MIZORAM PUBLIC SERVICE COMMISSION

COMMON COMPETITIVE EXAMINATION FOR GROUP 'B' NON-GAZETTED (TECHNICAL)

JUNIOR ENGINEER (CONTRACT BASIS) (ELECTRICAL) UNDER POWER & ELECTRICITY DEPARTMENT, GOVERNMENT OF MIZORAM, NOVEMBER-2024

PAPER-III (MECHANICAL ENGINEERING)

Time Allowed : 2 hours FM : 200

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

1. The SI unit of force is -
(a) Foot-Poundal (b) Kgf
(c) Dyne (d) Newton

2. The columns whose slenderness ratio is less than 80, are known as -
(a) Medium columns (b) Long columns
(c) Weak columns (d) Short columns

3. A coil is cut into two halves, the stiffness of cut coil will be -
(a) Double (b) Half
(c) Same (d) None of above

4. The value of Poisson's ratio for cast iron is -
(a) 0.1 to 0.2 (b) 0.23 to 0.27
(c) 0.25 to 0.33 (d) 0.4 to 0.6

5. The bending moment diagram for a simply supported beam loaded in its centre is -
(a) A right angled triangle (b) An equilateral triangle
(c) An equilateral triangle (d) An isosceles triangle

6. The materials having same elastic properties in all directions are called -
(a) Uniform materials (b) Isotropic materials
(c) Elastic materials (d) Ideal materials

7. Tensile strength of the material is obtained by dividing the maximum load during the test by the -
(a) Area at the time of fracture (b) Original cross-sectional area
(c) Average of (a) and (b) (d) Minimum area after fracture

8. The stress at which extension of the material takes place more quickly as compared to the increase in load is called -
(a) Elastic point of the material (b) Breaking point of the material
(c) Yielding point of the material (d) Ultimate point of the material

9. Damping capacity of a material is its ability to -
   (a) Absorb shock
   (b) Absorb vibration
   (c) Withstand compression
   (d) Absorb impact load

10. A beam of uniform strength is one in which -
   (a) Bending moment is same throughout the beam
   (b) Deflection is same throughout the length
   (c) The bending stress is same in every section along the longitudinal axis
   (d) Shear stress is uniform throughout the beam

11. The property of material by virtue of which a body returns to its original shape after removal of the load is called -
   (a) Plasticity
   (b) Elasticity
   (c) Ductility
   (d) Malleability

12. The loss of strength in compression due to overloading is known as -
   (a) Hysteresis
   (b) Creep
   (c) Bouschinger effect
   (d) Resilience

13. Which of the following materials is most elastic?
   (a) Rubber
   (b) Plastic
   (c) Steel
   (d) Brass

14. The deformation per unit length is called -
   (a) Tensile stress
   (b) Compressive stress
   (c) Shear stress
   (d) Strain

15. Within elastic limit, stress is -
   (a) Square root of strain
   (b) Directly proportional to strain
   (c) Equal to strain
   (d) Inversely proportional to strain

16. A thin walled cylindrical vessel of diameter 'D' and wall thickness 't' is subjected to pressure 'P'. The circumferential stress induced is -
   (a) $\frac{pD}{4t}$
   (b) $\frac{pD}{8t}$
   (c) $\frac{pD}{6t}$
   (d) $\frac{pD}{2t}$

17. The shear modulus of most materials with respect to the modulus of elasticity is -
   (a) Less than half
   (b) More than half
   (c) Equal to half
   (d) More than one

18. A continuous beam is one which is -
   (a) Infinitely long
   (b) Supported at two places
   (c) Supported at one point
   (d) Supported at more than two supports

19. The centrifugal tension in the belt depends upon -
   (a) tight side tension of belt
   (b) slack side tension of belt
   (c) velocity of the belt
   (d) weight per unit length of belt

20. The number of bolts by empirical formula in a flange coupling is -

(a) $N = \frac{D}{2} + 3$ (b) $N = \frac{D}{5} + 3$

(c) $N = \frac{3D}{4} + 3$ (d) $N = \frac{2D}{5} + 3$

21. Universal coupling is used to join two shafts -

(a) Which has lateral misalignment (b) Whose axes intersect at a small angle

(c) Which are not in exact alignment (d) Which is the simplest type of rigid coupling

