1. Define the following equations of Linear Motion.
   (a) \( v = u + ft \)  
   (b) \( s = ut + \frac{1}{2} ft^2 \)  
   (c) \( v^2 = u^2 + 2fs \)  
   (d) \( s = \frac{(u + v)t}{2} \)  

2. What is Mechanism?  

3. Fill in the blanks of the following sentences.
   (a) A mechanism with more than ________ links is known as compound mechanism.
   (b) ________ is an instrument used to reproduce to an enlarged or a reduced scale and as exactly as possible the path described by a given point.
   (c) The magnitude of the force of friction is exactly ________ to the force, which tends the body to move.
   (d) The force of friction ________ with the increase of temperature of the lubricant.
   (e) ________ is defined as the ratio of the limiting friction to the normal reaction between the two bodies.

4. Define the following types of pumps.
   (a) Displacement pump  
   (b) Centrifugal pump  
   (c) Vertical turbine pump

5. Fill in the blanks of the following sentences.
   (a) For suction of pump include the type and size of wells, fluctuation of ________ levels and location of the pump.
   (b) A careful consideration of characteristic curves (H-Q), (n-Q) and ________ is extremely necessary before arriving final selection of the pump.
   (c) The pump selected should be which gives maximum ________ at the operating point.
   (d) The ________ in speed of the pump improves the efficiency of the pump.

6. Mention careful observations to be made during the whole period of pump test.

7. Fill in the blanks of the following sentences.
   (a) ________ maintenance only after fault or breakdown.
   (b) Pump / machines should be ________ correctly to avoid vibration.
   (c) Prior to start the pump, all ________ system should be with recommended lubricants.
(d) Bearing lubrication of pump should be checked at the interval of every ________ months.
(e) Induction motor starter & rotor should be checked at the interval of every ________ months.
(f) Bearing of induction motor should be checked at the interval of every ________ months.
(g) ‘B’ maintenance checks of Cummins Engine should be done at ________ hours.
(h) ‘D’ maintenance checks of Cummins Engine should be done at ________ hours.
(i) ________ used in machine serve as energy reservoir.
(j) The function ________ is to regulate the mean speed of an engine when there is variation on the load.
(k) Black smoke emitting from the exhaust is due to ________ ratio imbalance.
(l) When blue smoke is emitted from the exhaust it indicates that the engine is burning ________.

8. Compare IC and CI Engine.

9. Complete the following sentences. (4×1=4)
   (a) In Spark ignition four stroke cylinder engine the cam shafts runs at half speed of the __________.
   (b) In a four stroke cylinder diesel engine, during suction stroke, only air __________.
   (c) The specific fuel consumption of diesel engine as compared to petrol engines is __________.
   (d) Standard firing order for four cylinder petrol engine is __________.

10. Define the following. (3×1=3)
    (a) Calorific value of fuel.
    (b) Higher calorific value of fuel.
    (c) Lower calorific value of fuel.

11. What are the important functions of lubricating oil? (3)

12. What are the reasons of high oil consumption? (3)

13. What are the important points to consider while deciding overall requirements of pumping stations? (4)

14. Water has to supplied to a town with one lakh population at the rate of 135 litres/capita/day from a river 2000m away. The difference in elevation between the lowest water level in the sump and main reservoir is 100m. If the demand has to be supplied in 8 hours. Determine if f = 0.0075, velocity of water in the pipe is 2.0 m/sec and efficiency of pump 80 %.
   (2+2+2=6)
   (a) Water demand of the town per day.
   (b) Diameter of the pumping mains
   (c) BHP of pump required.

15. Fill in the blanks of the following sentences. (5×1=5)
    (a) The pump house should have a telephone, a wall clock and ______ inside the building.
    (b) The inflow in the suction pump should be at the furthest end from the suction pipe to avoid effect of ______.
    (c) During drying of motor insulation winding temperature should be maintained at about ______.
    (d) The advantage of providing power capacitor is improvement of ______.
    (e) It is undesirable to run the pump at capacities ______ than design capacity.

16. What are the differences between PERT and CPM for planning and controlling of a Project? (5)

17. Write about Health and Welfare of Water Works maintenance personnels. (3)
18. Explain the process of the following (3×3=9)
   (a) Oxyacetylene Gas Welding
   (b) Metal Arc Welding
   (c) Resistance Welding

19. Write a short note on the following and their applications. (3×3=9)
   (a) Lathe machine
   (b) Boring machine
   (c) Drilling machine

20. Define rotary air compressor and its application in water works. (3)

21. Write the properties of the following (3×2=6)
   (a) Steel
   (b) Cast Iron
   (c) Ductile Iron

22. Write compositions of stainless steel and its uses. (2)