

**MIZORAM PUBLIC SERVICE COMMISSION**  
**COMPETITIVE EXAMINATIONS FOR JUNIOR GRADE OF M.E.S.**  
**UNDER PUBLIC WORKS DEPARTMENT, AUGUST, 2018.**

**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. In metal forming process the hardness of the material?
  - (a) Decreases
  - (b) Remains same
  - (c) Increases then decreases
  - (d) Increases
2. A grinding wheel is said to be of \_\_\_\_\_ if the abrasive grains can be easily dislodged.
  - (a) soft grade
  - (b) medium grade
  - (c) hard grade
  - (d) none of these
3. In a shaper, the length of stroke is increased by
  - (a) Increasing the centre distance of bull gear and crank pin
  - (b) Decreasing the centre distance of bull gear and crank pin
  - (c) Increasing the length of the arm
  - (d) Decreasing the length of the slot in the slotted lever
4. In metal machining, the work-tool contact zone is a zone where heat is generated due to
  - (a) Plastic deformation of metal
  - (b) Burnishing friction
  - (c) Friction between the moving chip and the tool face
  - (d) None of these
5. Which of the following operation is first performed?
  - (a) Spot facing
  - (b) Boring
  - (c) Tapping
  - (d) Drilling
6. When the temperature of a solid metal increases,
  - (a) Strength of the metal decreases but ductility increases
  - (b) Both strength and ductility of the metal decreases
  - (c) Both strength and ductility of the metal increases
  - (d) Strength of the metal increases but ductility decreases
7. 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

8. Which type of welding defect caused due to poor deposition of weld rod?
  - (a) porosity
  - (b) undercut
  - (c) under fill
  - (d) crack
9. Hardness of steel greatly improves with
  - (a) annealing
  - (b) normalizing
  - (c) cyaniding
  - (d) tempering
10. Hot rolling of mild steel is carried out
  - (a) At recrystallization temperature
  - (b) Between 100° C to 150° C
  - (c) Between recrystallization temperature
  - (d) Above recrystallization temperature
11. What is the method of brazing used to join relatively small assemblies made from materials that either do not oxidize at the brazing temperature or can be protected from oxidation with a flux?
  - (a) Furnace brazing
  - (b) dip brazing
  - (c) torch brazing
  - (d) resistance brazing
12. Two 1 mm thick steel sheets are to be spot welded at a current of 5000 A. Assuming effective resistance to be 200  $\Omega$  and current flow time of 0.2 second, heat generated during the process will be
  - (a) 0.2 joule
  - (b) 1 joule
  - (c) 5 joule
  - (d) 1000 joule
13. In a gating system, the ratio 1: 2: 4 represents
  - (a) Sprue base area: runner area: ingate area
  - (b) Pouring basin area: ingate area: runner area
  - (c) Sprue base area: ingate area: casting area
  - (d) Runner area: ingate area: casting area
14. 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
15. The tool life is affected by
  - (a) Depth of cut
  - (b) Cutting speed
  - (c) Feed
  - (d) All of these
16. Which of the following statement is wrong?
  - (a) The larger side rake angle produces chipping
  - (b) The increase in nose radius decreases tool life
  - (c) The smaller rake angle produces excessive wear and deformation in tool
  - (d) The side cutting edge angle (less than 15°) increases tool life
17. The machining of titanium is difficult due to
  - (a) High thermal conductivity of titanium
  - (b) Chemical reaction between tool and work
  - (c) Low tool-chip contact area
  - (d) None of these
18. Which of the following statement is correct about nose radius?
  - (a) It improves tool life
  - (b) It improves the surface finish
  - (c) Both (a) and (b)
  - (d) None of these
19. Cutting fluids are used to
  - (a) Cool the tool
  - (b) Improve surface finish
  - (c) Cool the work piece
  - (d) All of these

20. In the relation  $VT^n = C$ , the value of  $n$  for carbide tools is  
(a) 0.1 to 0.2 (b) 0.20 to 0.25  
(c) 0.25 to 0.40 (d) 0.40 to 0.55
21. It is desired to perform the operations like drilling, reaming, counter-boring etc. on a work piece. Which of the following machine will be used?  
(a) sensitive drilling machine (b) radial drilling machine  
(c) gang drilling machine (d) multiple spindle drilling machine
22. A solid cylinder of diameter 100 mm and height 50 mm is forged between two frictionless flat dies to a height of 25 mm. The percentage change in diameter is  
(a) 0 (b) 2.07  
(c) 20.7 (d) 41.4
23. The crystal structure of austenite is  
(a) Body centered cubic (b) Base centered cubic  
(c) Hexagonal closed packed (d) Body centered tetragonal
24. The material property which depends only on the basic crystal structure is  
(a) Fatigue strength (b) work hardening  
(c) fracture strength (d) elastic constant
25. Friction at the tool-chip interface can be reduced by  
(a) Decreasing the rake angle (b) Increasing the depth of cut  
(c) Decreasing the cutting speed (d) Increasing the cutting speed
26. The factor responsible for the formation of discontinuous chips is  
(a) Low cutting speed and small rake angle (b) Low cutting speed and large rake angle  
(c) High cutting speed and large rake angle (d) High cutting speed and small rake angle
27. Flank wear occurs mainly on the  
(a) Nose part, front relief face and side relief face of the cutting tool  
(b) Face of the cutting tool at a short distance from the cutting edge  
(c) Cutting edge only  
(d) Front face only
28. The ultimate tensile strength and yield strength of most of the metals, when temperature change from 0 to 100°C will  
(a) increase (b) decrease  
(c) remain same (d) none of these
29. The ability of a material to resist softening at high temperature is known as  
(a) creep (b) hot tempering  
(c) hot hardness (d) fatigue
30. Which of the following constituents of steels is softest and least strong  
(a) austenite (b) pearlite  
(c) ferrite (d) cementite
31. The molecules in a solid moves  
(a) in a random manner (b) in a haphazard way  
(c) a circular motion (d) back and forth like tiny pendulums