22. A screw is specified by -

(a) Major diameter x pitch (b) Minimum diameter x length

(c) Major diameter x length (d) Nominal major diameter

23. Screw used for power transmission should have -

(a) High efficiency (b) Strong teeth

(c) Finished threads (d) High efficiency and string teeth

24. Which of the following line is the safest in machine design?

(a) Goodman line (b) Soderberg line

(c) Gerber parabola (d) Lagrange line

25. Wahl's stress factor _____ very rapidly as the spring index decreases.

(a) increases (b) decreases

(c) remain same (d) none of these

26. The property of a material which enables it to be drawn into wires with the application of a tensile force, is called -

(a) Elasticity (b) Plasticity

(c) Ductility (d) Malleability

27. The yield point in static loading is _____ as compared to fatigue loading.

(a) same (b) lower

(c) higher (d) approximately equal

28. The coefficient of friction between the belt and pulley depends upon the -

(a) Material of belt and pulley (b) Slip of belt

(c) Speed of belt (d) All of these

29. In a flange coupling, the bolts are subjected to -

(a) Tensile stress (b) Shear stress

(c) Compressive stress (d) Both (a) & (c)

30. Diameter of washer is generally taken -

(a) Equal to nut size (b) Less than nut size

(c) Bigger than nut size (d) Any size irrespective of nut size

31. Which of the following discipline provides study of the relative motion between the parts of a machine and the forces acting on the parts?

(a) Theory of machines (b) Applied mechanics

(c) Mechanism (d) Kinematics

32. The Hooke's joint consists of -

(a) Two forks (b) One fork

(c) Three forks (d) Four forks

33. A flywheel absorbs energy during those periods of crank rotation when the turning moment is greater than the resisting moment. The absorption is -

(a) At constant speed (b) Accompanied by increase in speed

(c) Accompanied by decrease in speed (d) Possible at all speeds

34. Which of the following elements transfers torque and is only subjected with bending moment?

(a) Axle (b) Clutch

(c) Brake (d) Belt drive

35. Vee-belt E-type cross-sections are generally used in -

(a) Automobiles (b) Small Engines

(c) Heavy duty machine (d) When driver and driven units are far off

36. If T_1, T_2 are the respective tensions in Newtons on the tight and slack side of the open belt drive in and v is the velocity in the belt in m/s, then the power transmitted by the belt drive will be given by:

(a) $P = \frac{1}{v}(T_1 - T_2)$ (b) $P = (T_1 - T_2)v^2$

(c) $P = (T_1 - T_2)v$ (d) $P = (T_1 + T_2)v$

37. If it is required to connect two parallel shafts, the distance between whose axes is small and variable, the shafts are coupled by -

(a) Universal joint (b) Knuckle joint

(c) Oldham's coupling (d) Flexible coupling

38. In a coupling rod of a locomotive, each of the four pairs is a _____ pair.

(a) sliding (b) rolling

(c) turning (d) screw

39. A kinematic chain is known as a mechanism when -

(a) One of the links is fixed (b) None of the links is fixed

(c) Two of the links are fixed (d) All links are fixed

40. A ball and a socket forms a -

(a) Rolling pair (b) Turning pair

(c) Screw pair (d) Spherical pair

41. Which type of gear train is used in clock mechanism to join hour hand and minute hand?

(a) Compound gear train (b) Epicyclic gear train

(c) Simple gear train (d) Reverted gear train

42. Coefficient of fluctuation of speed is the -

(a) Variation of energy above and below the mean resisting toque line

(b) Difference between maximum and minimum energies

(c) Ratio of the maximum fluctuation of energy to the work done per cycle

(d) Ratio of maximum fluctuation of speed to the mean speed

43. The supply of working fluid to the engine to suit the load conditions is controlled by -

(a) Meyer's expansion valve (b) D-slide valve

(c) Flywheel (d) Governor

44. The term 'effort of governor' refers to -

(a) Centrifugal force of balls

(b) Useful power developed

(c) Force acting on sleeve for given percentage change of speed

(d) Minimum force required on sleeve for percentage change of speed

45. If speed of a mechanism is to be reduced in the ratio 1000:1, which of the following systems would you choose?

(a) Bevel gear system (b) Spur gear system

(c) Differential gear system (d) Worm and worm wheel system

46. When the relation between the controlling force (F_c) and radius of rotation (r) for a spring controlled governor is $F_c = ar + b$, then the governor will be -

