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-IV (MECHANICAL ENGINEERING)

Time Allowed : 2 hours FM : 200

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

1. The two important forces for a floating body are -
   (a) Buoyancy, gravity (b) Buoyancy, pressure
   (c) Buoyancy, initial (d) Inertial, gravity
2. Venturimeter is used to measure flow of fluids in pipes when pipe is -
   (a) Horizontal (b) Vertical, flow downwards
   (c) Vertical, flow upwards (d) In any position
3. The most economical section of a rectangular channel for maximum discharge is obtained when its depth is equal to -
   (a) Half the breadth (b) Twice the breadth
   (c) Same as the breadth (d) 3/4 th the breadth
4. Water hammer in pipes occurs due to -
   (a) Someone hitting the pipe with a hammer
   (b) Sudden change in the velocity of any flowing fluid
   (c) Heavy pressurisation of pipe
   (d) Obstruction in pipe
5. Which among the following control the flow rate?
   (a) Valve (b) Pump
   (c) Head (d) Tank pipe
6. Reynold's number is the ratio of inertia force to -
   (a) Pressure force (b) Elastic force
   (c) Gravity force (d) Viscous force
7. If P is the gauge pressure within a spherical droplet, then gauge pressure within a bubble of the same fluid and of same size will be -
   (a) P/4 (b) P/2
   (c) P (d) 2P

8. When a body, floating in a liquid, is given a small angular displacement, it starts oscillating about a point known as -
   (a) Centre of pressure (b) Centre of gravity
   (c) Centre of buoyancy (d) Metacentre

9. Power transmitted through a pipe is maximum when the loss of head due to friction is -
   (a) One-half of the total head supplied (b) One-third of the total head supplied
   (c) One-fourth of the total head supplied (d) Equal to the total head supplied

10. Normal depth in open channel flow is the depth of flow corresponding to -
   (a) Unsteady flow (b) Uniform flow
   (c) Laminar flow (d) Steady flow

11. The efficiency of a centrifugal pump is maximum when its blades are -
   (a) Straight (b) Bent forward
   (c) Bent backward (d) Bent forward first and then backward

12. Axial flow pump is started with its delivery valve -
   (a) Kept fully closed (b) Kept fully open
   (c) Irrespective of any position (d) Kept 50% open

13. A turbine pump is basically a centrifugal pump equipped additionally with -
   (a) Adjustable blades (b) Backward curved blades
   (c) Vaned diffusion casing (d) Inlet guide blades

14. To avoid cavitation in centrifugal pumps -
   (a) Suction pressure should be low (b) Delivery pressure should be low
   (c) Suction pressure should be high (d) Delivery pressure should be high

15. Hydraulic ram is a pump which works -
   (a) On the principle of centrifugal action (b) On the principle of reciprocating action
   (c) On the principle of water hammer (d) On the principle of reaction

16. Hydraulic turbines are classified based on _____.
   (a) Energy available at inlet of turbine (b) Direction of flow through vanes
   (c) Head at inlet of turbine (d) Energy available, Direction of flow, Head at inlet.

17. Pelton wheel are used for minimum of following heads-
   (a) 20 meter (b) 100 meter
   (c) 125 meter (d) 180 meter and above

18. Reaction turbines are used for -
   (a) Low head (b) High head
   (c) High head and low discharge (d) Low head and high discharge

19. Francis, Kaplan and Propeller turbines fall under the category of -
   (a) Impulse turbines (b) Reaction turbines
   (c) Axial flow turbines (d) Mixed flow turbines

20. The main function of nozzle is to _____.
   (a) Varying temperatures (b) Pressure variations
   (c) Load variations (d) Heat variations

21. As per common design practice, the three types of hydraulic turbines, in descending order of flow rate, are -

(a) Pelton, Francis, Kaplan
(b) Pelton, Kaplan, Francis
(c) Francis, Kaplan, Pelton
(d) Kaplan, Francis, Pelton

22. Pneumatic and other power systems can support three kinds of motion; they are -

(a) Linear, reciprocating, and random motion
(b) Linear, flowing, and rotary motion
(c) Linear, zigzag, and spiral motion
(d) Linear, reciprocating, and rotary motion

