickel, copper
 - (b) Nickel, molybdenum
 - (c) Zinc, tin, lead
 - (d) Nickel, lead, tin
41. Break-even analysis consists of
- (a) fixed cost
 - (b) variable cost
 - (c) fixed and variable costs
 - (d) operation costs
42. The standard time for a job is
- (a) total work content
 - (b) basic time + relaxation time
 - (c) total work content + basic time
 - (d) total work content + delay contingency allowance
43. Job evaluation is the method-of determining the
- (a) relative worth of jobs
 - (b) skills required by a worker
 - (c) contribution of a worker
 - (d) contribution of a job

44. Gantt chart provides information about the
- (a) material handling
 - (b) proper utilisation of manpower
 - (c) production schedule
 - (d) efficient working of machine
45. Process layout is employed for
- (a) batch production
 - (b) continuous type of product
 - (c) effective utilisation of machines
 - (d) all of these
46. The metallic structure of mild steel is
- (a) body centred cubic
 - (b) face centred cubic
 - (c) hexagonal close packed
 - (d) cubic structure
47. In a PERT chart
- (a) all activities should be numbered
 - (b) only important activities should be numbered
 - (c) only critical activities are numbered
 - (d) only selected activities are numbered
48. The probability distribution of project completion in PERT follows the following distribution
- (a) Gaussian
 - (b) normal
 - (c) binomial
 - (d) exponential
49. The first method invented for planning projects was
- (a) bar chart method
 - (b) milestone chart
 - (c) critical path method (CPM)
 - (d) programme evaluation and review technique (PERT)
50. Work study comprises following main techniques
- (a) method study and work measurement
 - (b) method study and time study
 - (c) time study and work measurement
 - (d) method study and job evaluation
51. Break-even analysis can be used for
- (a) short run analysis
 - (b) long run analysis
 - (c) average of above two run analysis
 - (d) there is no such criterion
52. Father of time study was
- (a) F.W. Taylor
 - (b) H.L. Gantt
 - (c) F.B. Gilberfh
 - (d) R.M. Barnes
53. Material handling and plant location is analysed by
- (a) Gantt chart
 - (b) bin chart
 - (c) Emerson chart
 - (d) travel chart
54. In inventory control, the economic order quantity is the
- (a) optimum lot size
 - (b) highest level of inventory
 - (c) lot corresponding to break-even point
 - (d) capability of a plant to produce
55. Micromotion study is
- (a) enlarged view of motion study
 - (b) analysis of one stage of motion study
 - (c) minute and detailed motion study
 - (d) subdivision of an operation into therbligs and their analysis

56. In metals subjected to cold working, strain hardening effect is due to
(a) slip mechanism (b) twining mechanism
(c) dislocation mechanism (d) fracture mechanism
57. Specify the sequence correctly
(a) Grain growth, recrystallisation, stress relief (b) Stress relief, grain growth, recrystallisation
(c) Stress relief, recrystallisation grain growth (d) Grain growth, stress relief, recrystallisation
58. Hot rolling of mild steel is carried out
(a) at recrystallisation temperature (b) between 100°C to 150°C
(c) below recrystallisation temperature (d) above recrystallisation temperature
59. In sheet metal blanking, shear is provided on punches and dies so that
(a) press load is reduced (b) good cut edge is obtained
(c) warping of sheet is minimized (d) cut blanks are straight
60. The cutting force in punching and blanking operations mainly depends on
(a) the modulus of elasticity of metal (b) the shear strength of metal
(c) the bulk modulus of metal (d) the yield strength of metal
61. Frederick W. Taylor introduced a system of working known as
(a) line organisation (b) line and staff organisation
(c) functional organisation (d) effective organisation
62. Which of the following is independent of sales forecast?
(a) Productivity (b) inventory control
(c) production planning (d) production control
63. Inventory management consists of
(a) effective running of stores
(b) state of merchandise methods of strong and maintenance etc.
(c) stock control system
(d) all of these
64. CPM has following time estimate
(a) one-time estimate (b) two-time estimate
(c) three-time estimate (d) four-time estimate
65. The linear programming techniques can be applied successfully to industries like
(a) iron and steel (b) food processing
(c) banking (d) all of these
66. Value engineering aims at finding out the
(a) depreciation value of a product
(b) resale value of a product
(c) major function of the item and accomplishing the same at least cost without change in quality
(d) break-even point when machine re-quires change
67. The term 'value' in value engineering refers to
(a) total cost of the product (b) selling price of the product
(c) utility of the product (d) manufactured cost of the product