(a) Stable (b) Unstable

(c) Isochronous (d) None of these

47. The critical speed of a shaft with a disc supported in between is equal to the natural frequency of the system in -

(a) Longitudinal vibrations (b) Critical vibration

(c) Torsional vibrations (d) Transverse vibrations

48. The process of chamfering the entrance of a drilled hole is known as _____.

(a) Counter-fillet (b) Trepanning

(c) Counter-boring (d) Counter-sinking

49. CNC machining centre does all the work _____.

(a) Milling machine (b) Drilling machine

(c) Both milling and drilling machine (d) Turning machine

50. Which of the following is the type of lathe machine?

(a) Jigs and fixtures (b) Capstan

(c) Turret (d) Both capstan and turret

51. Internal or external tapers on a turret lathe can be turned by -

(a) Sliding attachment (b) Morse taper attachment

(c) Taper turning attachment (d) Face turning attachment

52. Welding process in which two pieces to be joined are overlapped and placed between two electrodes is known as -

(a) Percussion welding (b) Projection welding

(c) Seam welding (d) Spot welding

53. Preheating is essential in welding -

(a) High speed steel (b) Stainless steel

(c) Cast iron (d) Aluminium

54. Fluxes are used in welding in order to protect the molten metal and the surfaces to be jointed from -

(a) Oxidation (b) Carburising

(c) Dirt (d) Distortion and warping

55. Water pipes of large length and diameter are made of -

(a) Semi-centrifugal casting (b) Continuous casting

(c) Sand casting (d) Electric resistance welding

56. The strength of a cutting tool depends on the following angle -

(a) Lip angle
(b) Clearance angle
(c) Rake angle
(d) Cutting angle

57. Drilling is an example of -

(a) Simple cutting
(b) Uniform cutting
(c) Orthogonal cutting
(d) Oblique cutting

58. A portable drilling machine is specified by -

(a) The size of the job it can hold
(b) Maximum diameter of drill it can hold
(c) Spindle speeds and feeds
(d) Maximum spindle travel

59. The process of bevelling sharp ends of a workpiece is called as _____.

(a) Knurling
(b) Facing
(c) Chamfering
(d) Grooving

60. TIG welding is best suited for welding -

(a) Stainless steel
(b) Carbon steel
(c) Aluminium
(d) Silver

61. Which of the following is an example of hybrid machining?

(a) Ultrasonic machining
(b) Electron beam machining
(c) Laser beam machining
(d) Ultrasonic assisted electrochemical machining

62. Cutting tool can never have its -

(a) Clearance angle- positive
(b) Rake angle - positive
(c) Clearance angle- negative
(d) Rake angle - negative

63. Hardness of steel greatly improves with -

(a) Annealing
(b) Tempering
(c) Normalising
(d) Cyaniding

64. Which of the following software is used to provide the users with various functions to perform geometric modelling and construction?

(a) Graphics software
(b) Programming software
(c) Operating software
(d) Application software

65. Which of the following device is mostly associated with automation?

(a) NC machine
(b) Flexible manufacturing
(c) Computer graphics workstation
(d) Robots

66. Which of the following is used to form Complex shapes effectively?

(a) Metal casting
(b) Sand casting
(c) Powder metallurgy
(d) Turning

67. What is the process, in which the metal is caused to flow through a restricted orifice to create an extremely elongated strip of uniform and comparatively smaller cross-sectional area, called?

(a) Rolling
(b) Extrusion
(c) Drawing
(d) Spinning

68. Cross-wire welding is -

(a) Multi-spot welding process
(b) Continuous spot welding process
(c) Used to form mesh
(d) Used where additional strength is desired