23. In a hydraulic crane _____ is the component mainly responsible for lifting.

(a) Boom
(b) Counter-weights
(c) Jib
(d) Rotex Gear

24. A Francis turbine is used when the available head of water is -

(a) 25 m to 250 m
(b) 0 to 25 m
(c) 250 m to 300 m
(d) Above 300 m

25. Which of the following items is not a path function?

(a) Heat
(b) Work
(c) Kinetic energy
(d) Thermal conductivity

26. A closed system is one in which -

(a) Mass does not cross boundaries of the system, though energy may do so
(b) Mass crosses the boundary but not the energy
(c) Neither mass nor energy crosses the boundaries of the system
(d) Both mass and energy cross the boundaries of the system

27. If a gas vapour is allowed to expand through a very minute aperture, then such a process is known as-

(a) Free expansion
(b) Hyperbolic expansion
(c) Adiabatic expansion
(d) Throttling

28. When a gas flows through a very long pipe of uniform cross section, the flow is approximately -

(a) Isentropic
(b) Isobaric
(c) Isothermal
(d) Adiabatic

29. The entropy may be expressed as a function of -

(a) Pressure and temperature
(b) Temperature and volume
(c) Heat and work
(d) All of these

30. Which of the following has the highest calorific value?

(a) Anthracite coal
(b) Bituminous coal
(c) Peat
(d) Lignite

31. Energy can neither be created nor destroyed but can be converted from one form to other is inferred from-

(a) Zeroth low of thermodynamic
(b) Basic law of thermodynamics
(c) First law of thermodynamics
(d) Second law to thermodynamics

32. The fuel mostly used in steam boilers is -

(a) Non-coking bituminous coal
(b) Brown coal
(c) Peat
(d) Coking bituminous coal

33. An open cycle gas turbine works on -

(a) Otto cycle (b) Carnot cycle

(c) Stirling cycle (d) Joule's cycle

34. For a given set of operating pressure limits of a Rankine cycle, the highest efficiency occurs for -

(a) Saturated cycle (b) Superheated cycle

(c) Reheat cycle (d) Regenerative cycle

35. The amount of heat generated per kg of fuel is known as -

(a) Calorific value (b) Heat energy

(c) Lower calorific value (d) Higher calorific value

36. The door of a running refrigerator inside a room was left open. Which of the following statements is correct?

(a) The room will be cooled to the temperature inside the refrigerator

(b) The room will be cooled very slightly

(c) The room will be gradually warmed up

(d) The temperature of the air in room will remained unaffected

37. Triple point of a pure substance is a point at which -

(a) Liquid and vapour exist together (b) Solid and liquid exist together

(c) Solid and vapor exist together (d) Solid, liquid and vapour phases exist together

38. Cycle used in thermal power plants is -

(a) Carnot (b) Reversed carnot

(c) Rankine (d) Brayton

39. A steam nozzle converts -

(a) Kinetic energy into heat (b) Heat energy into potential energy

(c) Potential energy into heat (d) Heat energy into kinetic energy

40. The volume of air required for consuming 1 litre of fuel by a four stroke engine is _____.

(a) 5-6m^3 (b) 9-10m^3

(c) 2.5m^3 (d) 1.0m^3

41. Which of the following is the anti-knock for compression ignition engines?

(a) Amyl nitrate (b) Hexadecane

(c) Naphthene (d) Tetra ethyl lead

42. A perpetual motion machine is -

(a) A thermodynamic machine

(b) a non-thermodynamic machine

(c) a hypothetical machine

(d) a hypothetical machine whose operation would violate the laws of thermodynamics

43. Compression ratio of I.C. engines is -

(a) The ratio of volumes of air in cylinder before compression stroke and after compression stroke

(b) Volume displaced by piston per stroke and clearance volume in cylinder

(c) Ratio of pressure after compression and before compression

(d) Swept volume/ cylinder volume

44. The reason for supercharging in any engine is to -

(a) Increase efficiency
(b) Increase power
(c) Increase power
(d) Reduce weight and bulk for a given output

45. The cetane ($C_{16}H_{34}$) which is a straight chain paraffin, is assigned a cetane number of -

(a) 0
(b) 50
(c) 100
(d) 120

46. The most effective air cleaner in the case of diesel engines is -

(a) Whirl type
(b) Oil bath type
(c) Wet type
(d) Dry type

47. Which of the following does not relate to a compression ignition engine?

(a) Fuel pump
(b) Fuel injector
(c) Governor
(d) Carburettor

48. The inlet valve of a four stroke cycle internal combustion engine remains open for -

(a) 130°
(b) 180°
(c) 230°
(d) 270°

49. If the intake air temperature of I.C. engine increases, its efficiency will -

(a) Increase
(b) Decrease
(c) Remain same
(d) Unpredictable

50. Which of the following is not an internal combustion engine?

(a) 2-stroke petrol engine
(b) 4-stroke petrol engine
(c) Diesel engine
(d) Steam turbine

