

**MIZORAM PUBLIC SERVICE COMMISSION**  
**TECHNICAL COMPETITIVE EXAMINATIONS FOR RECRUITMENT TO**  
**JUNIOR GRADE OF MIZORAM ENGINEERING SERVICE**  
**UNDER PUBLIC HEALTH ENGINEERING DEPARTMENT, 2014**

**MECHANICAL ENGINEERING**  
**PAPER - III**

Time Allowed : 3 hours

Full Marks : 200

*Attempt all questions.*

**Part A - Objective Type Questions (100 Marks)**

*All questions carry equal marks of 2 each.*

1. The number of nearest neighboring atoms in Face-centred cubic (FCC) crystal is
  - (a) six
  - (b) eight
  - (c) twelve
  - (d) none of these
2. The property of the material due to which it can cut another material is known as
  - (a) ductility
  - (b) malleability
  - (c) hardness
  - (d) none of these
3. Which one of the following micro constituents has maximum hardness?
  - (a) Austenite
  - (b) Pearlite
  - (c) Sorbite
  - (d) Cementite
4. When \_\_\_\_\_ is added to, its tensile strength of steel can be increased by adding
  - (a) Chromium
  - (b) Manganese
  - (c) Magnesium
  - (d) Tungsten
5. Which one of the following is an alloy of copper and zinc?
  - (a) Brass
  - (b) Bronze
  - (c) Duralumin
  - (d) None of these
6. Examples of line defects are
  - (a) Vacancies
  - (b) Dislocations
  - (c) Twins
  - (d) Stacking faults
7. Which of the following elements does not impart hardness to steel?
  - (a) copper
  - (b) chromium
  - (c) nickel
  - (d) silicon
8. Carbon steel is
  - (a) made by adding carbon in steel
  - (b) refined from cast iron
  - (c) an alloy of iron and carbon with variable quantities of phosphorus and sulphur
  - (d) extremely brittle

9. Which of the following is the most ductile material?
  - (a) mild steel
  - (b) copper
  - (c) zinc
  - (d) aluminium
10. Delta iron occurs at temperature of
  - (a) room temperature
  - (b) above melting point
  - (c) between 1400°C and 1539°C
  - (d) between 910°C and 1400°C
11. Type of alloyed plain carbon steel used for drawing dies, punches and drills is
  - (a) high carbon steel
  - (b) medium carbon steel
  - (c) high speed steel
  - (d) none of these
12. Which one of the following is the cause of tool failure?
  - (a) excessive temperature
  - (b) excessive stress
  - (c) flank wear
  - (d) all of these
13. The angle obtained between the machined surface and underside of the tool is generally named as
  - (a) clearance angle
  - (b) relief angle
  - (c) edge angle
  - (d) nose angle
14. The tool life under oblique cutting in comparison to that of orthogonal cutting is
  - (a) same
  - (b) less
  - (c) more
  - (d) none of these
15. In which of the following welding processes is non-consumable electrode used?
  - (a) TIG welding
  - (b) LASER welding
  - (c) MIG welding
  - (d) plasma arc welding
16. In which of the following processes does electrode get consumed?
  - (a) TIG welding
  - (b) resistance welding
  - (c) thermit welding
  - (d) arc welding
17. Time required for non conventional machining in comparison to the conventional machining is
  - (a) less
  - (b) equal
  - (c) more
  - (d) unpredictable
18. Automobile bodies can be manufactured by employing
  - (a) deep drawing
  - (b) tube drawing
  - (c) wire drawing
  - (d) rod drawing
19. The heating of pressed compact to below the melting temperature of any constituent of the product, or at least below the melting temperature of all principal constituents of the product is called
  - (a) tempering
  - (b) compacting
  - (c) atomizing
  - (d) sintering
20. The material used for coating the electrode is called
  - (a) flux
  - (b) slag
  - (c) protective layer
  - (d) deoxidizer
21. A forming operation which is carried on cylindrical rolls is termed as
  - (a) casting
  - (b) drawing
  - (c) rolling
  - (d) grinding

22. A model of casting which is constructed in such a way that it can be used for forming an impression in damp sand is defined as
- (a) molding
  - (b) pattern
  - (c) damper
  - (d) prototype
23. In sand casting, draft allowance is added to
- (a) All linear dimensions
  - (b) Only the interior dimensions
  - (c) Only the exterior dimensions
  - (d) Only to the dimensions that are perpendicular to the parting plane
24. Hot-chamber die-casting process is used for
- (a) Aluminium
  - (b) Zinc
  - (c) Cast iron
  - (d) Steel
25. Drawing out is a forging operation used to
- (a) reduce the cross section of a part
  - (b) increase the cross section of a part
  - (c) finish the part
  - (d) flatten the part
26. Filler metal is not required in the following type of welding process:
- (a) Oxy-oxy-acetylene welding
  - (b) Arc welding
  - (c) Resistance welding
  - (d) Oxy-oxy- hydrogen welding
27. Consumable electrode for manual metal arc welding of steel is made of
- (a) tungsten
  - (b) steel
  - (c) copper
  - (d) cadmium copper
28. For gas welding of brasses, the most useful flame is:
- (a) oxidizing flame
  - (b) reducing flame
  - (c) neutral flame
  - (d) no specific choice
29. Which of the following conditions does not favour the production of discontinuous chips?
- (a) brittle material
  - (b) large chip thickness
  - (c) low cutting speed
  - (d) large rake angle
30. In grinding wheel a dense structure is required for:
- (a) tough material
  - (b) ductile material
  - (c) heavy cuts
  - (d) finishing cut
31. The flexible manufacturing systems (FMS) is most suitable for a production system that falls under
- (a) mass type
  - (b) batch type
  - (c) job type
  - (d) all of these
32. Margin of safety is generally expressed as
- (a) ratio of budgeted sales to sales at BEP
  - (b) ratio of actual sales to sales at BEP
  - (c) percentage of budget to BEP
  - (d) all of these
33. The prime objective of value engineering is to minimize
- (a) cost of production
  - (b) time of production
  - (c) cost of labor
  - (d) cost of value

