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MECHANICAL ENGINEERING

BPSC PRACTICE QUESTIONS

01. The maximum velocity attainable at the throat of a steam nozzle is

(A) much less than sonic velocity
(B) slightly less than sonic velocity
(C) sonic velocity
(D) slightly more than sonic velocity

02. For a convergent-divergent nozzle, critical pressure ratio occurs when

(A) velocity at exit becomes sonic
(B) shock wave occurs
(C) nozzle efficiency is maximum
(D) increase in exit and inlet pressure ratio does not increase steam flow rate

03. Mach number is more than unity in which of the following portions of a convergent-divergent nozzle?

(A) Convergent portion
(B) Straight portion
(C) Throat
(D) Divergent portion

04. Under thermal equilibrium, flow of steam is

(A) isentropic
(B) adiabatic
(C) hyperbolic
(D) polytrophic

05. The flow of steam in a nozzle is subsonic at

(A) throat
(B) entrance
(C) convergent portion
(D) divergent portion

06. Shock effect in a nozzle is felt in

(A) divergent portion
(B) straight portion
(C) convergent portion
(D) throat

07. Losses in a centrifugal compressor are due to

(A) inlet losses
(B) impeller channel losses
(C) diffuser losses
(D) all of the above

08. The ratio of the increase in pressure in rotor blades to total increase in pressure in the stage is called

(A) pressure ratio
(B) pressure coefficient
(C) degree of reaction
(D) slip factor

09. The pressure ratio of an ideal vaned compressor with increase in mass flow rate

(A) increases
(B) decreases
(C) remains constant
(D) first decreases and then increases

10. Gas turbine blades are given a rake

(A) equal to zero
(B) in the direction of motion of blades
(C) opposite to the direction of motion of blades
(D) depending on the velocity

11. The blades of gas turbine are made of

(A) mild steel
(B) stainless steel
(C) carbon steel
(D) high-nickle alloy (neimonic)

12. The specific heat of the products of combustion increases with increase in

(A) pressure
(B) temperature
(C) fuel-air ratio
(D) both (B) and (C)

13. Inter-cooling results in

(A) improved work ratio

(B) lower work ratio

(C) unaffected work ratio

(D) improved work ratio initially which is lowered subsequently

14. Reheating in a gas turbine results in

(A) increase in work ratio

(B) decrease in work ratio

(C) increase in thermal efficiency

(D) increase in work ratio but decrease in thermal efficiency

15. The insulating ability of an insulator with the pressure of moisture would

(A) increase

(B) decrease

(C) remain unaffected

(D) none of the above

16. Heat is transferred by all three modes of transfer, viz, conduction, convection and radiation in

(A) electric heater (B) steam condenser

(C) melting of ice (D) boiler

17. The ratio of heat flow Q_1/Q_2 from two walls of same thickness having their thermal conductivities as $K_1 = 2\ K_2$ will be

(A) 1 (B) 0.5 (C) 2 (D) 0.25

18. A steam pipe is to be insulated by two insulating materials put over each other. For best results

(A) better insulation should be put over pipe and better one over it

(B) inferior insulation should be put over pipe and better one over it

(C) both may be put in any order

(D) whether to put inferior one over pipe or the better one would depend on steam temperature

19. The ratio of the emissive power and absorptive power of all bodies is the same and is equal to the emissive power of a perfectly blackbody. This statement is known as

