

















Solution Report For Mini Gate Exam 2018 CBT-2 (ME)

Q. No	Question Status
Q.1	<p>Select the word that is most SIMILAR in meaning to the bold word in capital letters.</p> <p>REIN</p> <ul style="list-style-type: none">a. Overcomeb. Flingc. ✔ Controld. Pour <p>Correct Ans. c </p> <p>🔑 Solution</p>
Q.2	<p>Select the word that is FARTHEST in meaning to the bold word in capital letters.</p> <p>TACIT</p> <ul style="list-style-type: none">a. Orderb. ✔ Explicitc. Implicitd. Understanding <p>Correct Ans. b </p> <p>🔑 Solution</p>
Q.3	<p>Complete the sentence using the appropriate word :</p> <p>Water parks are one of the few places where everyone come together to escape the _____ summer heat.</p> <ul style="list-style-type: none">a. innocuousb. superciliousc. ✔ viciousd. dulcet <p>Correct Ans. c </p> <p>🔑 Solution</p>
Q.4	<p>The following question has 3 statements numbered I, II, and III giving certain information given in the statements is sufficient for answering the problem will be</p> <p>Five person A, B, C, D and E are sitting in a row. Who is sitting in the middle.</p> <p>I. B is between C and E</p> <p>II. B is to the right of E</p> <p>III. D is between A and E</p> <ul style="list-style-type: none">a. I and II togetherb. II and III togetherc. I and III togetherd. ✔ I, II and III together

	<div>Correct Ans. </div> <div> Solution</div>
Q.5	<p>In a public bathroom, there are n taps 1, 2, 3, .. n. Tap 1 and tap 2 take equal time to fill the tank while tap 3 takes half the time taken by tap 2 and tap 4 takes half the time taken by tap 3. i.e. k^{th} tap takes half the time taken by $(k - 1)^{\text{th}}$ tap. If the 8^{th} tap takes 80 hours to fill the tank then 10^{th} and 12^{th} tap working together fill the tank in _____ hours.</p>
	<div>Correct Ans. </div> <div> Solution</div>
Q.6	<p>Choose the correct pair of words to form a meaningful sentence: A tool-man without his _____ does not _____ well for the job.</p> <p>a.  Auger and Augur b. Augur and Auger c. Auger and Auger d. Augur and Augur</p>
	<div>Correct Ans. </div> <div> Solution</div>
Q.7	<p>During our campaign against child labor we have found that in 3 glass making factories A, B and C there were total 33 children aged below 18 years were involved. The ratio of male to female in A, B and C was 4 : 3, 3 : 2 and 5 : 4 respectively. If the number of female children working in B and C be equal then total number of female children are</p> <p>a.  14 b. 18 c. 22 d. 26</p>
	<div>Correct Ans. </div> <div> Solution</div>
Q.8	<p>The average age of Donald, his wife and their 2 children is 23 years. His wife is 4 years younger than Donald himself. His wife was 24 years old when his daughter was born. He was 32 years old when his son was born. The average age of Donald and his daughter is</p> <p>a.  25 years b. 22.5 years c. 26 years d. Insufficient information</p>
	<div>Correct Ans. </div> <div> Solution</div>
Q.9	<p>Four runners started running the race in the same direction along a circular path of 7 km. Their speed are 4, 3, 9, 3.5 km/h individually. If they started their race at 6 AM then at what time they all will be at the starting point?</p> <p>a. 2 PM</p>


