



BPSC AE ME

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7.

- 1. A four-stage compressor, with perfect intercooling between stages, compresses air from 1 bar to 16 bar. The optimum pressure in the last intercooler will be
 - (A) 6 bar
 - (B) 10 bar
 - (C) 8 bar
 - (D) 12 bar
- 2. The concentration of pressure pulses created by an object moving at Mach number of 0.5 is
 - (A) uniform outside Mach cone
 - (B) uniform within Mach cone
 - (C) larger behind the object
 - (D) larger ahead of the object
- 3. Thermal conductivity is lower for
 - (A) wood
 - (B) air (0.024)
 - (C) steam at 1 bar
 - (D) water at 100 °C

- 4. In case of one-dimensional heat conduction in a medium with constant properties, T is the temperature at position x at time t. Then $\partial T/\partial t$ is proportional to
 - (A) $\frac{T}{x}$ $Q = KA \frac{dT}{dx}$
 - (B) $\frac{\partial T}{\partial x}$
 - (C) $\frac{\partial^2 T}{\partial x^2}$
 - (D) $\frac{\partial^2 T}{\partial x \cdot \partial t}$
 - . When heat is transferred by molecular cooling, it is referred to as heat transfer by
 - (A) conduction
 - -(B) convection
 - (C) radiation
 - (D) scattering
 - 6. The temperature of steam at around 540 °C can be measured by
 - (A) thermometer
 - (B) radiation pyrometer
 - (C) thermopile
 - (D) thermocouple



- 7. A composite slab has two layers of different materials with thermal conductivities k_1 and k_2 . If each layer has the same thickness, the equivalent thermal conductivity of the slab would be
- 9. In an ideal vapour compression refrigeration cycle, the specific enthalpy of refrigerant (in kJ/kg) at the following states is given as:

(A) $k_1 + k_2$

Inlet of condenser: 283
Exit of condenser: 116
Exit of evaporator: 232



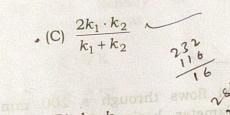
The COP of this cycle is

(A) 2.27 C

(B) 2·75

(C) 3·27

(D) 3·75



(D) $k_1 \cdot k_2$

pe (friction factor f = (1 0225)

10. Which of the following cycles uses air as the refrigerant?

(A) Ericsson

(B) Stirling

(C) Carnot

- 8. For a refrigerator operating between 273 K and 303 K, the maximum achievable COP is
- -(D) Bell Coleman

- A) 5:1 273
- 1. The horsepower per ton of refrigeration is expressed as

303

(B) 8·1

- S. M.
- (B) $\frac{\text{COP}}{4.75}$

- (c) 9·1
- (C) 4.75×COI

(D) 10·1

- (D) None of the above
- COP COP



1

15. A streamlined body is defined as 12. Sensible heating or cooling of a body about which air is the process of heating 17. or cooling (A) at the same humidity ratio (A) the flow is laminar (B) while changing the humidity ratio (B) the flow along 15 (C) at constant dry-bulb streamlines temperature (D) at the same wet-bulb (C) the flow separations temperature suppressed 13. The SI unit of kinematic viscosity is (D) the drag is zero (B) m/s² Oil flows through a 200 mm diameter horizontal cast iron pipe (friction factor f = 0.0225) of length 500 m. The volumetric flow rate is 0.32 m³/s. The head toox225 x500 x (32) loss (in m) due to friction is 14. For a Newtonian fluid $9.310^{4} \times 10^{4} \times 12 \times 2^{2}$ (assume $g = 9.8 \text{ m/s}^{2}$) (A) shear stress is proportional 100 × 100 × 12 20 25 3 (A) 116·18 to shear strain .(B) shear stress is proportional to rate of shear strain (B) 0·116 12 × 0.0225 × 0.32 (C) rate of shear stress is proportional to shear strain (C) 18·22 (D) rate of shear stress is proportional to rate of shear (D) 232·36 strain @ 322 x 200 X 18x (35) 215 × 800 × 32×328 71 07/AAS/CME-2022-5/21-C