68. If there is a 50 percent chance of making Rs 120,000 and a 70 percent chance of losing Rs 150,000, then the expected monetary outcome in Rupees is:
- (a) 50000 (b) -45000
(c) 90000 (d) -90000
69. The stepping-stone method
- (a) is an alternative to using the northwest corner rule
(b) often involves tracing closed paths with a triangular shape
(c) is used to evaluate the cost effectiveness of shipping goods via transportation routes not currently in the solution
(d) is used to identify the relevant costs in a transportation problem
70. Which of the following statements about the basic EOQ model is true?
- (a) If the ordering cost were to double, the EOQ would rise
(b) If annual demand were to double, the EOQ would increase
(c) If the carrying cost were to increase, the EOQ would fall
(d) All of the above statements are true
71. The Production Order Quantity model
- (a) relaxes the assumption of known and constant demand
(b) is appropriate when units are sold/used as they are produced
(c) results in larger average inventory than an equivalent EOQ model
(d) uses Ordering Cost, not Setup Cost, in its formula
72. Dental castings and turbine blades are produced by
- (a) Centrifugal casting (b) Investment casting
(c) Die casting (d) Sand casting
73. In investment casting the pattern is made of
- (a) Wood (b) Urea formaldehyde
(c) Wax (d) Metal
74. Shell moulding is a process in which
- (a) A thin shell is cast in sand mould
(b) A strong core is prepared
(c) A mould comprising thin shell is produced by mixing dry silica and resin binder
(d) None of these
75. A pit furnace can be used for the melting of
- (a) Cast iron (b) Brass
(c) Aluminium (d) Cast iron, Aluminium, Brass
76. In shielded arc welding
- (a) Large electrode is used
(b) Welding rod coated with slag is used
(c) Welding rod coated with fluxing material is used
(d) None of these

77. Which effect is not seen in alloys on weldability?
- (a) Control of ductile-malleable transformation temperature
 - (b) Provision for oxidation to molten metal
 - (c) Reduction in segregation
 - (d) Grain refinement
78. Which precious metals and stones are used for jewellery and industrial cutting?
- (a) Diamonds
 - (b) Gold
 - (c) Copper
 - (d) Lead
79. What is the necessary condition for turning?
- (a) Material of work piece should be harder than the cutting tool
 - (b) Cutting tool should be harder than the material of work piece
 - (c) Hardness of the cutting tool and material of piece should be same
 - (d) None of these
80. In drilling operation, the metal is removed by
- (a) Shearing
 - (b) Extrusion
 - (c) Shearing and extrusion
 - (d) Shearing and compression
81. Which of the following milling process is used for machining of irregular shapes?
- (a) Slab milling
 - (b) Face milling
 - (c) Angular milling
 - (d) Form milling
82. In which of the following processes, highly polished steel ball is used instead of abrasive
- (a) Honing
 - (b) Lapping
 - (c) Polishing
 - (d) Burnishing
83. In CNC machine tool, the part program entered into the computer memory
- (a) Can be used only once
 - (b) Can be used again and again
 - (c) Can be used again but it has to be modified every time
 - (d) Cannot say
84. Which of the following materials requires the largest shrinkage allowance, while making a pattern for casting?
- (a) Aluminium
 - (b) Brass
 - (c) Cast Iron
 - (d) Plain Carbon Steel
85. Hardness of green sand mould increases with
- (a) increase in moisture content beyond 6 percent
 - (b) increase in permeability
 - (c) decrease in permeability
 - (d) increase in both moisture content and permeability
86. In Oxyacetylene gas welding, temperature at the inner cone of the flame is around
- (a) 3500°C
 - (b) 3200°C
 - (c) 2900°C
 - (d) 2550°C

87. Which one of the following welding processes uses non- consumable electrodes?
- (a) TIG welding (b) MIG welding
(c) Manual arc welding (d) Submerged arc welding
88. The maximum heat in resistance welding is at the
- (a) tip of the positive electrode
(b) tip of the negative electrode
(c) top surface of the plate at the time of electric contact with the electrode
(d) interface between the two plates being Joined
89. In milling machine, the cutting tool is held in position by
- (a) Chuck (b) Spindle
(c) Arbor (d) Tool holder
90. In which of the following machining manual part programming is done?
- (a) CNC machining (b) NC machining
(c) DNC machining (d) FMS machining
91. The angle between the face and the flank of the single point cutting tool is known as
- (a) rake angle (b) clearance angle
(c) lip angle (d) point angle
92. Which of the following is a single point cutting tool?
- (a) Hacksaw blade (b) Milling cutter
(c) Grinding wheel (d) Parting tool
93. A measure of Rockwell hardness is the
- (a) Depth of penetration of indenter (b) Surface area of indentation
(c) Projected area of indentation (d) Height of rebound
94. The coordination number for FCC crystal structure is
- (a) 4 (b) 8
(c) 12 (d) 16
95. What do Flexible Manufacturing systems (FMS) do?
- (a) Co-ordinates the whole process of manufacturing and manufactures a part, component or product
(b) Completely manufactures a range of components without significant human intervention during the processing
(c) Moves and manipulates products, parts or tools
(d) Moves materials between operations
96. Which of the following cutting tool has highest hot hardness?
- (a) Ceramics (b) Cast alloys
(c) High speed steels (d) Carbon tool steel
97. The angle between side cutting edge and end cutting edge is called as
- (a) Approach angle (b) Nose angle
(c) Side relief angle (d) End relief angle

98. The process utilizing mainly thermal energy for removing material is
- (a) Ultrasonic Machining
 - (b) Electrochemical Machining
 - (c) Abrasive Jet Machining
 - (d) Laser Beam Machining
99. In which of the following operation jigs are preferred over fixture?
- (a) Drilling
 - (b) Turning
 - (c) Milling
 - (d) Grinding
100. The most commonly used criteria for measuring forecast error is-
- (a) Mean absolute deviation.
 - (b) Mean absolute percentage error
 - (c) Mean standard error.
 - (d) Mean square error

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