

**[DMRC ME PAPER-1]**

1. Separators are generally used in air compressor installation
- Between the after cooler and receiver
  - Before first stage suction
  - Before intercooler
  - After intercooler

Ans: a

2. In simple harmonic motion the acceleration is proportional to
- Angular velocity
  - Displacement
  - Linear velocity
  - Square of displacement

Ans: b

3. Rateau turbine is a
- Simple reaction turbine
  - Velocity compound turbine
  - Pressure compound turbine
  - None of the above

Ans: d

4. An air cooled compressor gets over heated during operation because of
- Insufficient lubricating oil
  - Valve strip broken
  - Intake filter clogged
  - All of these

Ans: d

5. Compressor in which compression is effected by a rotating vane or impeller is known as
- Single stage compressor
  - Single acting compressor
  - Rotary compressor
  - Reciprocating compressor

Ans: c

6. If an axial flow compressor is designed for a constant velocity through all stages, then

the area of annulus of the succeeding stages will

- Remain the decrease
- Progressively decrease
- Progressively increase
- Depend upon the number of stages

Ans: c

7. What will the shape of the velocity triangle at the exit of a radial bladed centrifugal impeller, taking into account slip?
- Right-angled
  - Isosceles
  - All angle less than  $90^\circ$
  - One angle greater than  $90^\circ$

Ans: d

8. Which one of the following statement is true?
- In a multi-stage compressor, adiabatic efficiency is less than stage efficiency
  - In a multi-stage turbine adiabatic efficiency
  - Preheat factor for a multi-stage compressor is greater than one
  - Preheat factor does not affect the multi-stage compressor performance

Ans: a

9. At constant efficiency the horse power of a fan is
- Proportional to rpm
  - Proportional to  $(\text{rpm})^2$
  - Proportional to  $(\text{rpm})^3$
  - A polynomial functioning of rpm

Ans: c

10. A gas having adiabatic index  $\gamma = 1.4$  and atomic weight A will have molecular weight

- $\frac{A}{2}$
- A

- c. 2A
- d. 3A

Ans: c

11. A gas turbine work on which one of the following cycles?
- a. Brayton
  - b. Rankine
  - c. Stirling
  - d. Otto

Ans: a

12. Reheating in a gas turbine
- a. Increases the compressor work
  - b. decreases the compressor work
  - c. increase the turbine work
  - d. decreases the compressor work

Ans: c

13. Which one of the following forms of draft tube will NOT improve the hydraulic efficiency of the turbine?
- a. Straight cylindrical
  - b. Conical type
  - c. Bell-mouthed
  - d. Bent tube

Ans: d

14. Which one of the following turbines is used in underwater power stations?
- a. Pelton turbine
  - b. Deriaz turbine
  - c. Tubular turbine
  - d. Turgo-impulse turbine

Ans: c

15. The amount of heat supplied to a gas under isothermal conditions will be used
- a. for raising internal energy
  - b. for raising energy
  - c. for doing enthalpy work
  - d. for doing external work and for temperature rise

Ans: c

16. consider the following turbines:

- 1. Kaplan
- 2. Pelton wheel
- 3. Francis

The correct sequence in increasing order of the specific speeds of these turbines is

- a. 2,3,1
- b. 2,1,3
- c. 3,1,2
- d. 1,2,3

Ans: d

17. Consider the following statements the Furrier heat conduction equations  $Q =$

$$kA \frac{dT}{dx}$$

- 1. Steady – state conditions
  - 2. Constant value of thermal conductivity
  - 3. Uniform temperatures at the will surfaces of these statements
- a. 1, 2 and 3 are correct
  - b. 1,2 and 4 are correct
  - c. 2,3 and 4are correct
  - d. 1,3 and 4 are correct

Ans: d

18. The temperature variation in a large plate, as shown in the given figure, would correspond to which of the following condition (s)?

