BYJU'S EXAM PREP

UPPSC Polytechnic

Mechanical Engineering

Mini Mock Challenge

(October 27th - October 28th 2021)

Questions & Answer Key

1. Recently SIDBI collaborated with which state government for development of MSMEs?

   A. Manipur
   B. Tripura
   C. Assam
   D. Nagaland
   E. Arunachal Pradesh

Ans. C

2. With which country India has signed a three-year Work Program for development in Agriculture cooperation?

   A. France
   B. Japan
   C. Israel
   D. Germany
   E. Canada

Ans. C

3. First batch of Multi-Mode Hand Grenades (MMHG) has been handed over to Indian Army in Nagpur, Maharashtra. The MMHG is manufactured by _____.

   A. BEML Limited
   B. Economic Explosives Limited (EEL)
   C. Bharat Dynamics Limited
   D. Bharat Electronics Limited
   E. Bharat Heavy Electricals Limited

Ans. B

4. Defence Research and Development Organisation (DRDO) has handed over the first deliverable Firing Unit (FU) of Medium Range Surface to Air Missile (MRSAM) System to Indian Air Force (IAF). The missile has been jointly developed by DRDO and which aerospace manufacturer?

   A. Israel Aerospace Industries
   B. Lockheed Martin Corporation
   C. The Boeing Company
   D. MBDA
   E. Airbus Group

Ans. A

5. Which act ended the "Trade Monopoly" of the East India Company?

   A. Regulating Act of 1773
   B. Pitt's India Act of 1784
   C. The Charter Act of 1833
   D. The Charter Act of 1813

Ans. D

6. Apart from the Himalayan region, the forest soils occur which of the following?

   A. Western Ghats
   B. Eastern Ghats
   C. Southern Ghats
   D. Both A and B

Ans. D

7. In which year was Nationalist Congress Party (NCP) founded?

   A. 1949
   B. 1999
   C. 1972
   D. 1997

Ans. B

8. Which of the following is related to Saffron Energy Revolution ?

A. Milk   B. Petroleum

C. Solar Energy   D. Fish Production

Ans. C

9. Where does the Tricarboxylic acid cycle, take place?

A. Mitochondria   B. Centrosome

C. Centrioles   D. Vacuoles

Ans. A

10. Which of the following districts come under Devipatan Division of Uttar Pradesh?

A. Bahraich, Gonda, Balarampur, Shravasti

B. Balarampur, Basti , Sant kabir Nagar, Shravasti

C. Shravasti, Gonda , Santkabir Nagar, Balrampur

D. Gonda, Bahraich Santkabir Nagar, Shravasti

Ans. A

11. In which of the following districts of Uttar Pradesh is Ayodhya, the birth place of Ram situated?

A. Varanasi   B. Meerut

C. Faizabad   D. Kanpu

Ans. C

12. Who is the Minister of Power in Uttar Pradesh Government?

A. Dinesh Sharma   B. Dharmpal Singh

C. Shrikant Sharma   D. Jai Pratap Singh

Ans. C

13. Which district of Uttar Pradesh is going to get India's first freight village?

A. Kannauj   B. Varanasi

C. Bijnor   D. Mainpuri

Ans. B

14. **Direction**: Select the one which is different from the other three responses.

A. 704, 11   B. 256,4

C. 832, 13   D. 310,5

Ans. D

15. 5kg of Rice at Rs.4 per kg is mixed with 10kg of rice at Rs.5 per kg. find the average price of the mixture.

A. 3.6   B. 5.8

C. 6.4   D. 4.6

Ans. D

16. The brake power of a diesel engine, keeping other parameters constant, can be increased by

A. decreasing the density of intake air

B. increasing the temperature of intake air

C. decreasing the pressure of intake air

D. increasing the pressure of intake air

Ans. D

17. Thermodynamic relation for the isothermal compressibility is

A. $-\dfrac{1}{V}\left(\dfrac{dV}{dP}\right)_T$

B. $-V\left(\dfrac{dP}{dV}\right)_T$

C. $-P\left(\dfrac{dV}{dP}\right)_T$

D. $\dfrac{1}{P}\left(\dfrac{dV}{dP}\right)_T$

Ans. A

18. For the velocity potential function $\emptyset = x^2 - y^2$. Find the velocity components at $x = 3$ and $y = 4$

A. -6 m/s; 2m/s

B. -6m/s; 8m/s

C. -3m/s; -7m/s

D. 3m/s; 6.32m/s

Ans. B

19. A solid sphere of radius 5 cm is to be covered with insulation (k = 3 W/m-deg). The critical thickness of insulation is (in cm). Assume h = 100 W/m².

