Solution Report For Mini Gate Exam 2018 CBT-1(ME)

Q. No	Question Status
Q.1	**Select the word that is most SIMILAR in meaning to the bold word in capital letters.** **COMMISERATE** a. ✔ Sympathy b. Placate c. Commemorate d. Consecrate
	Correct Ans. a — Solution
Q.2	**Select the word that is FARTHEST in meaning to the bold word in capital letters.** **CAPACIOUS** a. Changeable b. Foolish c. Caring d. ✔ Limited
	Correct Ans. d — Solution
Q.3	**Choose the correct statement** a. The United States was an allay of Great Britain in two world wars. b. ✔ The United States was an ally of Great Britain in two world wars. c. The United States was an alley of Great Britain in two world wars. d. None of these
	Correct Ans. b — Solution
Q.4	**Which of the following term is wrong in the given series?** **G4T, J10R, M20P, P43N S90L** a. G4T b. ✔ J10R c. M20P d. P43N
	Correct Ans. b — Solution
Q.5	**A 4 cm cube is cut into 1 cm cubes. The percentage increase in the surface area due to cutting is _____ %.**

Correct Ans. 300 | Solution

Q.6

Choose the correct pair of words to form a meaningful sentence:
The priest and the lad reached _____ early morning and saw that the place was occupied by both _____ and infantry, waiting for the orders of the serior command about when to press forward.

a. ✔ Calvary and Cavalry
b. Cavalry and Cavalry
c. Calvary and Calvary
d. Cavalry and Calvary

Correct Ans. a | Solution

Q.7

In a right angle triangle ABC, the perpendicular sides are *a* and *b*. The maximum possible area of square that can be inscribed when one of the vertex of square coincide with vertex of right angle triangle, is

a. $\frac{a^3+b^3}{a+b}$
b. $\frac{1}{2}\left(\frac{ab}{a+b}\right)^2$
c. $\frac{1}{2}(a^2+b^2)$
d. ✔ $\left(\frac{ab}{a+b}\right)^2$

Correct Ans. d | Solution

Q.8

The 288^{th} term of the series
a, b, b, c, c, c, d, d, d, d, ...

a. *u*
b. *v*
c. *w*
d. ✔ *x*

Correct Ans. d | Solution

Q.9

The difference between CI and SI for 3 years at 10% per annum was ₹93. Then principal was

a. ✔ 3000
b. 3333
c. 3330
d. 3030

Correct Ans. a

Solution

Q.10

What is the remainder when 7^{342} is divided by 9?

Correct Ans. 1

Solution

Q.11

If the velocity distribution over a plate is given by $u = \frac{2}{3}y - y^2$ in which u is the velocity in metre per second at a distance y metre above the plate. Determine the shear stress at y = 0.15 m. Take dynamic viscosity of fluid as 8.63 Poise.

a. 0.5756 N/m^2

b. ✔ 0.3167 N/m^2

c. 0.2367 N/m^2

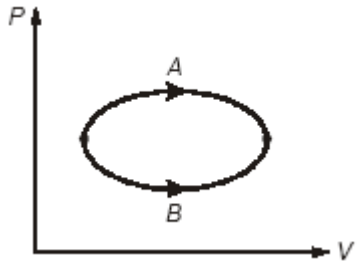
d. 0.1126 N/m^2

Correct Ans. b

Solution

Q.12

Consider a PV diagram shown below. Let ΔU_1 and ΔU_2 be the changes in internal energy of the system in the processes *A* and *B* respectively. Then



a. $\Delta U_1 > \Delta U_2$

b. $\Delta U_1 < \Delta U_2$

c. $\Delta U_1 \neq \Delta U_2$

d. ✔ $\Delta U_1 = \Delta U_2$

Correct Ans. d

Solution

Q.13

A block of mass m_A kept on an inclined surface just begins to slide if the inclination is 32°. If another block of mass m_B begins to slide for θ = 39°, then

a. $m_A > m_B$

b. $m_A < m_B$

c. $m_A = m_B$

d. ✔ All the three are possible

Correct Ans. d Solution

Q.14 **Sorbite is the product of:**

a. Case hardening
b. ✔ High temperature tempering
c. Medium temperature tempering
d. Low temperature tempering

