APSEd

GATE 2020

Afternoon Solutions

E-LEARNING PLATFORM FOR
CIVIL ENGINEERING

APS
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GATE 2020 Afternoon Questions

(Solutions follows after the questions)

Q.1) Partial: impartial :: popular : ?

[A] Dispopular

[B] Impopular

[C] Unpopular

[D] Mispopular

Q.2) Replace the underlined word:
Now a days, most children have a tendency to belittle the legitimate concern of their parents

[A] Reduce

[B] Disparage

Q.3) Rescue teams deployed _____ disaster hit areas combat _____ a lot of difficulties to save the people.

[A] in, with

[B] to, to

[C] with, with

[D] with, of

Q.4) If $f(x) = x^2$, what is the value of following function?

$$\frac{f(f(f(x)))}{f(x)}$$

[A] $[f(x)]^4$

[B] $[f(x)]^3$

[C] $[f(x)]^2$

[D] $[f(x)]$

Q.5) What is the ratio of sum of odd positive integers from 1 to 100 to the sum of even positive integers from 150 to 200 ?

[A] 1/1

[B] 50/91

[C] 45/95

[D] 1/2

Q.6) 2019 calendar will be same as that of?

[A] 2011

[B] 2012

[C] 2013

[D] 2014

Q.7) Soil deposit formed due to transportation by wind is termed as

[A] Aeolian

[B] Lacustrine

[C] Alluvial

[D] Estuarine

Q.8) Muskingum method is used for?

[A] Hydraulic River Routing

[B] Hydrological Channel Routing

[C] Hydraulic Channel Routing

[D] Hydrological River Routing

Q.9) Traffic starts discharging from an intersection with the signal turning green. The constant headway from the 4th/5th headway position is known as ?

[A] Intersection headway

[B] Saturation headway

[C] Discharge headway

[D] Effective headway

Q.10) 24 hour traffic count on Tuesday, July is 1000 vehicles. If daily adjustment factor is 1.121 and monthly adjustment factor for July is 0.913, AADT is?

Answer: _____

Q.11) A soil has dry unit weight of 15.5 kN/m3 specific gravity of 2.65 and degree of saturation of 72%. Considering the unit weight of water as 10 kN/m^3, the water content of the soil is___? (in %)

Answer: _____

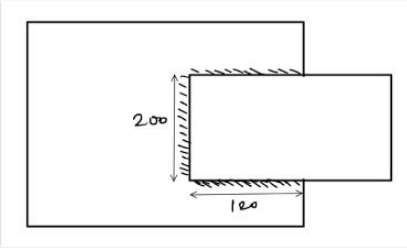
Q.12) One dimensional consolidation test is carried out on a standard 19 mm thick clay sample. The oedometers deflection gauge indicates a reading of 2.1 mm, just before removal of the load, without allowing any swelling. The void ratio is 0.62 at this stage. The initial void ratio of the standard specimen is _____ .

Answer: _____

Q.13) A constant head permeability test was performed at hydraulic gradient of 2.5. The saturated soil has water content 20% and specific gravity 2.65. If permeability of soil in 0.1 cm/s. Determine the seepage velocity (in cm/s)

Answer: _____

Q.14) If the size of weld is 6 mm and the weld material is done in shop and structural steel is of grade Fe 410. Find the strength of weld in kN as per the recommendations of IS 800:2007?



Answer: _____

Q.15) The maximum applied load on a cylindrical concrete specimen of diameter 150 mm and length 300 mm tested as per the split tensile strength test guidelines of I.S 5816:1999 is 157 kN. The split tensile strength (in MPa) of the specimen is

Answer: _____

Q.16) The ion product of water (PKw) is 14. If a rain water sample has a pH of 5.6, the concentration of OH– in the sample (in 10^{-9} mol/litre) is

Answer: _____

Q.17) A cast iron pipe of diameter 600 mm and length 400 m carries water from a tank and discharge freely into air at a point 4.5 m below the water surface in the tank. The friction factor of the pipe is 0.018. Consider acceleration due to gravity as 9.81 m/s^2. The velocity of flow in pipe (in m/s) is

Answer: _____

Q.18) A hydraulic jump occurs in a triangular (V-shaped) channel with side slopes 1:1 (V:H). The sequent depths are 0.5 m and 1.5 m. The flow rate (in m^3/s) in the channel is

Answer: _____

Q.19) An unbiased coin is tossed for 15 times. What is the probability to get exactly 8 heads?