A. 0.5

B. 1

C. 6

D. 2

Ans. B

20. If m is the ratio of maximum and minimum temperature of Brayton cycle, then the efficiency corresponding to the maximum work done is given by the relation _____.

A. $\eta = 1 + \dfrac{1}{\sqrt{m}}$

B. $\eta = 1 - \dfrac{1}{\sqrt{m}}$

C. $\eta = 1 - \sqrt{m}$

D. $\eta = 1 + \sqrt{m}$

Ans. B

21. Which of the following statements are correct with respect to capillary tube as expansion device.

(a) The enthalpy drop is directly proportional to length and inversely proportional to diameter of capillary tube.

(b) It is used in domestic refrigerator.

(c) It is complex and costly

(d) All of above

A. a, b

B. b, c

C. a, c

D. d

Ans. A

22. The mean effective pressure of an Otto cycle can be expressed as:

[where, ΔP = Pressure rise during heat addition]

A. $\dfrac{\Delta P}{(\gamma-1)(r-1)}$

B. $\dfrac{\Delta P \eta_{th}}{(\gamma-1)(r-1)}$

C. $\dfrac{(\Delta P)\eta_{th}}{(\gamma-1)r}$

D. $\dfrac{(\Delta P)\eta_{th}}{\gamma(r-1)}$

Ans. B

23. A diesel engine working on diesel cycle having compression ratio of 16. If cut-off take place 10% of the stroke, then find the cut-off ratio of the cycle.
   A. 1.5
   B. 2
   C. 2.5
   D. 3

Ans. C

24. A VCRS system uses Refrigerant R-134 and operates b/w 0.15 MPa and 80 kPa, if the values of enthalpy at entry and exit of evaporator are 78 kJ/kg and 178 kJ/Kg and enthalpy at inlet of condenser is 220 kJ/kg . If the power supplied to the compressor is 4.2 kW. What is the refrigeration capacity of the refrigeration plant _____ (in kW)?
   A. 100 kW
   B. 10 kW
   C. 42 kW
   D. 4.2kW

Ans. B

25. Match the differentials in list 1 with the corresponding differentials in list 2

   List-1

   A). $\left(\frac{\partial P}{\partial T}\right)_v$

   B). $\left(\frac{\partial T}{\partial v}\right)_s$

   C). $\left(\frac{\partial T}{\partial p}\right)_s$

   List-2

   1). $-\left(\frac{\partial p}{\partial s}\right)_v$

   2). $\left(\frac{\partial v}{\partial s}\right)_p$

   3). $\left(\frac{\partial s}{\partial v}\right)_T$

   A. A-3,B-1, C-2
   B. A-1,B-2,C-3
   C. A-2, B-3,C-1
   D. A-1, B-3, C-2

Ans. A

26. In an Otto cycle, the compression ratio increase from 8 to 10. The efficiency will increase by _____ %.
   A. 6.1
   B. 6.4
   C. 6.6
   D. 6.89

Ans. C

27. Which of the following is a fire tube type high pressure boiler?
   A. Velox boiler
   B. Benson boiler
   C. Loeffler boiler
   D. Lancahsire boiler

Ans. D

28. Availability function for a closed system is given by _____.

A. $u - pv - Ts$
B. $u + pv + Ts$

C. $u - pv + Ts$
D. $u + pv - Ts$

Ans. D

29. Match list – I and List – II and select the correct answer using the codes given below

List – I	List – II
P: Draft tube	1. Velocity compounding
Q: Impulse Turbine	2. Diffuser
R: Reaction Turbine	3. Continuous pressure drop
S : Pumps	4. Pressure rise

A. P – 3 Q – 4 R – 2 S – 1
B. P – 2 Q – 1 R – 3 S – 4

C. P – 2 Q – 4 R – 3 S – 1
D. P – 3 Q – 1 R – 2 S – 4

Ans. B

30. A Bi-molecular gas expanding in a piston cylinder arrangements, following $pv^{1.3}$ = constant. If the heat transfer during this polytropic process is 100kW then the amount of the work done by the gas will be