Correct Ans. b Solution

Q.15 **A cold storage is to be maintained at –5°C while the surroundings are at 35°C. The heat leakage from the surroundings into the cold storage is estimated to be 29 kW. The actual COP of the refrigeration plant is onethird that of an ideal plant working between same temperature. The power is required to run the plant, is**

a. ✔ 13 kW
b. 19 kW
c. 17 kW
d. 21 kW

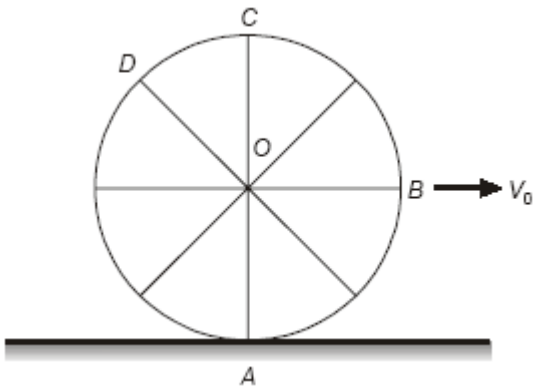
Correct Ans. a Solution

Q.16 **When a bar is heated, and it is left to expand freely. Which of the following stress is induced in the bar?**

a. Thermal Stress
b. Tensile Stress
c. Compressive Stress
d. ✔ No stress is induced

Correct Ans. d Solution

Q.17 **A bicycle is rolling on a horizontal road with a linear speed V_0 as shown. The wrong statement is**



a. the speed of point *A* is zero
b. the speed of point *C* is $2V_0$
c. ✔ the speed of point *B*, and point *O* are equal
d. the speed of point *B* is greater than the speed of point *O*

Correct Ans. | c | Solution

Q.18 **The length of connecting rod is three times the length of crank. What is the ratio of maximum value of primary force to secondary force for a reciprocating engine?**

a. 2
b. 4
c. 1
d. ✔ 3

Correct Ans. | d | Solution

Q.19 **A solid shaft of diameter *d*, length *L* is fixed at both ends. A torque T_0 is applied at a distance $\frac{L}{4}$ from left end. The maximum shear stress in shaft is**

a. $\frac{16T_0}{\pi d^3}$
b. ✔ $\frac{12T_0}{\pi d^3}$
c. $\frac{8T_0}{\pi d^3}$
d. $\frac{4T_0}{\pi d^3}$

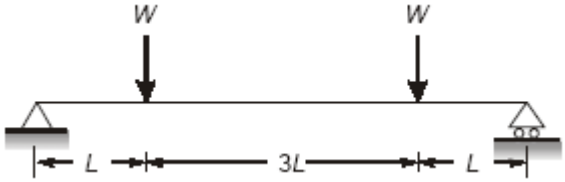
Correct Ans. | b | Solution

Q.20 **Expected life of a roller bearing is 1500 hours when subjected to a load of 9840 N and working at 1200 rpm. If the bearing is subjected to a similar load of 1230 N while working at 3600 rpm, the expected life of the same bearing is**

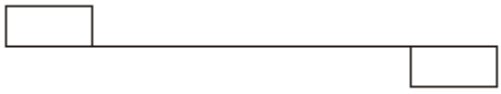
a. 128000 hours
b. 256000 hours
c. ✔ 512000 hours
d. 768000 hours

Correct Ans. | c | Solution

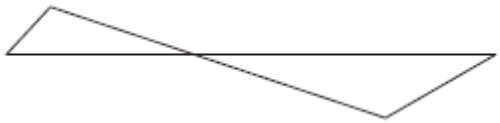
Q.21 **Which of the following represents the correct SFD for the following loaded beam?**



a. ✔



b.



c.

d.