	<p>b. 8 PM</p> <p>c. 8 AM</p> <p>d. 6 PM</p>
	<p>Correct Ans. b </p> <p> Solution</p>
Q.10	<p>Kamya, a student of class Xth told her friend that she did every day 3 more passage of English that of previous day and thus she completed the passages in 10 days. Later on she also told that the number of passage she did on second last day were four times that she did on second day. The total number of passages she completed in 10 days are _____ .</p>
	<p>Correct Ans. 175 </p> <p> Solution</p>
Q.11	<p>Falling sphere resistance method used to calculate the viscosity is based on</p> <p>a. Stoke's law</p> <p>b. Hagen-Poiseuille</p> <p>c. Darcy-Weisbach equation</p> <p>d. None of these</p>
	<p>Correct Ans. a </p> <p> Solution</p>
Q.12	<p>The work done by a closed system will increase when the value of the polytropic index n</p> <p>a. increases</p> <p>b. decreases</p> <p>c. first increases and then decreases</p> <p>d. first decreases and then increases</p>
	<p>Correct Ans. b </p> <p> Solution</p>
Q.13	<p>If a sphere is rolling, the ratio of its rotational energy to the total kinetic energy is given by</p> <p>a. 7 : 10</p> <p>b. 2 : 5</p> <p>c. 2 : 7</p> <p>d. 7 : 9</p>
	<p>Correct Ans. c </p> <p> Solution</p>
Q.14	<p>In Iron-carbon diagram</p> $L \xrightleftharpoons[4.3\%C]{115^{\circ}C} \gamma + Fe_3C \text{ is known as}$ <p>a. Eutectoid reaction</p> <p>b. Peritectic reaction</p> <p>c. Eutectic reaction</p> <p>d. Monotonic reaction</p>

Correct Ans. **c**


 Solution

Q.15

During sensible cooling

- a. Relative humidity remains constant
- b. Wet bulb temperature increases
- c. Specific humidity increases
- d.  Dew point temperature constant


Correct Ans. **d**

 Solution


Q.16

What is the strain energy stored in a cube of 50 mm, when it is subjected to shear stress of 200 MPa?

Given $G = 100 \text{ GPa}$.

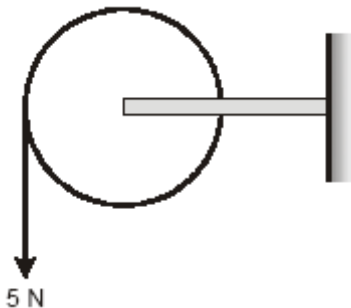
- a.  25 Nm
- b. 75 Nm
- c. 125 Nm
- d. 150 Nm


Correct Ans. **a**

 Solution


Q.17

A pulley of radius 100 mm can rotate freely about its centre as shown. A string is wrapped over it and is pulled by a force of 5 N. If the angular acceleration of the pulley is found to be 2 rad/s^2 , the moment of inertia of the pulley is




- a.  0.25 $\text{kg}\cdot\text{m}^2$
- b. 0.50 $\text{kg}\cdot\text{m}^2$
- c. 0.75 $\text{kg}\cdot\text{m}^2$
- d. 0.90 $\text{kg}\cdot\text{m}^2$

Correct Ans. **a**


 Solution

Q.18

The moment of inertia of a flywheel is 2000 kgm^2 . Initially at rest, it is moving with uniform acceleration of 0.5 rad/s^2 . After 10 seconds, its kinetic energy will be


- a. 2500 Nm
- b. 500 Nm
- c. 5000 Nm
- d.  25000 Nm

Correct Ans. **d**


 Solution

Q.19

If Poisson's ratio for a material is 0.25, the ratio of modulus of rigidity to modulus of elasticity is


- a. 0.2
- b.  0.4
- c. 0.8
- d. 1.0

Correct Ans. **b**

 Solution

Q.20

Which of the following is the major disadvantage of welded joints?

- a. welded joints are permanent joints
- b. the welding process is costly and requires skill labour
- c.  the magnitude of residual stresses cannot be predicted with any degree of certainty
- d. it is a time consuming process as compared to other joining processes

Correct Ans. **c**


 Solution

Q.21

A 2.5 m long cantilever is 100 mm wide and 170 mm deep. In order to limit the deflection at the free end to 5 mm, the uniformly distributed load the beam can carry is (Take $E = 200 \text{ GN/m}^2$)


- a. 6.38 kN/m
- b. 7.38 kN/m
- c.  8.38 kN/m
- d. 9.38 kN/m

Correct Ans. **c**


 Solution

Q.22

What would be the shear stress distribution across the section of two fixed parallel plates kept at a distance t apart and having a viscous flow?


