



## Uttar Pradesh Power Corporation Limited

Participant ID:	
Participant Name:	
Test Center Name:	ION Digital Zone
Test Date:	31/12/2018
Test Time:	9:00 AM - 12:00 PM
Subject:	Civil Engineering

### Note

A. This is the provisional answer sheet. After considering all the complaints and suggestions, the final answer script will be released by 14 January 2019.

B. The correct answer key is mentioned with the sign (✓). Candidate's response is mentioned as the 'Chosen Option' on the right.

Section : CE (1 Mark)

Q.1 Consider the following sentence:

Bleeding in a bituminous mix refers to the appearance of excess bitumen on the surface over a period of time on account of \_\_\_\_\_ in the mix.

Identify the CORRECT option from among those given below to fill in the blank in the above sentence.

Ans  A.

seepage of water through the road surface displacing the bitumen

- B. action of traffic load and subgrade upthrust.
- C. action of traffic load and there being inadequate voids
- D. action of traffic load and there being excess voids

Question ID : 2449921246

Status : Answered

Chosen Option : 1

Q.2

A canal with rectangular cross-section of width  $b$  is carrying an uniform flow of depth  $h$ . For this canal, if Chezy's coefficient is  $C$  and Manning's roughness coefficient is  $n$ , the product ' $Cn$ ' is

Ans given by

- A.  $(2b + h)^{2/3}$
- B.  $(b + 2h)^{2/3}$
- C.  $(b + 2h)^{1/6}$
- D.  $(2b + h)^{1/6}$

Question ID : 2449921243

Status : Answered

Chosen Option : 3

Q.3

In the context of provisions for design of mixes and acceptance of concrete in Indian Standards, consider the following statements:

- Statement – 1:** For a M25 grade concrete, if it is expected that the standard deviation in strength will be 4MPa, the target mean strength for the design of the mix should be taken as 31.5 MPa  
**Statement – 2:** The sample of three specimens should be rejected if the difference between the maximum and the minimum strength obtained (from the three specimens) is more than 3.5MPa

Which of the following is CORRECT?

- Ans  A. Both statements are FALSE  
 B. Statement – 1 is TRUE and Statement – 2 is FALSE  
 C. Both statements are TRUE  
 D. Statement – 1 is FALSE and Statement – 2 is TRUE

Question ID : 2449921225  
 Status : Answered  
 Chosen Option : 2

Q.4 The dimensions of a rectangular primary sedimentation tank is, length = 30 m; breadth = 10 m and depth = 3 m. If the flow rate through the tank is  $0.1 \text{ m}^3/\text{s}$ , the surface overflow rate (SOR) of the tank is \_\_\_\_\_.

- Ans  A.  $14.4 \text{ m}^3/\text{m}^2/\text{d}$   
 B.  $28.8 \text{ m}^3/\text{m}^2/\text{d}$   
 C.  $9.6 \text{ m}^3/\text{m}^2/\text{d}$   
 D.  $21.6 \text{ m}^3/\text{m}^2/\text{d}$

Question ID : 2449921235  
 Status : Answered  
 Chosen Option : 2

Q.5 Euler critical buckling load for a prismatic column of length  $L$ , flexural rigidity  $EI$ , hinged at both ends is \_\_\_\_\_:

- Ans  A.  $\frac{2\pi^2 EI}{L^2}$   
 B.  $\frac{4\pi^2 EI}{L^2}$   
 C.  $\frac{\pi^2 EI}{4L^2}$   
 D.  $\frac{\pi^2 EI}{L^2}$

Question ID : 2449921202  
 Status : Answered  
 Chosen Option : 4

Q.6 The point of contraflexure in a beam is that location where \_\_\_\_\_:

- Ans  A. the shear force changes sign

- B. the deflection changes sign
- C. the slope of the elastic curve changes sign
- D. the bending moment changes sign

Question ID : 2449921207  
Status : Answered  
Chosen Option : 4

Q.7 What is the main reason for providing an equalization tank in the sewage treatment plant?