Correct Ans. a | Solution

Q.22 **If the coefficient of velocity and the discharge coefficient are 0.98 and 0.84 respectively. Then the contraction coefficient of an orifice is**

a. ✔ 0.8571
b. 0.8232
c. 0.9232
d. 0.8416

Correct Ans. a | Solution

Q.23 **Inter cooling in gas turbines:**

a. Decreases net output but increases thermal efficiency
b. ✔ Increases net output but decreases thermal efficiency
c. Decreases both net output and thermal efficiency
d. Increases both net output and thermal efficiency

Correct Ans. b | Solution

Q.24 **The value of** $\oint_C \frac{(4-3z)}{z(z-1)}\frac{dz}{(z-2)}$, **where *C* is the ellipse** $4x^2 + y^2 = 9$, **will be**

a. 0
b. ✔ $2\pi i$
c. $-2\pi i$
d. $2\pi(i + 1.5)$

Correct Ans. b | Solution

Q.25

A vector field $\vec{F}$ is given by $\vec{F} = \sin y\hat{i} + x(a + \cos y)\hat{j}$. The value of integral $\oint_C \vec{F} \cdot \overrightarrow{dr}$, where *C* is the circular path given by $x^2 + y^2 = a^2$, is

a. $\frac{4}{3}\pi a^3$

b. ✔ πa^3

c. πa^2

d. $\frac{1}{3}\pi a^3$

Correct Ans. b | Solution

Q.26 The filament of a 90 W bulb may be considered a black body radiating into a black enclosure at 60°C. If filament diameter is 0.1 mm and length is 50 mm, the filament temperature is _____°C.

Correct Ans. 2897.65 (2890 - 2905) | Solution

Q.27 A cube of ice floats partly in water and oil. The ratio of the ice immersed in water to that of oil if the density of oil, ice and water are 800 kg/m^3, 900 kg/m^3 and 1000 kg/m^3 respectively, is _____.

Correct Ans. 1 | Solution

Q.28 Two alternative methods can produce a product. First method has a fixed cost of ₹3000 and variable cot of ₹30 piece. The second method has fixed cost of ₹2000 piece and a variable cost of ₹40. The break even quantity between the two alternatives is _____ units.

Correct Ans. 100 | Solution

Q.29 For a M/M/1 : ∞/FCFS queue, the mean arrival rate is equal to 10 per hour and the mean service rate is 15 per hour. The expected queue length is _____.

Correct Ans. 1.33 (1.31 - 1.35) | Solution

Q.30 In a forging operation, the initial and final diameter of blank is 270 mm and 410 mm, then the value of true strain is _____.

Correct Ans. 0.835 (0.82 - 0.85) | Solution

Q.31

A rolling mill has a roll diameter of 200 mm. If coefficient of friction is 0.12, then the maximum possible reduction during rolling of a 250 mm thick plate is _____.

Correct Ans. 1.44 (1.42 - 1.46)

Solution

Q.32

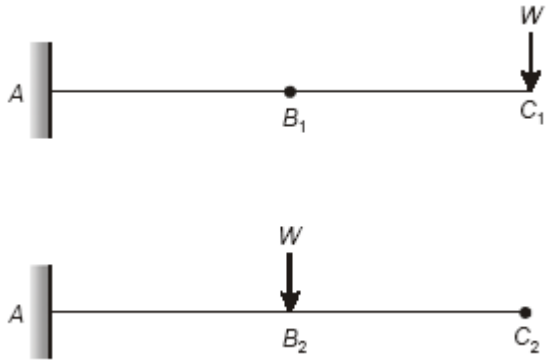
The force required to be exerted by the punched in order to shear out the blank 28 mm diameter from a 1.6 mm thick disk and having shear strength equal to 250 MPa, will be _____ kN.

Correct Ans. 35.185 (34.83 - 35.54)

Solution

Q.33

Consider the two cases of a cantilever beam



So, the ratio of deflection at point B_1 due to load at C_1 to the deflection of point C_2 due to load at B_2 is _____.

Correct Ans. 1

Solution

Q.34

Consider the 3 × 3 matrix given below:

$$A = \begin{bmatrix} 2 & -1 & 1 \\ -1 & 2 & -1 \\ 1 & -1 & 2 \end{bmatrix}$$

If the eigen vector corresponding to one of the eigen values is $[-1 \quad 1 \quad 2]^T$, then the sum of the remaining eigen values will be _____.

Correct Ans. 5

Solution

Q.35

For special security in a certain protected area, it was decided to put three light bulbs on a pole. If each bulb is burning out in the first 100 hours of service with a probability of 0.3, then the probability that atleast one of them is still good after 100 hours of service is _____.