- 1. Unsteady heat
  - 2. Steady–state with variation of k.
  - 3. Steady –state with heat generation.
- Select the correct answer using the codes given below:

Codes:

- a. 2 alone
- b. 1 and 2
- c. 1 and 3
- d. 1, 2 and 3

Ans: a

19. In a long cylindrical rod of radius  $R$  and a surface heat flux of  $q_0$  the uniform internal heat generation rate is
- $2q_0/R$
  - $2q_0$
  - $Q_0/R$
  - $Q_0R^2$

Ans: a

20. For a solid cone of height  $h$  the CG lies on the axis at a distance above the base equal to
- $\frac{h}{4}$
  - $\frac{h}{3}$
  - $\frac{2h}{3}$
  - $\frac{3h}{8}$

Ans: a

21. Consider the following emission of an IC engine
- CO
  - HC
  - NO<sub>x</sub>
  - Particulates

Ans: c

22. Velocity of flame propagation in the SI engine is maximum for a fuel – air mixture which is
- 10% richer than stoichiometric
  - Equal to stoichiometric
  - More than 10 % richer than stoichiometric
  - 10% leaner than stoichiometric

Ans: d

23. Divided chamber diesel engines use, lower injection pressures compared to open chamber engines because

- Pintle nozzles cannot withstand high injection pressures
- High air swirl does not require high injection pressures for atomization
- High injection pressures may cause over-penetration
- High injection pressure causes leakage of the fuel at the pintle

Ans: b

24. In a variable S.I Engine, the maximum torque occurs at the maximum
- Speed
  - Brake power
  - Indicated power
  - Volumetric efficiency

Ans: c

25. In a single stage impulse, turbine, the velocity of steam approaching nozzle is :
- High
  - Very high
  - Negligible
  - Moderate

Ans: c

26. Methane burns with stoichiometric quantity of air The air / fuel ratio by weight is
- 4
  - 14.7
  - 15
  - 17.16

Ans: d

27. Benson boiler is one high pressure boiler having
- One drum
  - One water drum and one steam drum
  - Three drums
  - No drum

Ans: d

28. The compounding of steam turbines is done to
- Improve efficiency
  - Reduce turbine speed
  - Increase blade speed ratio
  - Refuse axial thrust

Ans: b

29. Consider the following of statements:
- De Laval nozzle is a subsonic nozzle.
  - Supersonic nozzle is a converging passage
  - Subsonic diffuser is a diverging passage. Which of these statements is/are correct?
- 1 and 2
  - 2 and 3
  - 1 alone
  - 3 alone

Ans: d

30. Blade friction the impulse while it passes over the blades reduces the velocity of steam by
- 10 to 15%
  - 15 to 20%
  - 20 to 30%
  - 30 to 40%

Ans: a

31. The expression for the maximum efficiency of a Parson's turbine is ( $a$  is the angle made by absolute velocity at inlet

- $\frac{\cos^2 a}{2(1 + \cos^2 a)}$
- $\frac{2 + \cos^2 a}{2 \cos^2 a}$
- $\frac{2 \cos a}{1 + \cos^2 a}$
- $\frac{2 \cos^2 a}{1 + \cos^2 a}$

Ans: d

32. Which one of the following safety devices is used to protect the boiler when the level falls below a minimum level?
- Water level indicator
  - Fusible plug
  - Blow of cock
  - Safety valve

Ans: b

33. A 3-stage reciprocating compressor has suction pressure of bar delivery pressure of 27 bar For minimum work of compression the delivery pressure of 1 it stage is
- 14 bar
  - 9 bar
  - 5.196 bar
  - 3 bar

Ans: b

34. Consider the following factors:
- Cylinder size.
  - Clearance ration
  - Delivery pressure.
  - Compressor shaft power

The factors which affect the volumetric efficiency of a single-stage reciprocating would include

- 1 and 2
- 3 and 4
- 2 and 3
- 1 and 4

Ans: a

35. Flow matters based on obstruction principle like orifice plates can be used with Reynold's number upto approximately
- 500
  - 1000
  - 2000
  - 4000

Ans: c

36. If the static temperature rise in the rotor and stator respectively are  $\Delta T_A$  and  $\Delta T_B$ , the degree of reaction in an axial flow compressor is given by

a.  $\frac{\Delta T_A}{\Delta T_B}$       b.  $\frac{\Delta T_A}{\Delta T_A + \Delta T_B}$

c.  $\frac{\Delta T_B}{\Delta T_A + \Delta T_B}$       d.  $\frac{\Delta T_B}{\Delta T_A}$

Ans: b

37. Consider the following statement relating to a closed gas turbine cycle:

1. The cycle can employ monatomic gas like helium instead of air to increase the cycle efficiency if other conditions the same.
2. The efficiency of the heat exchanger increases with the use of helium
3. The turbine blades suffer higher corrosion damages.
4. Higher output can be obtained for the same size.

