

MIZORAM PUBLIC SERVICE COMMISSION
DEPARTMENTAL EXAMINATION FOR JUNIOR GRADE OF M.E.S. (AE/SDO)
UNDER PUBLIC WORKS DEPARTMENT,
GOVERNMENT OF MIZORAM.
(JULY-2025)

ENGINEERING PAPER – I
(Common for Mechanical & Electrical Engineers)

Time Allowed : 3 hours

FM : 100 PM : 40

SECTION - A (Multiple Choice Questions) (50 Marks)

All questions carry equal mark of 1 each. Attempt all questions.

*This Section should be answered only on the **OMR Response Sheet** provided.*

1. In a four-stroke engine, the combustion stroke is:
(a) The intake stroke (b) The compression stroke
(c) The power stroke (d) The exhaust stroke
2. The term “compression ratio” in an engine refers to the:
(a) Ratio of engine power to fuel consumption
(b) Ratio of intake valve opening time to closing time
(c) Ratio of cylinder volume at BDC to TDC
(d) Ratio of exhaust valve opening time to closing time
3. Which type of lubricant are calcium and sodium?
(a) Permanent (b) Liquid
(c) Solid (d) Semi-solid
4. In an engine, if the cooling system fails, which one of the following problems will occur?
(a) Piston seizes (b) Clutch plate seizes
(c) Crank shaft seizes (d) Flywheel seizes
5. What is the gasoline additive?
(a) Tetraethyl lead (b) Oxidation inhibitors
(c) Anti-icers (d) All are correct
6. Which diesel system supplies high-pressure diesel fuel to all of the injectors all of the time?
(a) Distributor type fuel injection system (b) Inline pump fuel injection system
(c) Common rail fuel injection system (d) Rotary fuel injection system
7. The capacity of a battery is expressed in terms of:
(a) Current rating (b) Voltage rating
(c) Ampere-hour rating (d) None of the above

8. The four arms of the spider which connect two yokes of the universal joint are called-
- (a) Trunion
 - (b) Joint to joint
 - (c) Socket joint
 - (d) Flange
9. _____ type of excavator carries the skimmer at its lower end.
- (a) Skimmer
 - (b) Dredger
 - (c) Escalator
 - (d) Elevator
10. A single device which converts a natural source of energy to mechanical motion is a/an:
- (a) prime mover
 - (b) heat engine
 - (c) electric motor
 - (d) steam plant
11. Which of the following earthmoving equipment is primarily used for clearing and grading sites?
- (a) Bulldozer
 - (b) Excavator
 - (c) Scraper
 - (d) Grader
12. A _____ consist of horizontal platform which is moved upward and downward by a powered winch between vertical guides.
- (a) Pulley block
 - (b) Hoists
 - (c) Elevator
 - (d) Conveyor
13. Chain slings are used for
- (a) Light loads
 - (b) Heavy loads
 - (c) Medium loads
 - (d) None of these
14. Which of the following is the primary purpose of dewatering equipment?
- (a) To add water to a system
 - (b) To remove water from a system
 - (c) To mix liquids
 - (d) To filter liquids
15. Which pile hammer preferred to work near Hospital & residential area?
- (a) Vibratory hammer
 - (b) Drop Hammer
 - (c) Diesel hammer
 - (d) Single & Double steam Hammer
16. Electromagnetic torque in rotating electrical machinery is present when _____.
- (a) Both stator and rotor windings carry current
 - (b) Air gap is uniform
 - (c) Stator winding alone carries current
 - (d) Rotor winding alone carries current
17. A consideration of the power losses in electrical machines is essential for which of the following reasons?
- (a) Operating cost
 - (b) Temperature rise
 - (c) Voltage drops
 - (d) All of the above
18. Which of the following can be obtained by the equivalent circuit of an electrical machine?
- (a) Complete performance characteristics of the machine
 - (b) Temperature coefficients of the machine components
 - (c) Type of protection to be used in the machine
 - (d) Design parameters of the windings