Answer: _____

Q.20) A triangular direct runoff hydrograph due to a storm has a time base of 90 hours. The peak flow of $60m^3/s$ occurs at 20 hours from the start of the storm. The area of catchment is 300 km^2. The rainfall excess of the storm (in cm) is

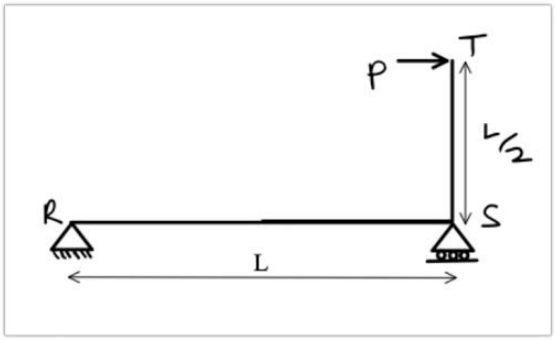
[A] 2

[B] 3.24

[C] 5.4

[D] 6.48

Q.21) For the structure shown below, find angle of rotation at support R.



[A] $PL^2/12EI$

[B] $PL^2/8EI$

[C] $PL^2/16EI$

[D] $PL^2/4EI$

Q.22) 500 gm dry sand was placed in a 2L volume container filled with water. It displaces 188 cm^3 of water volume. Considering the density of water as 1 g/cm^3. Find the specific gravity of the sand sample.

Answer: _____

Q.23) For the hottest month of the year at the proposed airport site, the monthly mean of the average daily temperature is 39°C. The monthly mean of the maximum daily temperature is 48°C for the same month of the year. From the given information, the calculated airport reference temperature (in °C) is

[A] 36

[B] 48

[C] 39

[D] 42

Q.24)

	A		B
P	Soundness test	1	Strength
Q	Crushing test	2	Weathering resistance
R	Los Angeles abrasion test	3	Adhesion
S	Stripping value test	4	Hardness

[A] P2 Q1 R4 S3

[B] P1 Q2 R4 S3

[C] P2 Q1 R3 S4

[D] P1 Q2 R3 S4

Q.25) The design speed of a two-lane two-way road is 60 km/h and the longitudinal coefficient of friction is 0.36. The reaction time of a driver is 2.5 sec. Consider acceleration due to gravity as 9.8 m/s^2. The intermediate sight distance (in m) required for the road is _____ .

Answer: _____

Q.26) Find the vehicle damage factor of a vehicle with an axle load of 15 tonnes when the standard axle load is 8 tonnes.

Answer: _____

Q.27) In canal cross drainage work, super-passage is a structure in which:

[A] Natural streamflow under pressure below the canal.

[B] Natural streamflow with the free surface below the canal.

[C] Canal water flows under pressure below the natural stream.

[D] Canal water flows with the free surface below the natural stream

Q.28) As per is 456:2000, the pH value of water concrete mix should not be less than

[A] 4.5

[B] 6

[C] 5.5

[D] 5.5

Q.29)

For a matrix P

$$P = \begin{bmatrix} 0 & 1 & 3 & 0 \\ -2 & 3 & 0 & 4 \\ 0 & 0 & 6 & 1 \\ 0 & 0 & 1 & 6 \end{bmatrix}$$

Eigen values will be

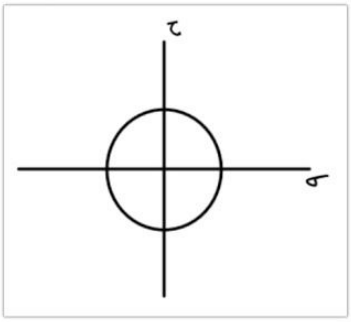
[A] 1,2,3,4

[B] 1,2,5,7

[C] 3,4,5,7

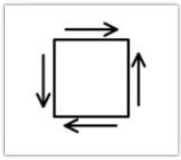
[D] 0,3,6,6

Q.30)

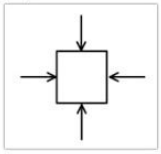


The state of stress is given as

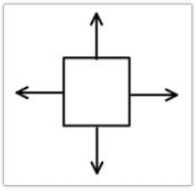
[A]



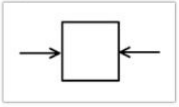
[B]