51. As a result of detonation in an I.C. engine, following parameter attains very high value -

(a) Rate of rise of pressure
(b) Rate of rise of temperature
(c) Peak temperature
(d) Peak pressure

52. A 150 cc engine has following parameter as 150 cc -

(a) Fuel tank capacity
(b) Swept volume
(c) Cylinder volume
(d) Clearance volume

53. For maximum power generation, the air fuel ratio for a petrol engine for vehicles, is of the order of -

(a) 9 : 1
(b) 12 : 1
(c) 15 : 1
(d) 18 : 1

54. The tendency of a diesel engine to knock increases, if -

(a) Engine speed is increased
(b) Engine Horse Power is increased
(c) Octane number of fuel is increased
(d) Compression ratio is increased

55. If petrol is used in a diesel engine, then -

(a) Higher knocking will occur
(b) Efficiency will be low
(c) Low power will be produced
(d) Black smoke will be produced

56. Which of the following is a classification of automobiles based on Load?

(a) Heavy transport vehicle (HTV)
(b) Sedan Hatchback car
(c) Four wheeler vehicle
(d) Front-wheel drive

57. Which of the following provides passages for the flow of cooling water?
(a) Crankcase
(b) Cylinder block
(c) Piston
(d) Cylinder head

58. A spark plug gap is generally kept from -
(a) 0 to 0.3 mm
(b) 0.3 to 0.7 mm
(c) 0.5 to 0.8 mm
(d) 0.6 to 1.0 mm

59. What is the function of the alternator?
(a) Voltage Regulator
(b) Recharging the battery
(c) Auto-ignition
(d) Mixture of air and fuel

60. Which of the following is not a part of the transmission system?
(a) Clutch
(b) Wheels
(c) Gear box
(d) Axles

61. Which of the following is a classification of IC Engine?
(a) Four-stroke engines
(b) S.I Engines
(c) Otto cycle engine
(d) Carnot cycle engine

62. Which of the following is necessary for the description of an automobile?
(a) Make
(b) Model
(c) Capacity
(d) All of above

63. The function of anti-lock brake system (ABS) in an automobile is that it -
(a) Reduces the stopping distance
(b) Minimizes the brake fade
(c) Maintains directional control during braking by preventing the wheels from locking
(d) Prevents nose dives during braking and thereby postpones locking of the wheels

64. The negative plates of a lead acid battery has -
(a) Lead peroxide (PbO_2)
(b) Spongy lead (Pb)
(c) Lead sulphate ($PbSO_4$)
(d) Sulphuric acid (H_2SO_4)

65. The seat belt tensioners are built in the -
(a) Front seats
(b) Shoulder anchors
(c) Seat belt retractors
(d) Seat belt buckles

66. The power source for a brake booster in an automobile is -
(a) Exhaust manifold pressure
(b) Electricity
(c) The pressure difference between the atmospheric pressure and the vacuum pressure in the intake manifold
(d) Hydraulic pump

67. The oil pump is driven by the -
(a) Camshaft
(b) Alternator shaft
(c) Crankshaft via drive belt
(d) Crankshaft directly

68. The basic part of the engine, to which the other engine parts are attached or assembled is the -
(a) Cylinder head
(b) Crankshaft
(c) Cylinder block
(d) Oil pan

69. Which of the following is defined as an upraised part on the hood which directs the airflow into the engine compartment?

(a) Spoiler (b) Wings

(c) Hood scoop (d) Hotpipe

70. Which of the following is a cylinder head type of an I.C. engine?

(a) C head (b) X head

(c) F head (d) U head

71. The temperature of the piston will be more at _____ in an automobile engine

(a) the piston rings (b) the crown of the piston

(c) the piston walls (d) the skirt of the piston

72. Which of the following is not a part of the transmission system?

(a) Clutch (b) Wheels

(c) Gear box (d) Axles

73. Which of the following provides passages for the flow of cooling water?

(a) Crankcase (b) Piston

(c) Cylinder block (d) Cylinder head

74. The operating pressure for refrigerating units using R-12 as a refrigerant is -

(a) 2 bar (b) 8 bar

(c) 15 bar (d) 30 bar

75. During heating and dehumidification process, dry bulb temperature -

(a) Increases (b) Remains constant

(c) Decreases (d) None of these

76. Environment friendly refrigerant R134a is used in the new generation domestic refrigerators. Its Chemical formula is -