- a. $\tau = -\frac{1}{2}\left(\frac{\partial P}{\partial x}\right)(t^2 - y^2)$
- b.  $\tau = -\frac{1}{2}\left(\frac{\partial P}{\partial x}\right)(t - 2y)$
- c. $\tau = -\frac{1}{2}\left(\frac{\partial P}{\partial x}\right)(ty - y^2)$
- d. $\tau = -\frac{1}{2}\left(\frac{\partial P}{\partial x}\right)(y - ty)$

Correct Ans. **b**


 Solution

Q.23

Consider following statements of gas turbine power plant. Which of the following statements is INCORRECT.


- a. It has capability of quick starting
- b.  Only certain high quality fuels can be used
- c. Floor space required for the plant installation is less
- d. Part load efficiency of this plant is low

Correct Ans.  **b** 


 Solution

Q.24

The time period of a pendulum is given by $T = 2\pi\sqrt{\frac{L}{g}}$. The maximum percentage change in T corresponding to 1% change in L and 2% change in g is


- a. 1%
- b.  1.5%
- c. 2%
- d. 3%

Correct Ans.  **b** 

 Solution

Q.25

The Newton Raphson algorithm for a function is given by $x_{n+1} = \frac{x_n - \sin x_n \cos x_n}{\sin^2 x_n}$. The function is given by

- a. $x = \sin x$
- b. $x = \cos x$
- c.  $x = \tan x$
- d. $x = \cot x$

Correct Ans.  **c** 

 Solution

Q.26

The heat flow equation through a sphere of inner radius 10 mm and outer radius 40 mm is to be written in the same form as that for heat flow through a plane wall. For wall thickness $[40 - 10 = 30]$ mm, the equivalent mean radius for the spherical shell is _____ mm.

Correct Ans.  **20** 


 Solution

Q.27

The boundary layer thickness at the trailing edge of a smooth plate of length 4 m and width 1.5 m, when the plate is moving with a velocity of 4 m/s in stationary air is _____ mm.

(Take kinematic viscosity of air as $1.5 \times 10^{-5} \text{ m}^2/\text{s}$).


Correct Ans.  **92.4 (90 - 95)** 

 Solution

Q.28

It is given that the actual demand is 200 units, a previous forecast 220 units and smoothening factor 0.3. The forecast for next period using exponential smoothing is _____ units.

Correct Ans. 214

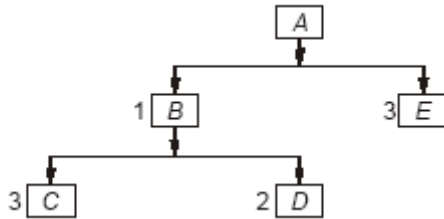
 Solution

Q.29

The product structure of product A is known in figure. The assembly of 3 units of C and 2 units of D to produce 1 unit of B takes 1 week. The ordering lead times for C, D and E are 2, 1 and 2 weeks. The master schedule for product P is as follows:

Weeks	10	14	12
Demands	30	15	45

If the initial inventory of B, C, D and E is 10, 20, 15 and 50 then the net requirement of item D will be _____.



Correct Ans. 145

 Solution

Q.30

Tungsten inert gas welding of an aluminium plate is carried out with welding current of 800A, voltage of 14V and weld speed is 18 mm/min, the heat required for melting is 20 kJ/mm, then the melting efficiency of the welding is _____%.

Correct Ans. 53.57 (52 - 55)

 Solution

Q.31

The die size for blanking a circular disc of 20 mm diameter from a C30 steel whose thickness is 1.2 mm and shear strength is 145 MPa, is _____ mm. (The clearance can be approximated per side as $0.0032 t \times \sqrt{\tau}$ mm, where t = sheet thickness in mm and τ = material shear stress in MPa)

Correct Ans. 20

 Solution

Q.32

A cup of 25 mm diameter and 40 mm deep is to be drawn from 1.6 mm thick steel sheet of tensile strength 300 MPa. (Neglect corner radius). Then the blank diameter is _____ mm.