Correct Ans. 0.973 (0.95 - 0.99)

Solution

Q.36

A rigid insulated tank contains 0.8 kg of air at 120 kPa and 22°C. A paddle wheel inside the tank is rotated by an external power source until the temperature rises to 60°C. If the ambient temperature is 22°C. What is the exergy destroyed in the process?

a. ✔ 20.53 kJ
b. 28.74 kJ
c. 25.25 kJ
d. 15.23 kJ

Correct Ans. a | Solution

Q.37

A cast steel slab of dimension 30 × 20 × 5 cm is poured horizontally using a side riser. The riser is cylindrical in shape with diameter and height both equal to 12 cm. The freezing ratio of the mould is

a. ✔ 1.134
b. 3.012
c. 2.034
d. 1.412

Correct Ans. a | Solution

Q.38

The water is flowing through a taper pipe of length 100 m having diameters 600 mm at the upper end and 300 mm at the lower end, at the rate of 50 litres/seconds. The pipe has a slope of 1 in 30. Find the pressure at the lower end if the pressure at the higher end is 19.62 N/cm^2.

a. 21.623 N/cm^2
b. ✔ 22.867 N/cm^2
c. 24.621 N/cm^2
d. 27.128 N/cm^2

Correct Ans. b | Solution

Q.39

A bolt is subjected to an axial pull of 8 kN together with a transverse shear force of 4 kN. If elastic limit in tension is 225 MPa, factor of safety = 3 and Poisson's ratio = 0.3, the diameter of the bolt on the basis of maximum principal strain theory is

a. 11.11 mm
b. ✔ 13.13 mm
c. 15.15 mm
d. 17.17 mm

Correct Ans. b | Solution

Q.40

If the extension of a bar due to suddenly applied load P is 1.7 mm. If cross-sectional area and length of the bar are 11 cm^2 and 3.1 m respectively, the value of P is (Take $E = 2 \times 10^5$ N/mm^2)

a. 30.16 kN

b. ✔ 60.32 kN
c. 90.48 kN
d. 120.64 kN

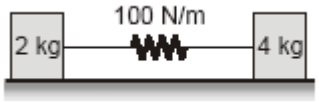
Correct Ans. | b | Solution

Q.41 **A point load of 250 kN acts on a rectangular column of width 180 mm and thickness 140 mm at an eccentricity of 10 mm. The ratio of magnitude of maximum and minimum stress on the section is**

a. ✔ 2
b. 3
c. 4
d. 5

Correct Ans. | a | Solution

Q.42 **The spring shown in figure is kept in a stretched position with extension x_0 when the system is released. Assuming the horizontal surface to be frictionless, what is the frequency of oscillation?**



a. 3.80 Hz
b. ✔ 1.38 Hz
c. 2.20 Hz
d. 4.08 Hz

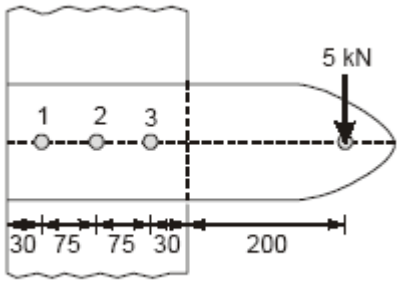
Correct Ans. | b | Solution

Q.43 **Each of the two gears in a mesh has 48 teeth and a module of 8 mm. The teeth are of 20° involute profile. The arc of contact is 2.25 times the circular pitch. What will be the addendum?**

a. 12.4 mm
b. 20.6 mm
c. ✔ 10.6 mm
d. 5.3 mm

Correct Ans. | c | Solution

Q.44 **A steel plate subjected to a force 5 kN and fixed to a channel by means of three identical bolts as shown in figure. The bolts are made up of plain carbon steel (S_{yt} = 380 N/mm^2) and the factor of safety is 3. Then the core diameter of the bolts is _____ mm (use MSST)**