(A) Kirchhoff's law (B) Stefan's law

(C) Wien law (D) Planck's law

20. The total emissivity power is defined as the total amount of radiation emitted by a blackbody per unit.

(A) temperature (B) thickness

(C) area (D) time

21. The emissive power of a body depends upon its

(A) temperature (B) wavelength

(C) physical nature (D) all of the above

22. A perfect blackbody is one which

(A) is black in colour (B) reflects all heat

(C) transmits all heat radiations (D) is fully opaque

23. Thermal radiation extends over the range of

(A) 0.01 μ to 0.1 μ (B) 0.1 μ to 100 μ

(C) 100 μ to 250 μ (D) 250 μ to 1000 μ

24. Critical pressure of a liquid is the pressure

(A) above which liquid will remain liquid (B) above which liquid will become gas

(C) above which liquid becomes vapour (D) above which liquid becomes solid

25. Sub-cooling occurs when the vapour

(A) removes latent heat from the refrigerant

(B) removes sensible heat from the refrigerant

(C) has high latent heat

(D) has low latent heat

26. Which of the following refrigerant characteristics change constantly during the cooling cycle?

(A) Pressure and phase (B) Phase and flow

(C) Flow and temperature (D) Temperature and pressure

27. General gas equation is

(A) PV = Nrt (B) PV = mRT

(C) $PV = \frac{1}{3}nRT$ (D) $PV^n = C$

28. Specific heat of air at constant pressure is equal to

(A) 0.17 (B) 0.21 (C) 0.24 (D) 1.41

29. Which of the following items is not a path function

(A) Heat (B) Work

(C) Kinetic energy (D) Thermal conductivity

30. If T_{max} and T_{min} be the maximum and minimum temperatures in an Otto cycle, then for the ideal conditions, the temperature after compression should be

(A) $\frac{T_{max} + T_{min}}{2}$ (B) $\sqrt{\frac{T_{max}}{T_{min}}}$ (C) $\sqrt{T_{max} \times T_{min}}$ (D) $T_{min} + \frac{T_{max} - T_{min}}{2}$

31. Which of the following relationships defines the Helmholtz function (F)?

(A) F = H+TS (B) F = H–TS

(C) F = U+TS (D) F = U–TS

32. Specific fuel consumption is defined as

(A) fuel consumption per hour (B) fuel consumption per BHP

(C) fuel consumption per hour per BHP (D) fuel consumption per hour per IHP

33. Most of the high-speed compression engines operate on

(A) Diesel engine (B) Otto cycle

(C) dual combustion cycle (D) special type of air cycle

34. Which of the following is the lightest and most volatile liquid fuel?

(A) Diesel (B) Kerosene

(C) Fuel oil (D) Gasoline

35. Pour point of fuel oil is the

(A) minimum temperature to which oil is heated in order to give off inflammable vapours in sufficient quantity to ignite momentarily when brought in contact with a flame.

(B) temperature at which it solidifies or congeals

(C) It catches fire without external acid

(D) temperature at which it flows easily

36. Which of the following fuels detonates readily?

(A) Benzene (B) Iso-octane

(C) n-heptane (D) Alcohol

37. The commonly used ignition accelerator is

(A) acetone peroxide (B) ethyl nitrate

(C) isoamly nitrate (D) Any one of the above

38. Ignition accelerators are substances which

(A) increase the rate of pre-flame reaction and reduce the ignition lag

(B) increase knock

(C) reduce detonation

(D) increase thermal efficiency

39. The power to weight ratio of diesel engine compared to petro engine is

(A) high (B) low (C) same (D) not comparable

40. The first nuclear power plant in India is located at

(A) Kota (B) Kalapakkam (C) Tarapur (D) Bareilly

41. Breeder reactor employs liquid metal coolant, because it

(A) acts as good moderator (B) produces maximum steam

(C) transfers heat from core at a fast rate (D) increases rate of reaction in core

42. Solid fuel for nuclear reactions may be fabricated into various small shapes, such as

(A) plates (B) pallets

(C) pins (D) Any one of the above

43. A boiling-water reactor uses which of the following as fuel?

(A) Enriched uranium (B) Plutonium

(C) U^{234} (D) U^{235}

44. The coolant used in boiling water reactor is

(A) CO_2 (B) pressurised water

(C) mixture of water and steam (D) liquid metal

45. One kg steam sample contains 0.4 kg water vapour. Its dryness fraction is

(A) 0.4 (B) 0.6

(C) $\frac{0.4}{1.4}$ (D) 0.4 ×0.6

46. The shell diameter and length of locomotive boiler are

(A) 1.5 m, 4 m (B) 1.5 m, 6 m

(C) 1 m, 4 m (D) 2 m, 4 m

47. Presence of moisture in fuel oil would

(A) keep the burner tips cool

(B) aid in proper combustion

(C) cause sputtering, possibly extinguishing flame

(D) clean the nozzles

48. After turbine trip, the cooling water to condenser

(A) is stopped immediately

(B) is stopped after 15–30 minutes

(C) is never stopped

(D) may be stopped anytime

49. In pressure-compounded turbine

(A) pressure drop in each stage is equal

(B) pressure increases as steam flows over blades

(C) most of the kinetic energy of steam is absorbed as it passes over moving blades

(D) pressure remains uniform throughout

50. The function of a condenser in thermal power plant is

(A) to act as reservoir to receive steam for turbine

(B) to condense steam into condensate to be reused again

(C) to create vacuum

(D) all of the above