

PUNJAB PUBLIC SERVICE COMMISSION

Objective Type Test (February-2017) for Recruitment of Sub Divisional Engineers (Mechanical) in the Department of Irrigation, Government of Punjab

READ INSTRUCTIONS BEFORE FILLING ANY DETAILS OR ATTEMPTING TO ANSWER THE QUESTIONS.

Candidate's Name _____

Father's Name _____

Date of Birth

DD MM YYYY

Category Code*

(*as given in the admit card)



OMR Response Sheet No. _____

Roll No. _____

Candidate's Signature (Please sign in the box)

Question Booklet Set
A
Booklet Series No.

INSTRUCTIONS

<p>1. The candidate shall NOT open this booklet till the time told to do so by the Invigilation Staff. However, in the meantime, the candidate can read these instructions carefully and subsequently fill the appropriate columns given above in CAPITAL letters. The candidate may also fill the relevant columns (other than the columns related to marking responses to the questions) of the Optical Mark Reader (OMR) response sheet, supplied separately.</p>	<p>9. The candidates shall ensure that the responses are marked in correct manner and any adverse impact due to wrong marking of responses would be the responsibility of the respective candidate. The following are some of the examples of wrong marking of responses on the OMR response sheet.</p> <div style="text-align: center;">  </div>
<p>2. Use only blue or black ball point pen to fill the relevant columns on this page. Use of fountain pen may leave smudges which may make the information given by the candidate here illegible.</p> <p>3. The candidate shall be liable for any adverse effect if the information given above is wrong or illegible.</p>	<p>10. The candidates, when allowed to open the question paper booklet, must check the booklet to confirm that the booklet has complete number of pages, the pages printed correctly and there are no blank pages. In case there is any such error in the question paper booklet then the candidate should immediately bring this fact to the notice of the invigilation Staff and obtain a booklet of the same series as given earlier.</p>
<p>4. Before attempting the paper, the candidate must fill all the columns given above on this page and sign at the appropriate place.</p> <p>5. Each candidate is required to attempt 100 questions in 120 minutes, except for visually impaired candidates, who would be given 40 minutes extra, by marking correct responses on the OMR sheet which would be supplied separately to the candidates.</p>	<p>11. The serial number of the new booklet should be entered in the relevant column of the OMR. The Invigilation Staff must make necessary corrections in their record regarding the change in the serial no. of question booklet.</p>
<p>6. The candidate must write the following on the OMRs sheet: (a) Serial number of OMR sheet supplied to him/her for marking the responses to the questions. (b) Serial number of the question booklet (c) Series of the question booklet. Failure to do so may lead to cancellation of candidature or any other action which the Commission may deem fit.</p>	<p>12. The question paper booklet has 14 pages.</p> <p>13. Each question shall carry three marks</p>
<p>7. The candidate should darken the appropriate response to the question by completely darkening the appropriate circle/oval according to his/her choice of response i.e. a, b, c or d in the manner shown in the example below.</p> <div style="text-align: center;">  </div>	<p>14. There are four options for each question and the candidate has to mark the MOST APPROPRIATE answer on the OMR response sheet using blue or black ball point pen.</p>
<p>8. Partly darkening the circle/oval on the OMR response sheet or using other symbols such as tick mark or cross would not result in evaluation of the response as the OMR scanner can only interpret the answers by reading the darkened responses in the manner explained in preceding paragraph. Darkening more than one circle/oval as response to a question shall also be considered as wrong answer.</p>	<p>15. There is no negative marking for wrong answers or questions not attempted by the candidate.</p>

1. In a single point cutting tool, the angle between the face of the tool and a line parallel to base of the tool and measured in a plane (perpendicular) through the side cutting edge is known as :
 - A) Side cutting edge angle
 - B) End cutting edge angle
 - C) Side relief angle
 - D) Back rack angle