- Ans  A. Damping the hourly variation in the sewage flow
- B. Damping of the daily variations in the sewage flow
- C. Aeration of the sewage
- D. Proper mixing the sewage before further treatment

Question ID : 2449921237  
Status : Answered  
Chosen Option : 4

Q.8 For laminar flow through a circular pipe, the ratio of maximum velocity to the average velocity is

- \_\_\_\_\_.
- Ans  A. 2.0
- B. 2.5
- C. 1.5
- D. 1.25

Question ID : 2449921238  
Status : Answered  
Chosen Option : 1

Q.9 In fall cone test, the depth of cone penetration corresponding to the liquid limit of any soil is \_\_\_\_\_.

- Ans  A. 25 mm
- B. 30 mm
- C. 10 mm
- D. 20 mm

Question ID : 2449921230  
Status : Not Answered  
Chosen Option : --

Q.10 The primary mode of force transmission in HSFGB bolts is \_\_\_\_\_:

- Ans  A. friction
- B. shearing
- C. bearing
- D. tension

Question ID : 2449921211

Q.1  
1 In the context of the Marshall test, consider the following statements.

- Statement – 1:** Stability of the mix is the maximum load which the bituminous mix can sustain.  
**Statement – 2:** Flow of the mix is defined as the deformation at maximum load.

Which of the following is CORRECT?

- Ans  A. Compressive strength using a cylinder.  
 B. Flexural strength using a beam  
 C. Compressive strength using a cube  
 D. Tensile strength using a cylinder

Question ID : 2449921247

Status : Answered

Chosen Option : 2

Q.1  
2 Reynold's number for flow through a pipe with a rectangular cross-section (width  $w$ , and height  $h$ ) flowing full with fluid (of mass density  $\rho$  and dynamic viscosity  $\mu$ ) at a flow rate of  $Q$  is expressed as \_\_\_\_\_.

- Ans  A.  $\frac{2\rho Qwh}{\mu(w+h)}$   
 B.  $\frac{2\rho Q}{\mu(w+h)}$   
 C.  $\frac{2\rho Q}{\mu wh}$   
 D.  $\frac{4\rho Q}{\mu(w+h)}$

Question ID : 2449921242

Status : Answered

Chosen Option : 3

Q.1  
3 At an internal hinge \_\_\_\_\_ :

- Ans  A. slope is always discontinuous  
 B. deflection is always discontinuous  
 C. bending moment is always discontinuous  
 D. shear force is always discontinuous

Question ID : 2449921208

Status : Answered

Chosen Option : 4

Q.1  
4 Under-reinforced concrete beams fail due to \_\_\_\_\_ :

- Ans  A. crushing of concrete  
 B. ductile failure of reinforcing bars

- C. tensile failure of concrete
- D. bond failure of reinforcing bars

Question ID : 2449921214  
 Status : Answered  
 Chosen Option : 2

Q.1  
 5 Consider the following two statements:

**Statement I:** In a statically determinate structure, influence line diagrams for internal forces are always composed of straight line segments.

**Statement II:** Müller-Breslau's principle is not applicable for statically indeterminate structures.

Which of the following is CORRECT?

- Ans  A. Statement I is true, but Statement II is false
- B. Both Statement I and Statement II are true
- C. Both Statement I and Statement II are false
- D. Statement I is false, but Statement II is true

Question ID : 2449921209  
 Status : Answered  
 Chosen Option : 1

Q.1  
 6 Balancing of sights means that:

- Ans  A. the horizontal angles in the face left and face right conditions of theodolite should be same.
- B. the distances corresponding to the fore sight and back sight in differential leveling should be equal.
- C. the stadia intercepts corresponding to the upper and lower cross hairs with respect to the middle cross hairs in tacheometry should be equal.
- D. the error of the loop closure in traverse adjustment should be zero.

Question ID : 2449921250  
 Status : Answered  
 Chosen Option : 2

Q.1  
 7 Pressuremeter test is used for the determination of \_\_\_\_\_.