69. Preheating is essential in welding -

(a) High speed steel (b) Stainless steel

(c) Cast iron (d) Aluminium

70. Soldering iron is made of wedge shape in order to -

(a) Apply high pressure at edge (b) Retain heat

(c) Retain solder (d) Facilitate molecular attraction

71. Brazing is the process of -

(a) Joining plastic sheets (b) Hard soldering using brass spelter

(c) Casing in brass (d) Joining protruded sections by melting

72. Which of the following device is mostly associated with automation?

(a) NC machine (b) Flexible manufacturing

(c) Computer graphics workstation (d) Robots

73. On which of the following just in time(J.I.T) manufacturing philosophy emphasizes?

(a) Manpower (b) Profit

(c) Inventory (d) Manufacturing

74. The work is usually rotated while the drill is fed into the work in -

(a) Hand drilling machine (b) Radial drilling machine

(c) Deep hole drilling machine (d) Multiple spindle drilling machine

75. Which of the following is used to form Complex shapes effectively?

(a) Sand casting (b) Turning

(c) Powder metallurgy (d) Metal casting

76. Which of the following manufacturing process is favourable for making tool for ECM?

(a) Casting (b) Shaping

(c) Cold forging (d) Laser cutting

77. In perpetual inventory control, the material is checked as it reaches its -

(a) Minimum value (b) Maximum value

(c) Average value (d) Alarming value

78. Gnatt chart provides information about -

(a) Material handling (b) Proper utilisation of manpower

(c) Production schedule (d) Efficient working of machine

79. Material handling and plant location is analysed by

(a) Bar chart (b) Bin chart

(c) Emerson chart (d) Travel chart

80. Break-even analysis consists of -

(a) Fixed cost (b) Variable cost

(c) Fixed and variable cost (d) Operation cost

81. 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) The time when company can make maximum profits

82. Work study is most useful -

(a) Where production activities are involved

(b) In judging the rating of machines

(c) In improving industrial relations

(d) In judging the output of a man and improving it

83. Expediting function consists in keeping a watch on -

(a) Operator's activity

(b) Flow of material and in case of trouble locate source of trouble

(c) Minimising the delays

(d) Making efficient despatching

84. Percent idle time for men or machines is found by -

(a) Work sampling (b) Time study

(c) Method study (d) Work study

85. Product layout is employed for -

(a) Batch production (b) Continuous production

(c) Effective utilisation of machine (d) Mass production

86. The most important objective behind plant layout is -

(a) Overall simplification, safety of integration (b) Economy in space

(c) Maximum travel time in plan (d) To provide conveniently located shops

87. Standard time is defined as -

(a) Normal time + allowances (b) Normal time + idle time + allowances

(c) Normal time + idle time (d) Only normal time for an operation

88. 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 cast method

(c) Current value method (d) Fixed price method

89. Which of the following functions of Production Planning and Control is related to the timetable of activities?

(a) Scheduling (b) Dispatching

(c) Expediting (d) Routing

90. Production Planning and Control function is crucial for ensuring cost savings and efficiency in _____.

(a) Planning (b) Promotion

(c) Forecasting (d) Production

91. _____ involves anticipating bottlenecks in advance and identifying steps that will ensure a smooth flow of production.

(a) Production control (b) Production audit

(c) Production planning (d) Scheduling

92. _____ is the probability of a product operating efficiently within an estimated time frame.

(a) Reliability (b) Durability

(c) Serviceability (d) Performance

93. Which of the following is not an input in the Material Requirement Planning process?

(a) The item master file
(b) The master production schedule
(c) The product structure file
(d) The planned order report

94. Inventory control in production, planning and control aims at -

(a) Achieving optimisation
(b) Ensuring against market fluctuations
(c) Acceptable customer service at low capital investment in inventory
(d) Regular supply and demand

95. Job evaluation is the method of determining the -

(a) Relative worth of jobs
(b) Skill required by a worker
(c) Contribution of a worker
(d) Contribution of a job

96. According to principle of Kaizen, people is the most important -

(a) Asset
(b) Factor
(c) Team
(d) Feature

97. _____ is equal to the differences of the two limits of size of the part.

(a) Tolerance
(b) Interference
(c) Low limit
(d) High limit

98. The maximum amount by which the result differs from the true value is called -

(a) Accuracy
(b) Correction
(c) Discrepancy
(d) Error

99. Standard to be used for reference purposes in laboratories and workshops are referred to as -

(a) Primary standards
(b) Secondary standards
(c) Tertiary standards
(d) Working standards

100. Error of measuring equipment is -

(a) The closeness with which a measurement can be read directly from a measuring instrument
(b) A measure of how close the reading is to the true size
(c) The difference between measured value and actual value
(d) The smallest change in measurand that can be measured

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