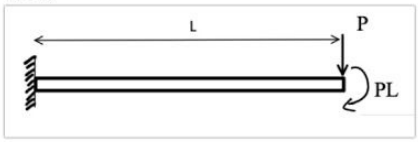
[C]



[D]



Q.31)



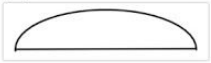
The shear force diagram for the above beam will be

[A]

[B]

[C]

[D]



Q.32) A theodolite is set up a station A. The RL of instrument axis is 212.250 m. The angle of elevation to the top of a 4 m long staff, held vertical at station B is 7°. The horizontal distance between stations A and B is 400 m. Neglecting the errors due to the curvature of earth and refraction, the RL of station B is _____

Answer: _____

Find limitQ.33)

$$\lim_{x \to \infty} \frac{\sqrt{9x^2 + 2020}}{x + 7}$$

Answer: _____

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Answers

Afternoon

Q.1)C Q.2)B Q.3)A Q.4)B Q.5)B Q.6)C Q.7)A Q.8)B Q.9)B Q.10)1023 to 1024 Q.11)19.2 to 19.4 Q.12)0.81 to 0.83 Q.13)0.72 to 0.73 Q.14)412 to 415 Q.15)2.20 to 2.24 Q.16)3.97 to 3.99 Q.17)2.69 to 2.73 Q.18)1.72 to 1.74 Q.19)0.195 to 0.197 Q.20)B Q.21)A Q.22)2.58 to 2.70 Q.23)D

Q.24)A Q.25)161 to 163 Q.26)12.36 Q.27)D Q.28)B Q.29)B Q.30)A Q.31)A Q.32)257 to 258

Q.33)3

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Explanations

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Q.1) Explanation:

Multiple Choice Type Question: ** Explanation Not Available **

Q.2) Explanation:

belittle means dismiss (someone or something) as unimportant.

Q.3) Explanation:

Multiple Choice Type Question: ** Explanation Not Available **

Q.4) Explanation:

$$\frac{f(f(f(x)))}{f(x)} = \frac{x^{2^{2^2}}}{x^2} = x^6$$

=> $[f(x)]^3 = (x^2)^3 = x^6$

Q.5) Explanation:

S = n/2[a+l] = 50/2 * [1+99] = 2500 (For odd positive integers 1 to 100)

S = n/2[a+l] = 26/2 * [150+200] = 4550 (For even positive integers 150 to 200)

Ratio => 2500/4550 => 50/91

Q.6) Explanation:

2018 - 1 odd day

2017 - 1 odd day

2016 - 2 odd days

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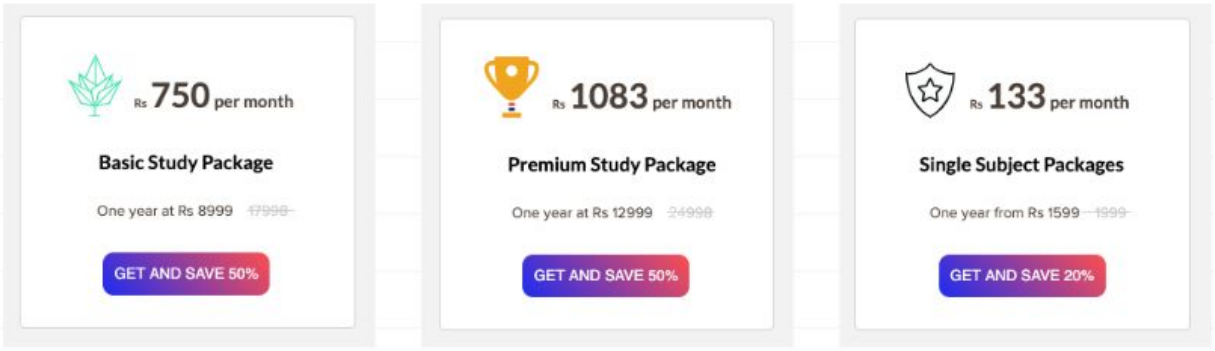