Correct Ans. 68 (67 - 69)

 Solution

Q.33

A rectangular bar having cross-sectional area of 10000 mm² is subjected to an axial load of 25 kN. The shear stress on a section inclined at an angle of 30° with normal cross-section of the bar is _____MPa.

Correct Ans. | 1.082 (1.07 - 1.09) |

🔑 Solution

Q.34

In a given year, the probability of an earthquake, with magnitude greater than 6, occurring in Himalayas is 0.04. The average time between successive occurrence of such earth quakes is _____ years.

Correct Ans. | 25 |

🔑 Solution

Q.35

A boundary C is defined as a triangle with vertices at $(0, 0)$, $(2, 0)$, $(2, 2)$ in counter clockwise direction. The value of integral $\oint_C (x^2 y dx + x^2 dy)$ will be _____.

Correct Ans. | 1.33 (1.26 - 1.40) |

🔑 Solution

Q.36

Air flows steadily at a rate of 0.5 kg/s through an air compressor, entering at 7 m/s velocity, 100 kPa, pressure and $0.95 \text{ m}^3/\text{kg}$ volume, and leaving at 5 m/s, 700 kPa and $0.19 \text{ m}^3/\text{kg}$. The internal energy of the air leaving is 90 kJ/kg greater than that of the air entering. Cooling water in the compressor jackets absorbs heat from the air at the rate of 58 kW. What is the rate of shaft work input to the air?

- a. ✓ -122 kW
- b. - 202 kW
- c. 202 kW
- d. 122 kW

Correct Ans. | a |

🔑 Solution

Q.37

Match List-I with List-II and select the correct answer using the codes given below the lists:

List-I

- A. Nichrome
- B. Monel
- C. Inconel
- D. Invar

List-II

- 1. Iron and Nickel
- 2. Nickel and Chromium
- 3. Nickel and Copper
- 4. Nickel, Chromium and Iron

Codes:

	A	B	C	D
(a)	1	2	3	4
(b)	1	4	2	3
(c)	4	3	2	1
(d)	2	3	1	4

- a. a
- b. b
- c. ✓ c
- d. d

Correct Ans. | c |

🔑 Solution

Q.38

A rectangular water tank, full to the brim, has its length, breadth and height in the ratio 2 : 1 : 2. What is the ratio of hydrostatic forces on the bottom to that on any larger vertical surface of the tank?

- a. 1.25
- b. 1.5
- c. ✓ 1
- d. 2.0

Correct Ans. c

Solution

Q.39

A component is subjected to a flexural stress which fluctuates between 310 MN/m^2 and -160 MN/m^2 . If endurance strength is half of the ultimate strength, the minimum ultimate strength according to Gerber relation is (Factor of safety = 2)

- a. ✓ 963.4
- b. 822.1
- c. 701.5
- d. 679.9

Correct Ans. a

Solution

Q.40

A $300 \text{ mm} \times 100 \text{ mm} \times 40 \text{ mm}$ metallic bar is subjected to a force of 5 kN (tensile), 6 kN (tensile) and 4 kN (tensile) along x , y and z directions respectively. If Young's modulus is $2 \times 10^5 \text{ N/mm}^2$ and Poisson's ratio is 0.3, the change in volume of the bar is

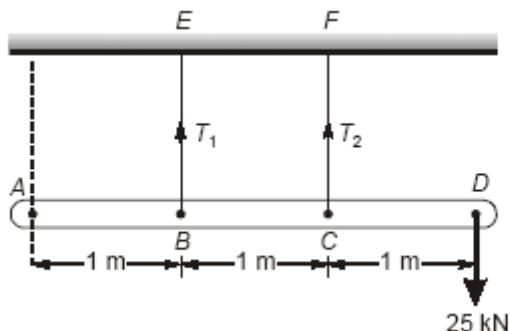
- a. 2.3092 mm^3
- b. ✓ 4.5192 mm^3
- c. 5.3592 mm^3
- d. 3.5118 mm^3