- 19.** Which of the following is the primary function of a commutator in a DC machine?
- (a) To reverse the current direction
 - (b) To maintain constant field flux
 - (c) To regulate the armature speed
 - (d) To reduce the power loss
- 20.** In an induction motor, which of the following factors determines the speed of the motor?
- (a) Frequency of the supply
 - (b) Resistance of the rotor
 - (c) Number of poles in the motor
 - (d) Voltage applied to the stator
- 21.** Which of the following is a characteristic of a synchronous motor?
- (a) It can operate at any speed depending on the load
 - (b) It always operates at synchronous speed
 - (c) It has high starting torque
 - (d) It is self-starting
- 22.** Which of the following is the primary advantage of a 3-phase induction motor?
- (a) Higher starting torque
 - (b) Smooth operation with less vibration
 - (c) High efficiency
 - (d) Simple construction and low cost
- 23.** Which of the following losses is associated with eddy currents in an electrical machine?
- (a) Copper loss
 - (b) Hysteresis loss
 - (c) Iron loss
 - (d) Mechanical loss
- 24.** Why are laminations used in the core of electrical machines?
- (a) To increase the magnetic flux
 - (b) To reduce eddy current losses
 - (c) To improve mechanical strength
 - (d) To reduce hysteresis losses
- 25.** What is the work of the frame of dc machines?
- (a) To reduce the voltage
 - (b) To reduce the flux
 - (c) To carry the flux
 - (d) To carry the current
- 26.** What is the primary objective of economic analysis in construction equipment management?
- (a) To determine the most visually appealing equipment
 - (b) To make informed decisions about equipment acquisition, use, and replacement
 - (c) To ensure the equipment is the most technologically advanced
 - (d) To prioritize safety regulations above all else
- 27.** Which of the following factors is most important when choosing equipment for a construction project?
- (a) The highest purchase price
 - (b) The lowest operating cost per unit of output
 - (c) The most visually appealing design
 - (d) The lowest initial purchase price
- 28.** What is the primary benefit of using a “present value” analysis in construction equipment economics?
- (a) It simplifies accounting for depreciation
 - (b) It allows for easier tracking of equipment costs
 - (c) It allows for comparison of the costs and benefits of equipment purchases across different time periods
 - (d) It makes it easier to negotiate prices with equipment vendors

29. Which of the following is NOT considered an alternative fuel?
- (a) Biodiesel
 - (b) Ethanol
 - (c) Natural Gas
 - (d) Petroleum-based fuel
30. What are the four types of electric vehicles?
- (a) Hybrid electric vehicles (HEVs)
 - (b) Heavy-weight electric vehicles (HEVs)
 - (c) Battery electric vehicles (BEVs)
 - (d) All of the above
31. Biodiesel can be made from which of the following:
- (a) Used vegetable oil
 - (b) Soybean oil
 - (c) Animal fat
 - (d) All of the above
32. Currently, most hydrogen vehicles use:
- (a) Liquid hydrogen
 - (b) Fuel cells powered by hydrogen
 - (c) A combination of hydrogen and diesel Gaseous hydrogen
 - (d) All of the above
33. Which of the following is not an important condition for preventive maintenance?
- (a) Size
 - (b) Age
 - (c) Location
 - (d) Oils used
34. Which of the following is not counted among safety equipment?
- (a) Vacuum reliever
 - (b) Alarms
 - (c) Flashback arresters
 - (d) Temperature reliever
35. Which of the following is not a material handling equipment?
- (a) Cranes
 - (b) Lifts
 - (c) Tongs
 - (d) Hoists
36. Which of the following materials is not used as process equipment?
- (a) Furnace
 - (b) Compressor
 - (c) Pump
 - (d) Generator
37. Which factor is LEAST likely to influence the hire charge of construction equipment?
- (a) Equipment type and size
 - (b) Rental period (hourly, daily, etc.)
 - (c) Contractor's experience level
 - (d) Location of the construction site
38. Which of the following is NOT a potential benefit of hiring construction equipment instead of purchasing it?
- (a) Lower initial investment
 - (b) No maintenance costs
 - (c) Access to a wider range of equipment
 - (d) Potential for tax benefits on rental payments
39. Which of the following is a unit of work done?
- (a) Newton-meter
 - (b) Joule
 - (c) Both a and b
 - (d) Neither a nor b
40. What is the common limitation of string law?
- (a) It only applies to stationary objects.
 - (b) It only applies to objects in motion.
 - (c) It does not account for friction.
 - (d) It does not account for gravity.