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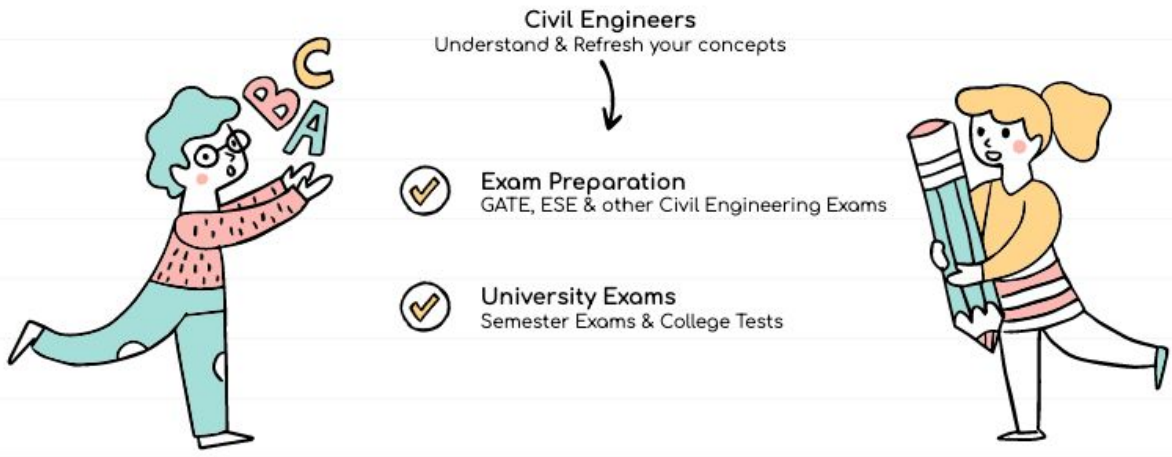


Q.12) Explanation:

$$\frac{\Delta H}{H_f} = \frac{\Delta e}{1+e_f} = \frac{e_i - e_f}{1+e_f}$$

$$\frac{2.1}{19-2.1} = \frac{e_i - 0.62}{1+0.62}$$

$$e_i = 0.821$$

Q.13) Explanation:

$Se = wG$

$1 \times e = 0.2 \times 2.65$

$e = 0.53$

$n = \frac{e}{1+e} = 0.346$

$V = ki$

$= 0.1 \times 2.5$

$= 0.25$ cm/s

seepage velocity

$= \frac{v}{n}$

$= 0.7225$ cm/s

Q.14) Explanation:

Strength of weld

$= \frac{f_{uw}}{\sqrt{3} \times 1.25} \times L \times t$

$= \frac{410}{\sqrt{3} \times 1.25} \times 520 \times 0.7 \times 6$

$= 413.58$ kN

Q.15) Explanation:

Split tensile strength

$= \frac{2P}{\pi LD} = \frac{2 \times 157 \times 1000}{\pi \times 300 \times 150}$

$= 2.22$ MPa

Q.16) Explanation:

$pOH = 14 - 5.6$

$= 8.4$

$-\log [OH^-] = 8.4$

$OH^- = 3.98 \times 10^{-9}$ moles/l

Q.17) Explanation:

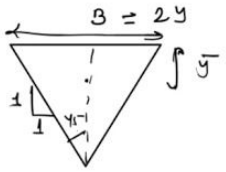
$h_f = \frac{fLv^2}{2gD}$

$4.5 = \frac{0.018 \times 400 \times v^2}{2 \times 9.81 \times 0.6}$

$v = 2.71$ m/s

Q.18) Explanation:

Specific force $= A\bar{y} + \frac{Q^2}{gA}$



$A_1\bar{y}_1 + \frac{Q^2}{gA_1} = A_2\bar{y}_2 + \frac{Q^2}{gA_2}$

$\frac{1}{2} \times B \times y_1 \times \frac{y_1}{3} + \frac{Q^2}{g \times \frac{1}{2} B y_1} = \frac{1}{2} B y_2 \times \frac{y_2}{3} + \frac{Q^2}{g \times \frac{1}{2} B y_2}$

$\frac{1}{2} \times 2 \times 0.5 \times 0.5 \times \frac{0.5}{3} + \frac{Q^2}{9.81 \times \frac{1}{2} \times 2 \times 0.5 \times 0.5}$

$= \frac{1}{2} \times 1.5 \times 2 \times 1.5 \times \frac{1.5}{3} + \frac{Q^2}{9.81 \times \frac{1}{2} \times 2 \times 1.5 \times 1.5}$