32. In malleable iron, carbon is present in the form of  
(a) nodular aggregates of graphite (b) free carbon  
(c) spheroids (d) flakes
33. A reversible change in the atomic structure of the steel with a corresponding change in the properties is known as  
(a) recrystallization (b) allotropic change  
(c) heat treatment (d) austempering
34. In which of the following cases, consideration of creep is important  
(a) flywheel of steam engine (b) cast iron pipes  
(c) gas turbine blades (d) cycle chains
35. Machining properties of steel are improved by adding the following elements  
(a) sulphur, lead, phosphorous (b) silicon, aluminium, titanium  
(c) chromium and nickel (d) lubricants
36. Eutectoid steel contains following percentage of carbon  
(a) 0.02 % (b) 0.3 %  
(c) 0.63 % (d) 0.8 %
37. Materials after cold working are subjected to following process to relieve stresses  
(a) hot working (b) annealing  
(c) tempering (d) normalizing
38. Vanadium in high speed steels  
(a) promotes decarburisation  
(b) provides high hot hardness  
(c) increases toughness  
(d) forms very hard carbides and thus increases wear resistance
39. Which of the following is not correct method of increasing fatigue limit  
(a) shot peening (b) surface decarburisation  
(c) nitriding of surface (d) cold working
40. Cupola produces the following material  
(a) cast iron (b) pig iron  
(c) wrought iron (d) white iron
41. The break-even point represents  
(a) the most economical level of operation of any industry  
(b) the time when unit can run without loss and profit  
(c) time when industry will undergo loss  
(d) time for overhauling a plant
42. Fixed position layout is also known as  
(a) analytical layout (b) synthetic layout  
(c) static product layout (d) none of these
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 job

44. Basic motion time study gives times for basic motions in ten thousandths of
- (a) second
  - (b) minute
  - (c) hour
  - (d) day
45. The most important function of inventory control is
- (a) stock control system
  - (b) to run the stores effectively
  - (c) technical responsibility for the state of materials
  - (d) all of these
46. Which of the following charts are used for plant layout design?
- (a) Operation process chart
  - (b) Man machine chart
  - (c) Travel chart
  - (d) all of these
47. Earliest finish time can be regarded as
- (a) earliest start time + duration of activity
  - (b) earliest start time - duration of activity
  - (c) latest finish time + duration of activity
  - (d) latest finish time - duration of activity
48. The wastage of material in the store is taken into account by the following method in the evaluation of the material issued from the store
- (a) inflated system
  - (b) primary cost method
  - (c) current value method
  - (d) variable price method
49. Inventory control in production, planning and control aims at
- (a) achieving optimisation
  - (b) regulate supply and demand
  - (c) acceptable customer service at low capital investment in inventory
  - (d) ensuring against market fluctuations
50. In perpetual inventory control, the material is checked when it reaches its
- (a) minimum value
  - (b) maximum value
  - (c) average value
  - (d) alarming value

**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. Explain briefly the defects in crystalline materials?
2. What are the parameters which influence the tool life?
3. Briefly outline the nitriding process. Discuss its importance and advantage in steel industry?
4. Explain what are the approaches used in manufacturing for quality assurance?
5. Describe the mechanism of EDM? List the type of tool materials used?
6. Iron at room temperature has BCC structure and atomic radius of 1.2 Å. Calculate the lattice constant of iron?
7. What are the steps involved in gear manufacturing?
8. Differentiate between arc welding and gas welding?
9. Plot the break even chart and explain how profit and loss is calculated?
10. A booking office managed by a single person. Customer arrives at a rate of 20/hour. The service rate follows exponential distribution with a mean of 90 seconds. Find the expecting waiting time of a customer?
11. What do you mean by normalizing and tempering and indicate how those heat treatment affect the properties of steel?
12. A manufacturing company has got a demand for a particular part of 10,000 unit/year. The cost/unit is Rs 2 and if cost Rs 36 to place an order and to process the delivery. The inventory carrying cost is estimated at 9% of average inventory investment. Determine,
  - (a) Economic order quantity
  - (b) Minimum cost of inventory/annum
13. How CNC is differ from DNC?
14. Differentiate Graphical and Simplex methods used in linear programming?
15. What will be the solidification time for a 1100 mm diameter, 33 mm thick casting of aluminium, if the mould constant,  $C = 2.2 \text{ s/mm}^2$ ?
16. Explain why ceramic material is usually bad conductor?
17. Draw the process plan chart of any manufacturing component?
18. Why are hydrodynamic bearings used for grinding machine in preference to ball or roller bearings?
19. During orthogonal cutting with a cutting tool having a  $12^\circ$  rake angle, the chip thickness is measured to be 0.44 mm, the uncut thickness is 0.18 mm. Find a) shear plane b) shear strain?
20. How hardenability test is carried out?