41. Corona loss is less when the shape of the conductor is-
- (a) Circular
 - (b) Flat
 - (c) Oval
 - (d) Independent of shape
42. Corona loss can be reduced by the use of hollow conductor, because-
- (a) current density is reduced
 - (b) eddy-current in the conductor is eliminated
 - (c) for a given cross-section, the radius of the conductor is increased
 - (d) of better ventilation in the conductor
43. Which of the following best describes a feeder in an electrical distribution system?
- (a) carries power from a substation to a distribution point, with no intermediate tapping.
 - (b) A line that connects individual consumers to the distribution system.
 - (c) A line that provides power to a specific load.
 - (d) A line that regulates voltage within the distribution system.
44. Which type of distribution system is best suited for areas with a high concentration of consumers and a need for redundancy?
- (a) Radial
 - (b) Ring main
 - (c) Branch
 - (d) Grid
45. Hollow conductors are used in transmission lines to-
- (a) Reduce weight of copper
 - (b) Improve stability
 - (c) Reduce corona
 - (d) Increase power transmission capacity
46. In a distribution system, what is the primary function of a distributor?
- (a) To carry power from the substation to the point of delivery.
 - (b) To regulate voltage within the distribution system.
 - (c) To connect individual consumers to the distribution system.
 - (d) To convert AC to DC power.
47. What type of fault occurs when a cable's conductor comes into contact with the ground or sheath?
- (a) Open Circuit
 - (b) Short Circuit
 - (c) Ground Fault
 - (d) Overload Fault
48. Which method uses a Wheatstone bridge to locate faults by measuring the resistance of faulty and sound cable sections?
- (a) Time Domain Reflectometry (TDR)
 - (b) Murray Loop Test
 - (c) Partial Discharge Testing
 - (d) Varley Loop Test
49. In a cable immediately above metallic sheath _____ is provided.
- (a) earthing connection
 - (b) bedding
 - (c) armouring
 - (d) none of the above
50. In capacitance grading of cables we use a _____ dielectric.
- (a) composite
 - (b) porous
 - (c) homogeneous
 - (d) hygroscopic

SECTION- B (Conventional Type) (50 Marks)

*This Section should be answered only on the Answer Sheet provided.
All questions carry equal 5 (five) marks each.*

Directions (Question Nos. 1 - 8) Answer any 5 (five) question of the following:

1. Define Engine tuning in petrol and diesel engine.
2. In the diesel and petrol engine of the same cubic meter, the combustion chamber can possess different power and torque. How and why ?
3. Nowadays, all petrol engines are not using Carburetor why ? What is the replacement of carburetor
4. What is Transformer ?
5. What is stepper motor and its uses?
6. Compare petrol engine with diesel engine.
7. What are the alternative of Petrol and Diesel engine?
8. What are pollution free engines, and mention advantages over Diesel and Petrol engines?

Directions (Question Nos. 9 - 15) Answer any 5 (five) question of the following:

9. Define Corona in a transmission line, effects of corona, remedial measures and advantage of corona.
10. Voltage ranges of Distribution Line, Transmission line and why high, very high, extra high voltage are required for transmission of power.
11. What are the different components of hire charge, procedure of accounting and crediting for different components of hire charge?
12. Mention different types of fault for underground cable and how to locate an underground cable fault by means of fault locator.
13. How to plan an electrical Distribution system and what are the components of Distribution system?
14. Define depreciation of a construction equipment and how to calculate its depreciation values.
15. What are the standard wiring cables approved by MPWD and what are the different sizes approved by MPWD?