A. 400 kW
B. −400 kW

C. 25 kW
D. −25 kW

Ans. A

31. In CI engines the knocking tendency increases with_____.

A. increase in compression Ratio

B. increasing inlet temperature of air

C. decrease in compression Ratio

D. Increasing Coolant water temperature

Ans. C

32. Ammonical cuprous chloride in an Orsat flue gas analyser is used to absorb _____.

A. CO_2
B. CO

C. O_2
D. N_2

Ans. B

33. Air at 20 °C dry bulb temperature and 40% relative humidity is heated up to 40 °C using heater, whose surface temperature is maintained uniformly at 45 °C. The bypass factor of the heater is

A. 0.10
B. 0.20

C. 0.30
D. 0.40

Ans. B

34. For a sphere falling at terminal velocity in the stokes law range, the drag coefficient C_D is given by _____. (Assume Reynold number R_e is less than 0.2)

A. $\dfrac{24}{R_e}$

B. 24 R_e

C. $\dfrac{64}{R_e}$

D. 64 R_e

Ans. A

35. A carnot cycle refrigerator 'A' operates between 500K and 900K, whereas a carnot cycle refrigerator 'B' operates between 300K and 500K. Find out the ratio of coefficient of performance of A to B

A. 1

B. 0.34

C. 0.83

D. 0.54

Ans. C

36. For two cycles coupled in series, the topping cycle has an efficiency of 40% and the bottoming cycle has an efficiency of 30%. The overall combined cycle efficiency is

A. 50%

B. 44%

C. 58%

D. 82%

Ans. C

37. A heat exchanger heats water entering at $10°C$ $at\ the\ rate\ of$ $1.5\ kg/s$ by hot air entering at 80 $°C\ at\ the\ rate\ of\ 3\ kg/s.$ The highest rate of heat transfer in the heat exchanger is

_____

For air, C=1.005 kJ/kg K and for water C=4.18 kJ/kg K

A. 420.5 kJ

B. 211 kJ

C. 128.3 kJ

D. 80.9 kJ

Ans. B

38. A steam plant has the boiler efficiency of 90%, turbine efficiency (mechanical) of 94%, generator efficiency of 98 % and cycle efficiency of 40%. If 8 % of the generated power is used to run the auxiliaries, the overall plant efficiency is

A. 34%

B. 31%

C. 45%

D. 25%.

Ans. B

39. Which of the following fitting is a boiler mounting?

A. Superheater

B. Economizer

C. feed pumps

D. Blow down cock

Ans. D

40. Two infinitely large parallel plates 1 and 2 are held at temperatures 800 K and 500 K respectively and placed at a distance 50 mm apart in vaccum. A third large infinite flat radiation shield is introduced in between the plates 1 and 2. Consider emissivity of all the plates are equal. The ratio of the steady state radiative heat flux with and without the shield is

A. 1

B. 0.5

C. 0.25

D. 0.75

Ans. B

41. Which of the following types of pumps is suitable for pumping viscous fluids?
    A. Centrifugal pump
    B. Reciprocating pump
    C. Air lift pump
    D. Screw pump

Ans. D

42. Calculate the increase in unavailable energy associated with transfer of 800 kJ of heat from a constant temperature system at 600 K to another constant temp system at 400K. The ambient temperature is 300K.
    A. 150 kJ
    B. 200 kJ
    C. 225 kJ
    D. 250 kJ

Ans. B

43. A two-dimensional flow field has velocities along x and y direction given by $u = x^2$ and $v = -2xy$, then equation of streamline is _____.
    A. x^2y = constant
    B. xy^2 = constant
    C. xy = constant
    D. None of the above

Ans. A

44. A gas turbine working on Brayton cycle has a back work ratio of 0.35 and net output is 250 kJ. If compressor efficiency of 90%, then find the work output by the turbine _____?
    A. 384 kJ
    B. 250 kJ
    C. 384.6 kJ
    D. 220 kJ

Ans. C

45. For Ideal Gas coefficient of volume expansion is
    A. Directly proportional to the absolute temperature
    B. Inversely proportional to the absolute temperature
    C. Directly proportional to the Kelvin temperature
    D. Inversely proportional to the Kelvin temperature

Ans. B

46. A mercury- oil differential manometer measures a 35 cm difference of mercury level. Mercury has specific gravity 13.6 and oil has has specific gravity 0.8. What is the difference in pressure head (m of oil) ?
    A. 6.85
    B. 5.95
    C. 4.96
    D. 3.45

Ans. B

47. Hydrostatic law of pressure is:

    1) $\frac{\partial P}{\partial Z} = -\rho g$ and is valid for incompressible fluid.