Correct Ans. b

Solution

Q.41

A rigid bar $ABCD$ hinged at A and supported in horizontal position by two identical steel wires as shown. If a vertical load of 25 kN is applied at D , the ratio of tensile forces induced in the two wires $\frac{T_1}{T_2}$ is



- a. 0.25
- b. ✓ 0.50

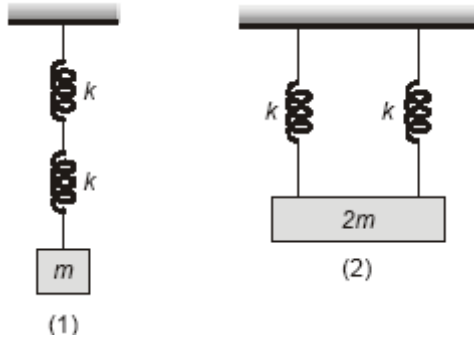
- c. 0.75
- d. 1.00

Correct Ans. **b**

Solution

Q.42

Two identical springs of spring constant k are connected in series and parallel as shown in figure below. What is the ratio of their frequencies of oscillations?



- a. 0.50
- b. 0.25
- c. 0.70
- d. 1.05

Correct Ans. **c**

Solution

Q.43

The controlling force F in newtons and r the radii of rotation in mm for a spring loaded governor are related by the expression

$$F = 5r - 120$$

Each ball has mass of 15 kg and the extreme radii of ball rotation are 120 mm and 200 mm. The minimum equilibrium speed is

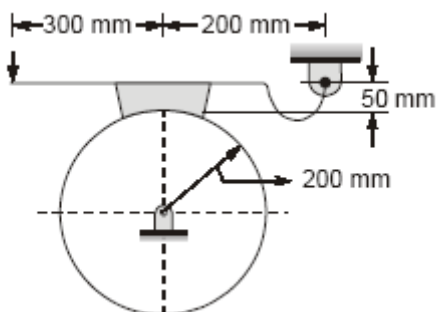
- a. 145.02 rpm
- b. 205.02 rpm
- c. 155.93 rpm
- d. 120.29 rpm

Correct Ans. **c**

Solution

Q.44


A single block brake with a torque capacity of 250 Nm is shown in figure. The brake drum rotates at 100 rpm and the friction coefficient is 0.35. The hinge-pin reaction for clockwise rotation of the drum is



- a. 2373.66 N

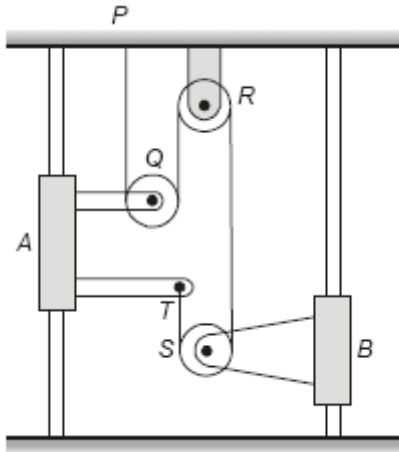
- b. ✓ 2589.53 N
- c. 3216.82 N
- d. 3728.88 N

Correct Ans. **b**

 Solution

Q.45

Collar A starts from rest and moves upward with constant acceleration. After 8 sec the relative velocity of collar B with respect to collar A is 2 m/s. The acceleration of A is



- a. ✓
0.167 m/s²
- b. 2.064 m/s²
- c. 1.028 m/s²
- d. 1.901 m/s²

Correct Ans. **a**


 Solution

Q.46

A pair of spur gears with gear ratio of 4 : 1 has pressure angle of 14.5. If the arc of approach is not to be less than the circular pitch, the addendum of the gear is

- a. ✓
 $\geq 0.278 P_c$
- b. $\leq 0.215 P_c$
- c. $\geq 0.318 P_c$
- d. $\leq 0.297 P_c$

Correct Ans. **a**

 Solution

Q.47

A 5 m long and 3.5 cm diameter steel rod is connected by two grips and maintained at a temperature of 90°C. If the temperature falls to 30°C and the ends yield by 1.2 mm, the stress induced in the rod is
(Take $E = 2.1 \times 10^5 \text{ N/mm}^2$ and $\alpha = 12 \times 10^{-6}/^\circ\text{C}$)