100 x 100 x 10 x 7 x 7 x 18

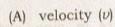
17. Kaplan turbine is

- (A) a high-head mixed flow turbine
- (B) a low-head axial flow turbine
- (C) an outward flow reaction turbine
- (D) an impulse inward flow turbine
 - 18. The density of water is maximum at
 - (A) 0 K
 - (B) 0 °C
 - (C) -4°C
 - _(D) 4°C ~
 - 19. The condition for the stable equilibrium of a floating body is
 - (A) the metacentre should lie above the centre of gravity
 - (B) the centre of buoyancy and the centre of gravity must lie on the same vertical line
 - (C) a righting couple should be formed
 - (D) All of the above

20. Manometer is used to measure

- (A) pressure in pipe, channel, etc.
- (B) atmospheric pressure
- (C) very low pressure
- (D) difference of pressure between two points
- 21. A hydraulic press has a ram of
 15 cm diameter and plunger of
 1.5 cm. It is required to lift a
 weight of 1 ton. The force
 required on plunger is equal to
 - (A) 10 kg
- (12) = (1.2) =
- (B) 100 kg
- 1000 = (1.2)
- (C) 1000 kg
- (D) 10000 kg

22. The losses in open channel vary as proportional to





- -(B) υ²
- (C) v3
- (D) $v^{1/2}$
- 23. A flow is called supersonic if the
 - (A) velocity of flow is very high
 - (B) discharge is difficult to measure
 - (C) Mach number is between 1 and 5
- (D) Mach number is less than 1
- 24. The dynamic viscosity of a liquid is $1.2 \times 10^{-4} \text{ N-s/m}^2$, whereas the density is 600 kg/m^3 . The kinematic viscosity (in m²/s) is
 - (A) 72×10-3

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- ひで
- (B) 20×10⁻⁸
- 1.2×10
- (C) 7.2×10^3
- 0 410
- (D) 70×10⁶

- 25. Reynolds' number signifies the ratio of
 - (A) gravity forces to viscous forces
 - (B) inertia forces to gravity forces
 - (C) inertia forces to viscous forces
 - (D) buoyant forces to inertia forces
- Refrigerant Freon-12 belongs to
 - (A) methane family
 - (B) alkyne family
 - (C) ketone family
 - (D) aldehyde family
- 27. The flow of water in a pipe about 3 metres in diameter can be measured by
- (A) orifice plate
 - (B) venturi meter
 - (C) Pitot tube
 - (D) rotameter





28. The characteristic gas constant of a gas is equal to



(B)
$$C_v + C_p$$

(C)
$$\frac{C_v}{C_p}$$

(D)
$$C_p - C_v$$

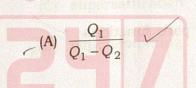
31. A perfect gas at 27 °C is heated at constant pressure till its volume is double. The final temperature is

(B) 327 °C P × 2V = T

(D) 108 °C

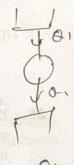
- 29. Boyle's law, i.e., pv = constant, is applicable to gases under
- (A) all ranges of pressures
 - (B) only small of range pressures
 - (C) only high range of pressures
 - (D) steady change of pressures
- 30. The statement that molecular weights of all gases occupy the same volume is known as
 - (A) Avogadro's hypothesis
 - (B) Dalton's law
 - (C) gas law
 - (D) law of thermodynamics

32. If Q_1 is the heat transfer between hot temperature source and machine, and Q_2 is the heat transfer between cold and temperature source machine, then for heat pump, the COP will be equal to



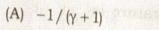
(C)
$$\frac{Q_1}{Q_2 - Q_1}$$

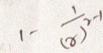
(D)
$$\frac{Q_2}{Q_2 - Q_1}$$



[P.T.O.