2. A standard ground drill has a point angle of :
 - A) 90°
 - B) 108°
 - C) 118°
 - D) 120°

3. Under which loading condition Mohr's circle touches the origin of shear stress axis and having one positive principal stress?
 - A) Uniaxial compression
 - B) Uniaxial tension
 - C) Pure torsion
 - D) None of the above

4. What would be general selection of number of runs (R), size of electrode (E) in mm and current (C) in ampere during fillet welding of 6 mm thick plate?
 - A) R = 1, E = 4, C = 160
 - B) R = 3, E = 5, C = 200
 - C) R = 1, E = 5, C = 200
 - D) R = 1, E = 4, C = 320

5. The each unit cell of Hexagonal Close Packed Structures (HCP) shares _____ atoms.
 - A) 8
 - B) 10
 - C) 12
 - D) 14

6. The Charpy impact test is carried out on a specimen of 55 mm X 10 mm X 10mm in size and has a 2 mm deep notch at its centre with _____ angle.
 - A) 60 degree
 - B) 55 degree
 - C) 50 degree
 - D) 45 degree

7. For any manufacturing setup the fixed cost may include the following costs _____
 - A) Overhead cost
 - B) Tooling cost
 - C) Part material cost
 - D) None of the above

8. While designing limit gauges, manufacturing tolerance & wear allowance to be provided are _____ % & _____ % of work tolerance.
- A) 10% & 5%
 - B) 5% & 10%
 - C) 5% & 5%
 - D) 10% & 10%
9. If rate of consumption of a particular item is 20 unit/year. The cost of procurement per order is Rs. 40/-. The unit cost is Rs. 100/-. The inventory carrying cost is 0.16% & it depends upon the average stock. What would be Economic ordering quantity (E.O.Q)?
- A) 8 items
 - B) 10 items
 - C) 12 items
 - D) 14 items
10. If L is the length of the stroke in shaping, B is the width of work piece including allowance, f = feed per cycle in mm. V_1 = cutting speed in m/min & k is ratio of idle stroke to cutting stroke time. Then machining time can be calculated by :
- A) $LB(1+K) / (fV_1)$
 - B) LB/fV_1
 - C) KLB/fV_1
 - D) KLB/f
11. The compressor capacity is defined as the:
- A) actual volume of the air delivered by the compressor when reduced to normal temperature and pressure conditions
 - B) volume of air delivered by the compressor
 - C) volume of air sucked by the compressor during its suction stroke
 - D) None of the above
12. A compressor mostly used for supercharging of I.C. engines is:
- A) radial flow compressor
 - B) axial flow compressor
 - C) roots blower
 - D) reciprocating compressor
13. The tangential velocity of the water element having a free vortex is:
- A) directly proportional to its distance from the centre
 - B) inversely proportional to its distance from the centre
 - C) directly proportional to its (distance)² from the centre
 - D) inversely proportional to its (distance)² from the centre
14. The process of heat transfer from one particle of the body to another by the actual motion of the heated particles, is called:
- A) conduction
 - B) convection
 - C) radiation
 - D) all of the above

15. The ratio of heat extracted in the refrigerator to the work done on the refrigerant is called:
- A) coefficient of performance of refrigeration
 - B) coefficient of performance of heat pump
 - C) relative coefficient of performance
 - D) refrigerating efficiency
16. A diesel engine is _____ as compared to petrol engine, both running at rated load:
- A) equally efficient
 - B) less efficient
 - C) more efficient
 - D) none of the above
17. The cavitation in reaction turbine is avoided, to a great extent by:
- A) installing the turbine below the tail race level
 - B) using stainless steel runner of the turbine
 - C) providing highly polished blades to the runner
 - D) all of the above
18. As per the Indian (BIS) system of the coding of electrodes, 2nd digit indicates_____.
- A) Position of welding
 - B) Percentage of elongation & impact value
 - C) Tensile strength
 - D) Current, Polarity and OCV
19. During N.C. programming machining plane is selected for the machining on XY plane by _____.
- A) G19
 - B) G18
 - C) G17
 - D) None of the above
20. Accuracy of measuring instrument is :
- A) The closeness with which a measurement can be read directly from a measuring instrument
 - B) A measure of how close the reading is to the true size
 - C) The difference between measured and actual value
 - D) The capability to indicate the same reading again and again for a given measurand
21. The intentional difference between the maximum material limits of mating parts is known as:
- A) Tolerance
 - B) Allowance
 - C) Deviation
 - D) Fit
22. In KAIZEN 5-S movement, meaning of Seiton is _____.
- A) Straighten up
 - B) Put things in order
 - C) Clean up
 - D) Discipline