$0.0416 + 0.4077 Q^2 = 1.125 + 0.045 Q^2$

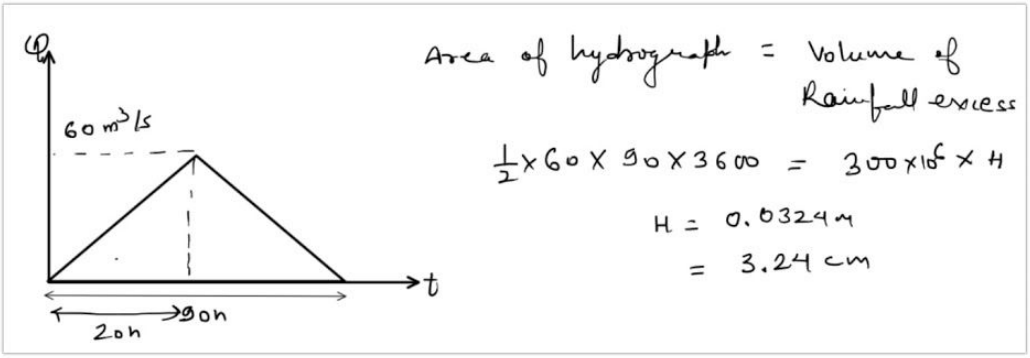
$Q = 1.728$ m³/s

Q.19) Explanation:

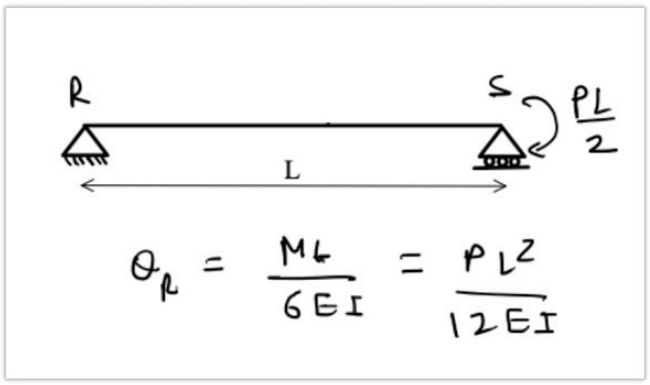
$$P(X = x) = {}^{n}C_x p^x q^{n-x}$$

$$P(X = 8) = {}^{15}C_8 . (0.5)^8 (0.5)^{15-8}$$
$$= 0.1964$$

Q.20) Explanation:



Q.21) Explanation:



Q.22) Explanation:

G = ρsolids/ρwater

= 500gm/188cm3/1 gm/cm3

=2.659

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Q.23) Explanation:

$$\text{Airport Reference Temp. } T_r = T_a + \frac{(T_m - T_a)}{3}$$

T_a = Average temp. of the hottest month

T_m = Monthly mean of max. daily temp of the same month

$$\text{Airport Reference Temp. } T_r = 39 + \frac{48-39}{3} = 42C$$

Q.24) Explanation:

Multiple Choice Type Question: ** Explanation Not Available **

Q.25) Explanation:

$$2 \text{ lane } 2 \text{ way road} \implies ISD = 2SSD$$

$$SSD = vt + \frac{v^2}{2gf} = 16.67 \times 2 + \frac{16.67^2}{2 \times 9.81 \times 0.36} = 81m$$

$$ISD = 2 \times 81 = 162m$$

Q.26) Explanation:

VDF = (axle load/standard load)^4

=12.36

Q.27) Explanation:

Multiple Choice Type Question: ** Explanation Not Available **

Q.28) Explanation:

Multiple Choice Type Question: ** Explanation Not Available **

Q.29) Explanation:

The product of eigenvalues = Determinant

$\lambda1\lambda2\lambda3\lambda4 = 70$

Summation

$\lambda1+\lambda2+\lambda3+\lambda4 = 0+3+6+6 = 15$

Checking the options

Option B satisfies both the conditions.

Q.30) Explanation:

In the Mohr circle, both the principal stresses are of equal magnitude and opposite sign which happens in the case of pure shear.

Q.31) Explanation:

As there is only one load at the free end the shear force will remain constant over the whole span.

Q.32) Explanation:

$$tan\ 7^0 = \frac{PQ}{400}$$

$$RL_B = 212.250 + 400.tan\ 7^0 - 4$$

$$RL_B = 257.36m$$

Q.33) Explanation:

$$\lim_{x\to\infty} \frac{\sqrt{9x^2+2020}}{x+7}$$

$$Let\ y = \frac{1}{x^2}\ \&\ y1 = \frac{1}{x}$$

$$\Longrightarrow \lim_{y,y1\to 0} \frac{\sqrt{9+2020y}}{y1+y}$$

$$\Longrightarrow \sqrt{9} = 3$$

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