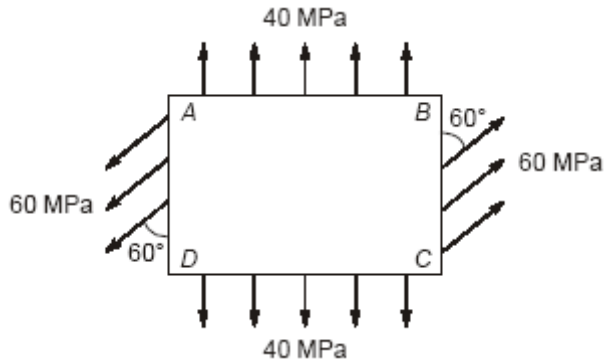
- a. 115.1 MPa
- b. 130.5 MPa
- c. 121.3 MPa
- d. ✓ 100.8 MPa

Correct Ans. **d**

Solution

Q.48

A point in a strained material is subjected to stresses as shown. The ratio of maximum and minimum principal stresses at the point is approximately



- a. 3
- b. 4
- c. 5
- d. 6

Correct Ans. **c**

Solution

Q.49

The gas neon has a molecular weight of 20.183 and its critical temperature, pressure and volume are 44.5 K, 2.73 MPa, and 0.0416 m³/kg-mol. Reading from the compressibility chart for a reduced pressure of 2 and a reduced temperature of 1.3, the compressibility factor is 0.7. Find the corresponding reduced volume.

- a. 1.21
- b. 1.48
- c. 1.76
- d. 1.92

Correct Ans. **b**

Solution

Q.50

The area enclosed by the curve $\sqrt{x} + \sqrt{y} = \sqrt{3}$ and the positive coordinate axes is

- a. 1 unit²
- b. 1.5 unit²
- c. 2 unit²
- d. 3 unit²

Correct Ans. **b**

Solution


Q.51

If the real part of the analytic function $f(z)$ is $\log\sqrt{x^2 + y^2}$, then the function $f(z)$ will be

- a. $\log z + C$
- b. $e^z + C$

c. $\frac{1}{\log z} + C$
d. $\log z + z + C$


Correct Ans. a

 Solution

Q.52

Heat is generated in a 3 cm diameter spherical radioactive material uniformly at a rate of 15 W/cm³. Heat is dissipated to the surrounding medium at 25° C with a heat transfer coefficient of 120 W/m²-K. The surface temperature of the material in steady operation is _____°C.


Correct Ans. 650 (645 - 655)

 Solution

Q.53

A shaft having a diameter of 50 mm rotates centrally in a journal bearing having a diameter of 50.15 mm and length 100 mm. The angular space between the shaft and the bearing is filled with oil having viscosity of 0.9 poise. The power absorbed in the bearing, when the speed of rotation is 600 rpm, is _____W.

Correct Ans. 46.496 (46 - 47)

 Solution

Q.54

The average drag coefficient for turbulent boundary layer flow past a thin plate is given by:

$$C_d = \frac{0.455}{[\log_{10} Re_x]^{2.58}}$$

where Re_x is Reynold number based on plate length. A plate 50 cm wide and 5 m long is kept parallel to the flow of water with free stream velocity 3 m/s. The drag force on both sides of the plate is _____ N. [Take kinematic viscosity of water as 0.01 stokes]

Correct Ans. 63.45 (63 - 64)

 Solution

Q.55

A 30 cm diameter spherical container used for storing liquid nitrogen (boiling point = 90 K) is insulated by enclosing it concentrically within another sphere of 45 cm diameter. The intervening space between 2 spheres is completely evacuated and both spheres have surface emissivity 0.3. The magnitude of the radiant heat flow between two spheres if outer container is at 300 K is _____W.