23. In screw thread measurement if P is the pitch of the screw & θ is the included angle then best wire size is calculated by:
- A) $P/(2 \sin\theta/2)$
 - B) $P/(2 \tan\theta/2)$
 - C) $P/(2 \cot\theta/2)$
 - D) $P/(2 \cos(\theta/2))$
24. The mean effective pressure of the compressor is the:
- A) actual volume of air delivered by the compressor when reduced to normal temperature and pressure conditions
 - B) volume of air delivered by the compressor
 - C) volume of air sucked by the compressor during its suction stroke
 - D) none of the above
25. Thermal diffusivity of a substance is:
- A) directly proportional to the thermal conductivity
 - B) inversely proportional to density of substance
 - C) inversely proportional to specific heat
 - D) all of the above
26. The knocking tendency in compression ignition engines for a given fuel will be:
- A) enhanced by decreasing compression ratio
 - B) enhanced by increasing compression ratio
 - C) dependent on other factors
 - D) none of the above
27. The basic requirement of a good combustion chamber is:
- A) minimum turbulence
 - B) low compression ratio
 - C) high thermal efficiency and power output
 - D) low volumetric efficiency
28. The hydraulic efficiency of an impulse turbine is the:
- A) ratio of the actual power produced by the turbine to the energy actually supplied by the turbine
 - B) ratio of actual work available at the turbine to the energy imparted to the wheel
 - C) ratio of the work done on the wheel to the energy of the jet
 - D) none of the above
29. If the net positive suction head (NPSH) requirement for the pump is not satisfied, then:
- A) no flow will take place
 - B) cavitation will be formed
 - C) efficiency will be low
 - D) excessive power will be consumed

30. Resilience is the:
- A) Energy stored in a body when strained within elastic limits
 - B) Energy stored in a body when strained upto the breaking of the specimen
 - C) Maximum strain energy which can be stored in a body
 - D) none of the above
31. Bifilar suspension method is used to find the:
- A) angular acceleration of the body
 - B) moment of inertia of the body
 - C) periodic time of the body
 - D) frequency of vibration of the body
32. What is the meaning of 18-4-1 High speed steel?
- A) 18% Carbon, 4% Tungsten, 1% Chromium
 - B) 18% Chromium, 4% Vanadium, 1% Carbon
 - C) 18% Tungsten, 4% Chromium, 1% Vanadium
 - D) None of the above
33. Among the following which features of the manufacturing system offer flexibilities in FMS?
- A) Expansion
 - B) Routing
 - C) Machine
 - D) All of the above
34. During Un-pressurized gating system the meaning of 1:3:3 is:
- A) Area of bottom of sprue, runner cross-section and total in gate opening
 - B) Runner Cross-section, total in gate opening and area of bottom of sprue
 - C) Area of bottom of sprue, total in gate opening and runner cross- section
 - D) Total in gate opening, runner cross-section and area of bottom of sprue
35. The following metal does not have HCP crystal structure:
- A) Cobalt
 - B) Cadmium
 - C) Nickel
 - D) Zinc
36. The overall isothermal efficiency of the compressor is defined as the ratio of:
- A) work required to compress the air isothermally to the actual work required to compress the air for the same pressure ratio.
 - B) Isothermal horse power to shaft horsepower or B.H.P. of the motor or engine required to drive the compressor
 - C) volume of free air delivery per stroke to the swept volume of the piston.
 - D) adiabatic horsepower to the horsepower required to drive the compressor
37. Intercooling in gas turbine systems:
- A) decreases net output but increases thermal efficiency
 - B) increases net output but decreases thermal efficiency
 - C) decreases net output and thermal efficiency both
 - D) increases net output and thermal efficiency both