    2) $\frac{\partial P}{\partial Z} = -\rho g$ and is valid for compressible fluid.

    which statement is correct _____?
    A. 1 only
    B. 2 only
    C. 1 & 2 both
    D. neither 1 nor 2

Ans. C

48. For a substance, the properties like pressure, temperature and density in thermodynamic coordinates are _____.
    A. Cyclic functions   B. Path functions
    C. Point functions   D. Real functions

Ans. C

49. Degree of reaction in a turbine is the ratio of _____.
    A. Enthalpy drop in fixed blade to total enthalpy drop
    B. Enthalpy drop in moving blade to total enthalpy drop
    C. Enthalpy drop in fixed blade to enthalpy drop in moving blade
    D. Enthalpy drop in moving blade to enthalpy drop in fixed blade

Ans. B

50. Find the maximum work obtainable per kg of air in ideal brayton cycle working between temperature limits of 127°C and 1327°C. (Take C_p = 1 kJ/kg/K)
    A. 100 kJ/kg   B. 200 kJ/kg
    C. 300 kJ/kg   D. 400 kJ/kg

Ans. D

51. In an ideal vapour compression refrigeration cycle, the specific enthalpy of refrigerant (in kJ/kg) at the following states is given as:
    Inlet of condenser: 283
    Exit of condenser: 116
    Exit of evaporator: 232
    The COP of this cycle is
    A. 2.27   B. 2.75
    C. 3.27   D. 3.75

Ans. A

52. In which type of the impeller of centrifugal pump, the head remains constant with variation in discharge?
    A. Forward curved vanes
    B. Radial vanes
    C. Backward curved vanes
    D. Both forward and backward curved vanes

Ans. B

53. In a 50% reaction turbine, absolute velocity angle at inlet is 45 ° and at exit it is axial. If the stage specific maximum work is 5000 J/Kg then, mean peripheral speed of blade at inlet will be _____ m/s.
    A. 66.12   B. 70.70
    C. 74.54   D. 79.76

Ans. B

54. For a system of ideal gas, in a reversible isothermal process the heat transferred to the system is 0.75 kJ. The internal energy at the initial point is 2.05 kJ. Determine the work done during the process.

A. -1.3 kJ   B. 0.75 kJ

C. -0.75 kJ   D. 2.8 kJ

Ans. B

55. The fouling factor is resistance to heat flow due to a build-up of layer of a layer of dirt or other fouling substance on the tube surfaces of the heat exchanger so if R_f is the resistance due to fouling then fouling factor in heat exchanger is defined as

A. $\frac{1}{R_f} = U_{dirty} - U_{clean}$ B. $\frac{1}{R_f} = \frac{1}{U_{dirty}} - \frac{1}{U_{clean}}$

C. $R_f = \frac{1}{U_{dirty}} - \frac{1}{U_{clean}}$ D. $R_f = U_{dirty} - U_{clean}$

Ans. C

56. In an ideal refrigeration cycle having COP 5.5 , if the cooling capacity was 5 KW, then the power input to the compressor in KW would be?

A. 1KW   B. 0.909KW

C. 1.101KW   D. 2.2KW

Ans. B

57. Consider the following statement ,which of them are correct.

A. In specular reflection, the angle of Incidence is equal to angle of reflection

B. In specular reflection ,the incident beam gets distributed unequally

C. In diffuse reflection, the incident beam gets distributed equally in all directions

D. All of above

Ans. D

58. Velocity profile of a flow is given by $\frac{u}{U} = \frac{3}{2}\left(\frac{y}{\delta}\right) - \frac{1}{2}\left(\frac{y}{\delta}\right)^3$. The flow

A. has separated   B. is on the verge of separation

C. will attach with the surface   D. cannot be determined

Ans. C

59. A stationary mass of gas is compressed without friction from an initial state of 0.5 m^3, 0.1 MPa to a final state of 0.2 m^3, 0.1 MPa. The transfer of heat from the gas during this process is 40 kJ. The change in internal energy of the gas is

A. 10 kJ   B. -10 kJ

C. 70 kJ   D. -70 kJ

Ans. B

60. Which of the following is not a advantage of Vortex Tube (Non-Conventional) refrigeration system?

A. It uses air as refrigerant, so there is no leakage problem.

B. It is heavy in weight and requires more space.

C. Vortex tube is simple in design and it avoids control systems.

D. Initial cost is low and its working expenses are also less, where compressed air is readily available.

Ans. B

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