(Given: Stiffen Boltzmann constant, $\sigma = 5.67 \times 10^{-8}$)


Correct Ans. 29.5 (28 - 31)

 Solution

Q.56

In a constant pressure open cycle gas turbine air enters at 1 bar and 25°C and leaves the compressor at 5 bar. If temperature of gases entering the turbine = 660°C, pressure loss in combustion chamber = 0.01 bar, $\eta_{comp.} = 83\%$, $\eta_{turbine} = 80\%$, $\gamma = 1.4$ and $c_p = 1.024$ kJ/kgK for air and gas, the back work ratio of the cycle is _____.

Correct Ans. | 0.7626 (0.74 - 0.80) |

 Solution

Q.57

Following data are given for a steam power plant

Maximum demand = 22000 kW

Load factor = 40%

Boiler efficiency = 85%


Turbine efficiency = 90%

Coal consumption = 0.88 kg/unit

Price of coal = ₹ 270 per tonne

The coal bill per annum for the steam power plant is _____ crores

Correct Ans. | 2.3943 (2.25 - 2.55) |

 Solution

Q.58

A wire has a mass $(0.4 \pm 0.003)\text{g}$, radius $(0.5 \pm 0.004)\text{ mm}$ and length $(5 \pm 0.05)\text{ cm}$. The difference between maximum and minimum density is _____ (g/cm^3) .

Correct Ans. | 0.6827 (0.65 - 0.72) |

 Solution

Q.59

Saturated air at 2°C is required to be supplied to a room where the temperature must be held at 20°C with relative humidity of 50%. The air is heated and then water is sprayed to give the required humidity. The mass of spray of water required per m^3 of air at room conditions is _____ gm moisture/ m^3 .

(Take: the total pressure constant at 101.3 kPa)

$[P_{\text{saturation}}]_{2^\circ\text{C}} = 0.7156\text{ kPa}$; $R_{\text{air}} = 0.287\text{ kJ/kgK}$; $[P_{\text{saturation}}]_{20^\circ\text{C}} = 2.239\text{ kPa}$

Correct Ans. | 3.012 (3 - 4) |

 Solution

Q.60

Consider the following transportation matrix

	10		4		22		14
		27					
	13		9		10		23
				17		11	
	5		16		6		18
15							9

Transportation cost (In hundreds)

Allocation

In the above matrix, an insignificant number ϵ should be allocated in the cell having the transportation cost ₹ _____.

Correct Ans. | 900 |

 Solution

Q.61

Consider the single server queuing model with Poisson arrivals ($\lambda = 4/\text{hr}$) and exponential service ($\mu = 4/\text{hr}$). The number in the system is restricted to a maximum of 10. The probability that a person comes in leaves without joining the queue is _____.

	<p>Correct Ans. 0.090 (0.89 - 0.91)</p> <p>Solution</p>
Q.62	<p>In ORS the tool angle are:</p> <p>Inclination angle, $i = 0^\circ$, Orthogonal rake, $\alpha = 6^\circ$, Principal cutting edge angle, $\lambda = 76^\circ$ then the back rake angle is _____ degree.</p> <p>Correct Ans. 1.456 (1.44 - 1.47)</p> <p>Solution</p>
Q.63	<p>An ideal diesel engine has a diameter of 15 cm and stroke 20 cm. The clearance volume is 10% of the swept volume. If cut off takes place at 6% of the stroke. The standard efficiency of the engine is _____%.</p> <p>Correct Ans. 57.53 (57 - 58)</p> <p>Solution</p>
Q.64	<p>The rank of the matrix given below is _____.</p> $\begin{bmatrix} 1 & 3 & 2 & 5 & 1 \\ 2 & 2 & -1 & 6 & 3 \\ 1 & 1 & 2 & 3 & -1 \\ 0 & 2 & 5 & 2 & -3 \end{bmatrix}$ <p>Correct Ans. 3</p> <p>Solution</p>
Q.65	<p>Consider the following differential equation:</p> $x^2 \frac{d^2 y}{dx^2} - 4x \frac{dy}{dx} + 6y = 0$ <p>If $y(1) = 2$ and $y'(1) = 5$, then the value of $y''(1)$ will be _____.</p> <p>Correct Ans. 8</p> <p>Solution</p>