38. The divergent portion of a venturi-meter is made longer than convergent portion to _____.
- A) avoid the tendency of breaking away the stream of liquid
 - B) to minimize frictional losses
 - C) both (A) and (B)
 - D) none of the above
39. The Kinematic viscosity is the:
- A) ratio of absolute viscosity to the density of the liquid
 - B) ratio of density of the liquid to the absolute viscosity
 - C) product of absolute viscosity and density of the liquid
 - D) product of absolute viscosity and mass of the liquid duct
40. Film coefficient is defined as the ratio of:
- A) thermal conductivity to the equivalent thickness of the film of fluid
 - B) temperature drop through the films of fluids to the thickness of film of fluid
 - C) thickness of film of fluid to the thermal conductivity
 - D) thickness of film of fluid to the temperature drop through the films of fluids
41. The ratio of the actual mass of water vapour in a unit mass of dry air to the mass of water vapour in the same mass of dry air when it is saturated at the same temperature and pressure, is called:
- A) humidity ratio
 - B) relative humidity
 - C) absolute humidity
 - D) degree of saturation
42. In a reaction turbine, the draft tube is used:
- A) to run the turbine full
 - B) to prevent air to enter the turbine
 - C) to increase the head of water by an amount equal to the height of the runner outlet above the tail race
 - D) to transport water to downstream
43. Which of the following welded joint is designed for shear strength?
- A) Transverse fillet welded joint
 - B) parallel fillet welded joint
 - C) butt welded joint
 - D) all of the above
44. According to Kelvin-plank's statement of second law of thermodynamics:
- A) It is impossible for a heat engine to produce net work in a complete cycle if it exchanges heat only with bodies at a single fixed temperature.
 - B) It is possible to construct an engine working on a cyclic process, whose sole purpose is to convert heat energy into work
 - C) It is impossible to construct a device which operates in a cyclic process and produces no effect other than the transfer of heat from a cooler body to a hotter body.
 - D) When two dissimilar metals are heated at one end and cooled at the other, the e.m.f. developed is proportional to the difference of their temperatures at the two end

45. Which of the following is a fire tube boiler?
- A) Lancashire boiler
 - B) Babcock and Wilcox boiler
 - C) Both of the above
 - D) none of the above
46. The component of the acceleration, parallel to the velocity of the particle, at the given instant is called:
- A) radial component
 - B) tangential component
 - C) coriolis component
 - D) none of the above
47. As per Von Mises' theory the shear yield stress (K) can be related with yield stress (σ_Y) under state of pure shear by _____
- A) $K = \sigma_Y / (3)^{0.5}$
 - B) $K = \sigma_Y$
 - C) $K = (\sigma_Y)^{0.5}/3$
 - D) None of the above
48. Mechanical fastening by BSW thread has thread angle of _____ degree.
- A) 50 degree
 - B) 55 degree
 - C) 60 degree
 - D) 57.5 degree
49. To make steel sufficiently tough to resist shock and fatigue which heat treatment process is done?
- A) Annealing
 - B) Hardening
 - C) Tempering
 - D) None of the above
50. Which geometry of form is judged by the difference in diameters at the middle and end cross sections when middle diameter is less compared to end cross section?
- A) Taperiness
 - B) Lobedness
 - C) Bowness
 - D) Barrelness
51. Material Stress-strain relationship expressed by $\sigma = K\epsilon^n$; where in K & n are:
- A) K is strength coefficient & n is yield strain
 - B) K is yield stress & n is work hardening exponent
 - C) K is strength coefficient & n is work hardening exponent
 - D) None of the above