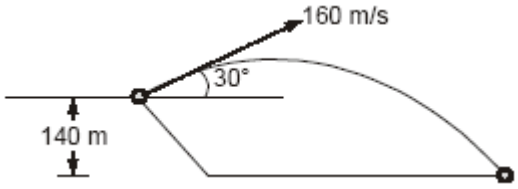


All dimensions are in mm

a. ✔ 15.42 mm
b. 12.02 mm
c. 10.81 mm
d. 18.20 mm

Correct Ans. a | Solution

Q.45 **A Gun is fired from the edge of a 140 m cliff with an initial velocity of 160 m/s at an angle of 30° with the horizontal. Neglecting air resistance, the greatest elevation above the ground reached by the projectile is**



a. 326.5 m
b. 366.5 m
c. 426.5 m
d. ✔ 466.2 m

Correct Ans. d | Solution

Q.46 **The ratio of height of Porter governor (sleeve of mass =18 kg) and that of Watt Governor both having balls of mass 3 kg each when lengths of the links and the arms are the same is**

a. 4
b. 5
c. 6
d. ✔ 7

Correct Ans. d | Solution

Q.47 **A metallic bar of length 40 cm, breadth 4 cm and depth 2 cm is subjected to an axial compressive load of 0.4 MN. If the decrease in length is 0.1 cm and increase in breadth is 0.003 cm, the modulus of rigidity is**

a. ✔ 76.92 GPa
b. 89.02 GPa
c. 52.80 GPa
d. 25.98 GPa

Correct Ans. | a | Solution

Q.48

Mean coil diameter, wire diameter and no. of turns of a closely coiled steel spring are D, d and N respectively and spring stiffness is *k*. A second spring is made of the same steel but with wire diameter, mean coil diameter and no. of turns as 2D, 2 d and 2 N respectively. The stiffness of the new spring is

a. ✔ k
b. 2k
c. 4k
d. 8k

Correct Ans. | a | Solution

Q.49

0.5 kg of air is compressed reversibly and adiabatically from 80 kPa, 60°C to 0.4 MPa and is then expanded at constant pressure to the original volume. Which of the following is net work transfer for whole process?
[Take γ = 1.4]

a. 163.2 kJ
b. 69.6 kJ
c. ✔ 93.6 kJ
d. 233.3 kJ

Correct Ans. | c | Solution

Q.50

A 3 × 3 matrix is given by

$$A = \begin{bmatrix} 1 & 0 & -1 \\ 1 & 2 & 1 \\ 2 & 2 & 3 \end{bmatrix}$$

Another matrix *B* is defined by $B = A^3 + A^2 + A + I$

The determinant of matrix B is

a. 59
b. 259
c. 794
d. ✔ 2400

Correct Ans. | d | Solution

Q.51

The integrating factor of the differential equation $x\cos x\frac{dy}{dx} - xy\sin x = -y\cos x + x$ **is**

a. ✔ $x\cos x$
b. $\cos x$
c. $\frac{1}{\cos x}$

d. $\frac{1}{x \cos x}$

Correct Ans. a | Solution

Q.52 A flat plate has thickness 5 cm, thermal conductivity 1 W/mK, convective heat transfer coefficients on its two flat faces of 10 W/m^{2}K and 20 Wm^{2}K. The overall heat transfer coefficient for such a flat plate is _____ W/m^{2}K.

Correct Ans. 5 | Solution

Q.53 A gate of trapezoidal shape is 16 m wide at the top and 10 m wide at bottom and is 6 m deep. The centre of pressure distance from the free surface of liquid if the top of gate just touches the liquid surface is _____ m.

Correct Ans. 3.833 (3.7 - 3.9) | Solution

Q.54 A pipe of diameter 300 mm and length 3500 m is used for the transmission of power by water. The total head at the inlet of pipe is 500 m. The maximum power in kW available at the outlet of the pipe, if the value of co-efficient of friction is 0.006 is _____ kW.

Correct Ans. 789.7 (785 - 795) | Solution

Q.55 Very large diameter steel discs of 1.2 cm thickness are quenched from 600°C to 150°C by submerging them in an oil reservoir held at 30°C. The average heat transfer coefficient for both faces of steel plates is 450 W/m^{2}K. The quench time for steel plates is _____ sec.

(Given: density of steel plates = 7800 kg/m^3, specific heat of steel = 470 J/kgK)

Correct Ans. 76.16 (72 - 80) | Solution

Q.56 In an open cycle regenerative gas turbine plant, air enters the adiabatic compressor at 1.1 bar absolute 27°C and leaves at 7 bar absolute. If temperature at the end of combustion chamber is 825°C, the work ratio is _____.