34. In process chart, the symbol '■' stands for the meaning of
- (a) storage
  - (b) inspection
  - (c) delay
  - (d) transport
35. PERT is a network analysis mainly based on
- (a) event oriented
  - (b) activity oriented
  - (c) process oriented
  - (d) none of these
36. The size of order which minimizes total cost of carrying and cost of ordering is called
- (a) minimum order quantity
  - (b) economic order quantity
  - (c) safety order quantity
  - (d) re-order quantity
37. Which one of the following is not an attribute of the control chart?
- (a) P chart
  - (b) R chart
  - (c) C chart
  - (d) np chart
38. The total cost of manufacturing a product is reduced due to
- (a) standardization
  - (b) diversification
  - (c) simplification
  - (d) sophistication
39. Work study is concerned with
- (a) improving present method and finding standard time
  - (b) motivation of workers
  - (c) improving production capability
  - (d) all of these
40. Scheduling gives information about
- (a) when work should start and how much work should be completed in a certain period
  - (b) when work should be completed
  - (c) how idle-time can be minimized
  - (d) proper utilization of machines
41. Product layout is employed for
- (a) batch production
  - (b) continuous production
  - (c) effective utilization of machine
  - (d) none of these
42. Statistical quality control techniques are based on the theory of
- (a) quality
  - (b) statistics
  - (c) probability
  - (d) all of these
43. An optimum project schedule implies
- (a) optimum utilization of men, machines and materials
  - (b) lowest possible cost and shortest possible time for project
  - (c) timely execution of project
  - (d) to produce best results
44. Graphical method, simplex method and transposition method are concerned with
- (a) break-even analysis
  - (b) value analysis
  - (c) linear programming
  - (d) inventory control

45. PERT has the following time estimate  
(a) one time estimate (b) two time estimate  
(c) three time estimate (d) four time estimate
46. Bar charts are suitable for  
(a) minor works (b) major works  
(c) large projects (d) all of these
47. A flow diagram drawn to scale must be given with  
(a) outline process charts (b) flow process charts  
(c) multiple activity chart (d) SIMO chart
48. The number of fundamental hand motion in micro-motion study are  
(a) thirteen (b) fifteen  
(c) sixteen (d) nineteen
49. Which one of the following is not a queuing theory model?  
(a) orders waiting to be processed  
(b) machines waiting to be repaired  
(c) machines in an assembly line to be operated  
(d) batch of finished products waiting to be transported
50. The probability distribution of project completion time in PERT is  
(a) Gaussian (b) gamma  
(c) beta (d) binomial

**Part B - Short Answer Questions (100 Marks)**

*All questions carry equal marks of 5 each.*

51. Define the term ‘Atomic packing factor’ and calculate its value for a body centred cube.
52. What is the purpose of heat treatment of steels? Also state the prime difference between normalizing and annealing.
53. Write the classification of engineering materials and give example of each.
54. What do you mean by plastics, ceramics and composite materials? Also write their properties.
55. Explain the terms cutting speed, feed and depth of cut as applied in drilling operation.
56. Discuss briefly the relative merits and demerits of A.C. and D.C. welding.
57. How do the cutting conditions affect the tool life? Also write the expression of Taylor’s tool life equation.
58. The activity chart of a mini project is shown below. Draw the network and find the critical path:

|                      |       |       |       |       |       |       |
|----------------------|-------|-------|-------|-------|-------|-------|
| <b>Activity</b>      | 1 - 2 | 1 - 3 | 1 - 4 | 2 - 5 | 3 - 5 | 4 - 5 |
| <b>Duration(Hrs)</b> | 8     | 5     | 4     | 12    | 8     | 10    |

59. What is product line? Write the steps involved in new product development.
60. Write the full form of the following terms related to industrial engineering:
- |            |            |
|------------|------------|
| (i) UCL    | (ii) BEP   |
| (iii) JIT  | (iv) LPP   |
| (v) MRP    | (vi) TQM   |
| (vii) PERT | (viii) CPM |
| (ix) LIFO  | (x) SQC    |
61. What are the parameters that control the weld quality in manual metal arc welding? Explain.
62. Explain the methods used for generation of threads in lathe.
63. What are the three most common metal crystal structures? Discuss briefly.
64. Describe the tempering process for a plain-carbon steel.
65. Describe ABC analysis. State its applications.
66. Describe the procedure for obtaining the Miller indices that describe a plane in a crystal.
67. Explain the processes of austempering and martempering.
68. What are composite materials? Explain their engineering applications.
69. Compare the similarities and differences of ECM and EDM.
70. Define 'control chart' and state the objectives of  $\bar{X}$  and R charts.

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