33. The air standard efficiency of an Otto cycle is equal to





(B)
$$r^{\gamma-1}-1$$

(C)
$$1 - r^{\gamma - 1}$$

- (D)
$$1 - (1/r^{\gamma-1})$$

 $(D) \ 1 - (1/r^{\gamma - 1})$ $(\frac{\partial V}{\partial S})_{p} = (\frac{\partial V}{\partial V})_{T}$ $(\frac{\partial V}{\partial S})_{p} = (\frac{\partial S}{\partial T})_{p}$ $(C) \ (\frac{\partial V}{\partial S})_{p} = (\frac{\partial S}{\partial T})_{p}$

system, V, S, P and T are specific volume, specific entropy, pressure and temperature respectively. As per Maxwell's relation

36. For a simple compressible

• (A)
$$\left(\frac{\partial V}{\partial S}\right)_P = \left(\frac{\partial T}{\partial P}\right)_S$$

(B)
$$\left(\frac{\partial V}{\partial S}\right)_P = \left(\frac{\partial P}{\partial V}\right)_T$$

(C)
$$\left(\frac{\partial V}{\partial S}\right)_P = \left(\frac{\partial S}{\partial T}\right)_P$$

(D)
$$\left(\frac{\partial V}{\partial S}\right)_P = \left(\frac{\partial T}{\partial V}\right)_P$$

- 34. Heat and work are
- (A) intensive properties
 - Designed Tale/189 (B) extensive properties
 - (C) point functions
- (D) path functions

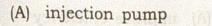
- 37. A 5 BHP engine running at full load would consume diesel of the order of
 - (A) 1 kg/hr
 - •(B) 5 kg/hr
 - (C) 3 kg/hr
 - (D) 0.3 kg/hr
- 35. The air-fuel ratio for idling speed of a petrol engine is approximately
 - (A) 1:1
 - (B) 5:1
 - (C) 10:1 ×
 - (D) 15:1

- 38. High carbon content in diesel oil used for diesel engine leads to
 - . (A) production of highly corrosive gases corroding the cylinder walls and exhaust system
 - (B) excessive engine wear
 - (C) damaging of both the storage tank and the engine
 - (D) deposition on engine parts

980

105

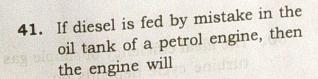
39. In case of diesel engine, mixing of air and fuel occurs in



(B) inlet manifold

· (C) engine cylinder

- (D) carburetor (D) reduce arou throat
- 40. In a petrol engine, which of the following gases gets exhausted out without burning without transformation?
 - (A) O₂
 - (B) CO₂ paragraphical (E)
 - = (C) CO
 - (D) N₂



- (A) give lot of smoke
 - .(B) detonate
 - (C) not run
- emberation of the temperature (D) run for some time and then stop state of the state of the



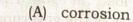
An engine at half load begins to act with an increasing load at 970 r.p.m. and with a decreasing load at 980 r.p.m. The sensitivity of the governor is

(A) 5%

10 ×100 975

- 2% and to IA (II.
- (C) 2.5%
- (D) 1% NA MES ALL DE boxi ous sabout of same
 - 43. Heating of dry steam above saturation temperature known as
 - (A) enthalpy
 - /(B) superheating /
 - (C) supersaturation
 - 7(D) supertempering
 - 44. 1 kg steam sample contains 0.4 kg water vapour. Its dryness factor is
 - (A) 0·4
 - (B) 0·4/1·4
 - (C) 0.4 × 0.6
 - (D) 0.6 20 10 1000 1031

45. The basic job of feedwater 48. The compounding of steam treatment in boilers is to overcome the problem of



- (B) scale
- (C) carryover
- (D) All of the above
- **46.** If Δh_m and Δh_f are the enthalpy drops in moving and fixed blades respectively, then the degree of reaction is defined as

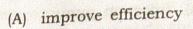




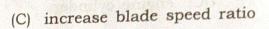
$$(C) \frac{\Delta h_m}{\Delta h_m + \Delta h_f}$$

(D)
$$\frac{\Delta h_f}{\Delta h_m + \Delta h_f}$$

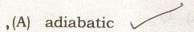
turbine is done to



(B) reduce turbine speed



- (D) reduce axial thrust
- 49. The maximum work is done in compressing air when the compression is

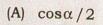


- (B) isothermal
- (C) Both (A) and (B)
- (D) None of the above

50. The ideal efficiency of simple gas

turbine cycle depends on

The maximum blade efficiency of a single-stage impulse turbine having nozzle angle α, under ideal condition, is



(C) $\cos 2\alpha$

 $ADI \cos^2 \alpha \sqrt{}$

(B) $\cos^2 \alpha/2$

(B) pressure ratio >

(C) minimum cycle temperature

(A) maximum cycle temperature

(D) All of the above