Correct Ans. 0.536 (0.52 - 0.56) | Solution

Q.57 A simple vapour refrigeration cycle works between pressure of 30 bar (T_{sat} = 234°C) and 0.04 bar (T_{sat} = 29°C), the initial condition of steam being dry saturated.

P bar	T_{sat} (°C)	s_f (kJ/kgK)	s_g (kJ/kgK)	C_{p_v} (kJ/kgK)
30	234	2.646	6.187	2.758
0.04	29	0.423	8.475	—

The maximum temperature of the cycle is _____°C.

Correct Ans. 889.23 (880 - 900) Solution

Q.58 A side and face cutter with 180 mm diameter has 12 teeth. It operates at a speed of 12 m/min with a table transverse of 80 mm/min. The feed per tooth of the cutter is _____ mm/tooth.

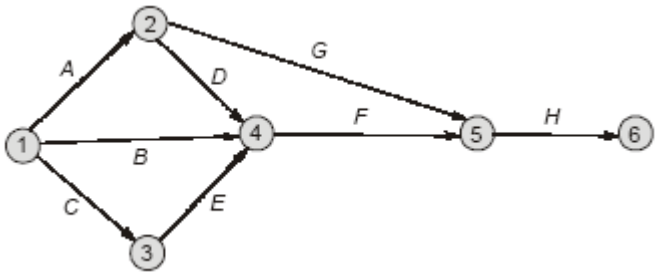
Correct Ans. 0.314 (0.30 - 0.33) Solution

Q.59 A refrigerator operating on standard vapour compression cycle has a *COP* of 5.5 and is driven by 40 kW compressor. Saturated liquid and saturated vapour enthalpies at condensing temperature of 30°C are 69.55 kJ/kg and 202.45 kJ/kg respectively. Saturated vapour leaving the evaporator has an enthalpy of 187.53 kJ/kg. The refrigerant temperature at compressor discharge is _____ °C.

[Take c_p of the vapour refrigerant = 0.6155 kJ/kg-K]

Correct Ans. 40.61 (40 - 41) Solution

Q.60 Consider the following PERT network:



The optimistic time, pessimistic time and most likely time of all the activities are given in the table below:

Activity	Optimistic Time	Pessimistic Time	Most Likely Time
A	1	5	3
B	2	4	3
C	3	5	4
D	2	10	9
E	4	6	5
F	5	13	6
G	2	6	4
H	0	6	3

The critical path duration of the network is _____days.

Correct Ans. 21 Solution

Q.61 For a particular product the following information is given:

Selling cost per unit : ₹ 200

Variable cost per unit : ₹ 150

Fixed cost : ₹ 4000000

Due to inflation the variable cost have increased by 12% while fixed costs have increased by 4%. If the break even quantity remains constant, the percentage increase in sales price would be _____%.

Correct Ans. 10 | Solution

Q.62

In an electro-machining process, following conditions are given:

ρ_3 = 7Ω cm, ΔV = 12 V, I = 500A, tool gap = 0.5 mm, Atomic weight = 56, valency = 2, ρ = 7.6 g/cm^3. The material removal rate is _____ cm^3/s.

Correct Ans. 0.01908 (0.018 - 0.020) | Solution

Q.63

A diesel engine working on a dual combustion cycle has a compression ratio of 15 : 1. The engine draws air at 1 bar and 27°C and the maximum pressure in the cylinder is limited to 55 bar. If heat transfer at constant volume is twice that at constant pressure. The cut off ratio for the cycle is _____.

Take C_v = 0.718 kJ/kgK; C_p = 1.005 kJ/kgK and γ = 1.4.

Correct Ans. 1.0695 (1.05 - 1.10) | Solution

Q.64

A quadrilateral is cut out from an ellipse such that its corners are the points where ellipse cuts the co-ordinate axis. The equation of ellipse is given as $x^2 + 9y^2 = 36$. The ratio of area of ellipse to area of remaining portion of ellipse after the quadrilateral is cut out, is _____.

Correct Ans. 2.75 (2.60 - 2.90) | Solution

Q.65

The missing terms in the table representing a cubic polynomial are found using Newton forward difference interpolation.

x	0	5	10	15	20	25
y	6	10	a	17	b	31

The value of *"b"* is _____ .

Correct Ans. 22.50 (22 - 23) | Solution