Which of these statements are correct?

- a. 1,2 and 3
- b. 1,2and 4
- c. 2,3 and 4
- d. 1,3 and 4

Ans: b

38. Forced draught fans of a large steam generator have

- a. Backward curved blades
- b. Forward curved blades
- c. Straight or radial blades
- d. Double curved blades

Ans: a

39. Air from a reservoir is to be passed through a supersonic nozzle so that the jet will have a Mach number of 2. If the static

temperature of the jet is not to be less than  $27^{\circ}$  C, the minimum temperature of air in the reservoir should be

- a)  $48.6^{\circ}$  C
- b)  $167^{\circ}$  C
- c)  $267^{\circ}$  C
- d)  $367^{\circ}$  C

Ans: a

40. Head developed by a centrifugal pump depends on

- a. Impeller
- b. Speed
- c. Type of casting
- d. Both (a) and (b) above

Ans: d

41. Consider the following statements:

1. A draft tube may be fitted to the tail end of a pelton turbine to increase the available head.
2. Kaplan turbine is an axial flow reaction turbine with adjustable vanes on the hub.
3. Modern Francis turbine is a mixed flow reaction turbine.

Which of these statements are correct?

- a. 1, 2 and 3
- b. 1 and 2
- c. 2 and 3
- d. 1 and 3

Ans: c

42. Consider the following data for the performance of a centrifugal pump:

Speed: 1200 rpm, flow rate: 30 l/s, head: 20 m,

Power: 5 kW

If the, speed is increased to 1500 rpm; the power will be nearly equal to

- a. 6.5 kW      b. 8.7 kW  
c. 9.8 kW      d. 10.9 kW

d. 20 to 30%

Ans: b

Ans: c

43. Consider the following pumps:

- 1) Centrifugal pump, single-stage
- 2) Centrifugal pump, multi-stage
- 3) Reciprocating pump.
- 4) Jet pump.

The pump (s) which can be used to lift water through a suction head of 12m from a well would include

- a. 2 alone
- b. 1,3 and 4
- c. 4 alone
- d. 1 and 3

Ans: c

44. If  $\omega_s$  and  $\omega_p$  represent the angular velocities of drive and driven members of a fluid coupling respectively, then the slip is equal to

- a.  $1 - \frac{\omega_s}{\omega_p}$
- b.  $\frac{\omega_s}{\omega_p}$
- c.  $\frac{\omega_p}{\omega_s}$
- d.  $1 - \frac{\omega_p}{\omega_s}$

Ans: d

45. Clearance ratio for a single stage compressor is

- a. 1.5 to 3 %
- b. 2 to 10%
- c. 10 to 5%

46. The correct sequence of the given hydraulic turbines in decreasing order of their specific speeds is:

- a. Pelton wheel, Francis turbine, Kaplan turbine
- b. Propeller turbine, Francis turbine, pelton wheel
- c. Kaplan turbine, pelton wheel, Francis turbine
- d. Francis turbine, Kaplan turbine, Pelton wheel

Ans: b

47. Gibb's free energy 'G' is defined as

- a.  $G=H-TS$
- b.  $G=U-TS$
- c.  $G=U + pV$
- d.  $G=H+TS$

Ans: a

48. The device used to heat feed-water by utilizing the heat of the exhaust flue gases before leaving through the chimney, is called

- a. Super heater
- b. Economizer
- c. Air preheater
- d. ID fan

Ans: b

49. A tank containing air is stirred by a paddle wheel. The work input to the paddle wheel is 9000 kJ and the heat transferred to the surroundings from the tank is 3000 kJ. The external work done by the system is

- a. Zero
- b. 3000 kJ
- c. 6000kJ
- d. 9000kJ

Ans: c

50. According to the laws of proportionality for homologous turbines, power is proportional to
- a.  $DH$
  - b.  $D^2 H$
  - c.  $D^2 H^{3/2}$
  - d.  $D^2 \sqrt{H}$

Ans: c