52. High oxygen levels in duplex stainless steel results into:
- Reduction of toughness
 - Increase in weld corrosion
 - Both of above
 - None of above
53. The Mohr's circle for which loading condition has centre coinciding with the origin of normal & shear stress axis?
- Uni-axial tensile
 - Uni-axial compression
 - Bi-axial tensile
 - Pure- torsion
54. Point P (X,Y) located in XY plane is to be rotated in counter clockwise direction to new point P1(X1, Y1) by an angle ϕ . Which transformation matrix is to be used?
- $\begin{bmatrix} -\cos \phi & \sin \phi \\ \sin \phi & -\cos \phi \end{bmatrix}$
 - $\begin{bmatrix} -\cos \phi & -\sin \phi \\ -\sin \phi & -\cos \phi \end{bmatrix}$
 - $\begin{bmatrix} \cos \phi & -\sin \phi \\ -\sin \phi & \cos \phi \end{bmatrix}$
 - $\begin{bmatrix} \cos \phi & -\sin \phi \\ \sin \phi & \cos \phi \end{bmatrix}$
55. Separators are generally used in air compressor installations:
- before the intercooler
 - after the intercooler
 - between the aftercooler and receiver
 - before first stage suction
56. The ratio of the energy absorbed by the body to the total energy falling on it, is called:
- emissivity
 - emissive power
 - absorptive power
 - none of the above
57. In a vapour compression system, the condition of refrigerant before entering the expansion or throttle valve is _____.
- high pressure saturated liquid
 - wet vapour
 - Very wet vapour
 - dry vapour
58. The relative humidity is defined as:
- the mass of water present in 1 m³ of dry air
 - the mass of water present in 1 kg of dry air
 - the ratio of the actual mass of water vapour in a unit mass of dry air to the mass of water vapour in the same mass of dry air when it is saturated at the same temperature and pressure
 - the ratio of the actual mass of water vapour in a given volume of moist air to the mass of water vapour in the same volume of saturated air at the same temperature and pressure

59. The hydraulic efficiency of a reaction turbine, is the ratio of:
- A) power produced by the turbine to the energy actually supplied by the turbine
 - B) actual work available at the turbine to energy imparted to the wheel
 - C) work done On the wheel to the energy (or head of water) actually supplied to the turbine
 - D) none of the above
60. Stress concentration is caused due to:
- A) variations in Load acting on a member
 - B) variations in Properties of materials in a member
 - C) abrupt change of cross-section
 - D) all of the above
61. The bending moment of a cantilever beam of length l and carrying a uniformly distributed load of w per unit length is _____ at the fixed end.
- A) zero
 - B) $Wl/4$
 - C) $Wl^2/2$
 - D) Wl
62. The polar moment of inertia of a solid circular shaft of diameter(d) is:
- A) $\frac{\pi d^3}{16}$
 - B) $\frac{\pi d^3}{32}$
 - C) $\frac{\pi d^4}{32}$
 - D) $\frac{\pi d^4}{64}$
63. Stirling cycle consists of:
- A) two constant volume and two adiabatic processes
 - B) two constant volume and two isothermal processes
 - C) two constant pressure and two isothermal processes
 - D) one constant volume, one constant pressure and two adiabatic processes
64. The coriolis component of acceleration acts:
- A) along the sliding surface
 - B) perpendicular to the sliding surface
 - C) at 45° to the sliding surface
 - D) parallel to the sliding surface
65. If T_1 is the tension on tight side (Newtons) & T_2 is the tension (Newtons) on slack side of the belt over a pulley, If v is the linear velocity of the belt in m/sec. What would be the magnitude of the power transmitted in H.P. ?
- A) $v(T_1-T_2)/1000$
 - B) $vT_1T_2/1000$
 - C) $v(T_1-T_2)/75$
 - D) $vT_1T_2/75$