(a) $CH\,Cl\,F_2$ (b) $C_2\,Cl_2\,F_3$

(c) $C_2\,H_2\,F_4$ (d) $C_2\,Cl_2\,F_4$

77. The moisture in a refrigerant is removed by -

(a) Evaporator (b) Safety relieve valve

(c) Dehumidifier (d) Driers

78. The domestic refrigerator uses following type of compressor -

(a) Centrifugal (b) Axial

(c) Miniature sealed unit (d) Piston type reciprocating

79. Refrigeration in aeroplane usually employs the following refrigerant -

(a) CO_2 (b) Freon – 11

(c) Freon – 22 (d) Air

80. The minimum temperature to which water can be cooled in a cooling tower is -

(a) Dew point temperature of air (b) Wet bulb temperature of air

(c) Dry bulb temperature of air (d) Ambient air temperature

81. In a refrigeration cycle, the flow of refrigerant is controlled by -

(a) Evaporator (b) Compressor

(c) Condenser (d) Expansion valve

82. A refrigeration cycle operates between condenser temperature of +27°C and evaporator temperature of -23°C. The Carnot coefficient of performance of cycle will be -

(a) 0.2 (b) 1.2

(c) 5 (d) 6

83. At lower temperatures and pressures, the latent heat of vaporisation of a refrigerant -

(a) Decreases (b) Increases

(c) Remains same (d) Depends on other factors

84. Compressor used in Window Air Conditioner is -

(a) Rotary (b) Reciprocating compressor

(c) Sealed compressor (d) Open type compressor

85. Formation of frost on evaporator in refrigerator -

(a) Results in loss of heat due to poor heat transfer (b) Increases heat transfer rate

(c) Is immaterial (d) Decreases compressor power

86. The most suitable refrigerant for a commercial ice plant is -

(a) Brine (b) NH_3

(c) Freon (d) Air

87. The comfort conditions in air conditioning system are defined by -

(a) 22°C dry bulb temperature (DBT) and 60% relative humidity (RH)

(b) 25°C DBT and 100% RH

(c) 20°C DBT and 75% RH

(d) 25°C DBT and 40% RH

88. Air refrigeration cycle is used in aeroplanes because of -

(a) High heat transfer rate of air

(b) Higher Coefficient of Performance (COP)

(c) Lower temperature attainable

(d) Lower weight of machine per ton of refrigeration

89. Cooling towers are installed where -

(a) Water is available in plenty (b) Water is scarce

(c) For very big plants (d) For very small plants

90. In aqua ammonia and Lithium bromide water absorption refrigeration systems, the refrigerants are respectively -

(a) Water and water (b) Ammonia and lithium bromide

(c) Ammonia and water (d) Water and lithium bromide

91. Time required for actual machining is called as _____.

(a) Service time (b) Set up time

(c) Machining time (d) Tear down time

92. From the following which is not the type of budget.

(a) Material budget (b) Salary budget

(c) Production budget (d) Sales budget

93. Production budget is also called as _____.

(a) Machining budget (b) Labour budget

(c) Manufacturing budget (d) Administrative budget

94. If welding length is 2 metre and welding speed is 10 metre/hour , then welding time is -

(a) 0.2 hour (b) Labour charges

(c) 5 hour (d) 0.02 hour

95. If cutting time is 0.5 hr, oxygen consumption is 5 m^3/hr and cost of oxygen is Rs.30 /m^3, then cost of oxygen is _____.

(a) Rs. 50 (b) Rs. 12

(c) Rs. 300 (d) Rs. 75

96. If arc voltage is 22 volts, arc current is 200 Amp., Welding time is 0.5 hr and transformer efficiency is 60 %, then power consumption is _____.

(a) 132 kwh (b) 5.66 kwh

(c) 3.66 kwh (d) 3666.66 kwh

97. Interest and depreciation of capital investment are included in _____.

(a) Variable cost (b) Fixed cost

(c) Overhead cost (d) Prime cost

98. Power generation cost is the ratio of _____.

(a) Total cost and power produced (b) Total cost and power consumption

(c) Variable cost and power produced (d) Fixed cost and power produced

99. _____ is the values of both semi-finished work lying in production shop or store.

(a) Work in progress (b) Salvage value

(c) Book value (d) Net present value

100. _____ is a graphical presentation of the relationship between the costs and income at a given time.

(a) Profit – volume ratio (b) Break even chart

(c) Bar chart (d) Margin of safety

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