66. Universal coupling is used to connect the shaft:
- Whose axes intersect at small angle
 - Which are perfectly aligned
 - Which are not aligned
 - Have lateral misalignment
67. During two high strip rolling using roller radius of 'R' and thickness reduction is 'Δh', the coefficient of friction between strip and roller is 'μ', the following equation holds true for the maximum draft :
- $\Delta h = \mu R$
 - $\Delta h = \mu R^2$
 - $\Delta h = (\mu R)^2$
 - $\Delta h = \mu^2 R$
68. Among the following which is not part of solid rivets?
- Bifurcated rivet
 - Pan head rivet
 - Flat countersunk rivet
 - Snap head rivet
69. While Brazing of Stainless steels, Nickel- and Cobalt base alloys which type of filler metal is used?
- Aluminium-silicon
 - Copper-phosphorus
 - Gold
 - Nickel-silver
70. The standard tolerance unit 'i' is equal to:
- $i = 0.45 \sqrt{D} + 0.001D$
 - $i = 0.45 \sqrt[3]{D} + 0.001D$
 - $i = 0.45 \sqrt{D} + 0.01D$
 - $i = 0.45 \sqrt[3]{D} + 0.01D$
71. The rolling defect seen at the centre due to the tensile stresses set-up in the rolled part because of bending of rolls under the rolling pressure is known as :
- Alligatoring
 - Zipper Cracks
 - Edge Cracks
 - None of the above
72. Zinc mould in permanent casting is preheated in temperature range of:
- 150° - 200°
 - 250° - 275°
 - 225° - 300°
 - 300° - 330°

73. The maximum amount of carbon that can be alloyed with iron is:
- A) 1.4%
 - B) 3.4%
 - C) 3.67%
 - D) 6.67%
74. Grinding wheel has a marking as 250 x 25 x 32 WA 46 L4 V17
What is the meaning of 46 & L
- A) Grain size & structure
 - B) Grade & structure
 - C) Grain size & Grade
 - D) Structure & Bond
75. Which equation holds true to calculate shear angle using Lee and Shaffer expression?
- A) $\Phi + \lambda - \alpha = \pi/4$
 - B) $\Phi + \lambda - \alpha/2 = \pi/4$
 - C) $2\Phi + \lambda - \alpha = \pi/2$
 - D) $\Phi + \lambda - \alpha = \pi$
76. Scaling is to be applied to point P(X,Y) by scaling factor S_x, S_y . What would be scaling matrix?
- A) $\begin{bmatrix} S_x & S_y \\ 0 & 0 \end{bmatrix}$
 - B) $\begin{bmatrix} 0 & 0 \\ S_x & S_y \end{bmatrix}$
 - C) $\begin{bmatrix} S_x & 0 \\ 0 & S_y \end{bmatrix}$
 - D) $\begin{bmatrix} 0 & S_x \\ S_y & 0 \end{bmatrix}$
77. The volumetric efficiency of a compressor:
- A) increases with decrease in compression ratio
 - B) decreases with decrease in compression ratio
 - C) increases with increase in compression ratio
 - D) decreases with increase in compression ratio
78. 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 black body. This statement is known as:
- A) Wien's law
 - B) Stefan's law
 - C) Kirchhoff's law
 - D) Plank's law
79. The value of stress concentration factor depends up on:
- A) material of the part
 - B) geometry of the part
 - C) material and geometry of the parts
 - D) none of the above

80. When a body is subjected to three mutually perpendicular stresses, of equal intensity, the ratio of direct stress to the corresponding volumetric strain is known as:
- A) Young's modulus
 - B) Modulus of rigidity
 - C) Bulk modulus
 - D) Poisson's ratio
81. Mohr's circle is used to determine the stresses on an oblique section of a body subjected to
- A) Direct tensile stress in one plane accompanied by a shear stress
 - B) Direct tensile stress in two mutually perpendicular directions
 - C) Direct tensile stress in two mutually perpendicular directions accompanied by a simple shear stress
 - D) All of the above
82. Among the following, which are standard Interchangeable Tooth Profiles?
- A) The 14.5° composite system
 - B) The 20° full depth involutes system
 - C) The 20° stub involutes system
 - D) All of the above
83. What would be machining time for cutting one pass on 118mm long work piece with 2mm depth of cut, feed of 0.1 mm/rev and 400 rpm?
- A) 3 min
 - B) 2.95 min
 - C) 3.05 min
 - D) 6 min
84. The tool of NC machine has to cut circular arc from starting point (10,16) to end of the arc (18,24) having centre of the arc (18,16). Which N.C. program statement would cut the required arc?
- A) G03 X 18.0 Y 24.0 I 0 J 8.0
 - B) G02 X 18.0 Y 24.0 I 8.0 J 0
 - C) G03 X 18.0 Y 24.0 I 8.0 J 8.0
 - D) G02 X 18.0 Y 24.0 I 8.0 J 8.0
85. Clinometer is related with:
- A) Bevel protractor
 - B) Angle gauges
 - C) Spirit level
 - D) None of the above
86. Active plane is selected during CNC programming for YZ plane by:
- A) G17
 - B) G18
 - C) G19
 - D) G04

87. Which type of residual stresses improve fatigue strength of the weld?
- Uniaxial tensile stress
 - Biaxial tensile stress
 - Triaxial tensile stress
 - Compressive stress
88. The softest crystalline form in ferrous metal is:
- Austenite
 - Pearlite
 - Bainite
 - Martensite
89. The unwanted vibrational motion between tool and work is known as:
- Deflection
 - Amplitude
 - Chatter
 - friction
90. The American designation for mild steel En 3A is:
- AISI 1020
 - AISI 1060
 - AISI 4142
 - AISI 5140
91. If F is the fixed cost of the assets for a given period, S is the unit selling price, V is variable cost per unit & P = Profit. Break Even Point is calculated by :
- $F/(S-V)$
 - $(F-V)/S$
 - $(F-S)/V$
 - $F-S+V$
92. Reflection of point P(X,Y) to P1(-X,-Y) required transformation matrix as :
- $\begin{bmatrix} 1 & 0 \\ 0 & -1 \end{bmatrix}$
 - $\begin{bmatrix} -1 & 0 \\ 0 & 1 \end{bmatrix}$
 - $\begin{bmatrix} -1 & 0 \\ 0 & -1 \end{bmatrix}$
 - $\begin{bmatrix} 0 & -1 \\ -1 & 0 \end{bmatrix}$
93. Coefficient of performance (C.O.P.) of refrigerator & heat pump can be related by:
- $[COP]_{H,P} = [COP]_{ref} + 1$
 - $[COP]_{H,P} = [COP]_{ref} - 1$
 - $[COP]_{H,P} = 1/ [COP]_{ref}$
 - All of the above

94. If the flow of air through the compressor is perpendicular to its axis, then it is a:
- A) reciprocating compressor
 - B) centrifugal compressor
 - C) axial flow compressor
 - D) turbo compressor
95. A flow in which each liquid particle has a definite path, and the paths of individual particles do not cross each other, is called:
- A) Steady flow
 - B) Uniform flow
 - C) Streamline flow
 - D) Turbulent flow
96. The power transmitted through the nozzle is maximum when the head lost due to friction in the pipe is:
- A) equal to the total supply head
 - B) one-third of the total supply head
 - C) one-half of the total supply head
 - D) two-third of the total supply head
97. Kirchhoff's law states that:
- A) the total radiation from a black body per second per unit area is directly proportional to the fourth power of the absolute temperature
 - B) the wave length corresponding to the maximum energy is proportional to the absolute temperature
 - C) 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 black body
 - D) none of the above
98. In a vapour compression system, the condition of refrigerant is dry saturated vapour:
- A) before entering the compressor
 - B) after leaving the compressor
 - C) before entering the condenser
 - D) after leaving the condenser
99. The difference between dry bulb temperature and wet bulb temperature, is called:
- A) dry bulb depression
 - B) wet bulb depression
 - C) dew point depression
 - D) degree of saturation
100. The probability of knocking in spark ignition engines, the charge away from the spark plug should have:
- A) high self ignition temperature
 - B) low volatility
 - C) low ignition delay
 - D) all of the above