- Ans  A. Poisson's ratio
- B. shear modulus
- C. bulk modulus
- D. Young's modulus

Question ID : 2449921229  
 Status : Answered  
 Chosen Option : 3

Q.1 The term 'alternate depth' is used in open channel flow to denote the paired flow depths \_\_\_\_\_.

8

- Ans
- A. having the same kinetic energy for a given discharge
  - B. having the same specific force for a given discharge
  - C. having the same Froude number
  - D. having the same specific energy for a given discharge

Question ID : 2449921240

Status : Answered

Chosen Option : 4

Q.1

9

In the context of testing of cements in the laboratory, consider the following statements:

**Statement – 1:** The Blaine method of determination of fineness is based on evaluation of the heat of hydration during the hydration process.

**Statement – 2:** The determination of initial and final setting times is based on change in penetration resistance over time due to continued hydration.

Which of the following is CORRECT?

- Ans
- A. Both statements are FALSE
  - B. Both statements are TRUE
  - C. Statement – 1 is FALSE and Statement – 2 is TRUE
  - D. Statement – 1 is TRUE and Statement – 2 is FALSE

Question ID : 2449921221

Status : Answered

Chosen Option : 3

Q.2

0

In the context of provisions given in IS 456:2000, consider the following statements:

**Statement – 1:** The modulus of concrete,  $E_c$ , may be estimated using the equation  $E_c = 500 (f_{ck})^{0.5}$ , where  $f_{ck}$  is the characteristic strength of the concrete

**Statement – 2:** The minimum grade of concrete that can be used in reinforced concrete construction is M15.

Which of the following is CORRECT?

- Ans
- A. Statement – 1 is TRUE and Statement – 2 is FALSE
  - B. Both statements are FALSE
  - C. Statement – 1 is FALSE and Statement – 2 is TRUE
  - D. Both statements are TRUE

Question ID : 2449921224

Status : Answered

Chosen Option : 2

Q.2

1

In plastic bending of beams, the shape factor of a section is the ratio of \_\_\_\_\_ :

- Ans
- A. yield rotation to ultimate rotation
  - B. yield moment to plastic moment
  - C. elastic modulus to plastic modulus
  - D. plastic moment to yield moment

Question ID : 2449921215

Status : Answered

Q.2  
2 In a PERT formulation, the Optimistic, Most likely and the Pessimistic times for the completion of an activity in a project are known to be 6, 12 and 24 weeks.

Which of the following statements is TRUE?

Ans  A.

The Expected time (in weeks) of completion of the activity, and the standard deviation (in weeks) 12 and 3, respectively.

B.

The Expected time (in weeks) of completion of the activity, and the standard deviation (in weeks) 13 and 4, respectively.

C.

The Expected time (in weeks) of completion of the activity, and the standard deviation (in weeks) 12 and 4, respectively.

D.

The Expected time (in weeks) of completion of the activity, and the standard deviation (in weeks) 13 and 3, respectively.

Question ID : 2449921226

Status : Answered

Chosen Option : 4

Q.2  
3 Which of the following methods is NOT used for the control establishment in Surveying?

Ans  A. Triangulation

B. Traversing

C. Trilateration

D. Plane tabling

Question ID : 2449921248

Status : Not Answered

Chosen Option : --

Q.2  
4 A distance of 270 m is to be taped with an error of not more than  $\pm 0.15$  m. Determine how accurately each 30 m length should be measured to ensure that the error in the above taped distance will not exceed the permissible limit.

Ans  A. 0.15 m

B. 0.05 m

C. 0.20 m

D. 0.25 m

Question ID : 2449921249

Status : Answered

Chosen Option : 2

Q.2  
5 Piezometric head is \_\_\_\_\_.

Ans  A. the sum of pressure head and velocity head

B. the sum of pressure head, datum head and velocity head

C. the sum of datum head and velocity head

D. the sum of pressure head and datum head

Question ID : 2449921239

Status : Answered

Chosen Option : 4

Q.2  
6 Name two air pollutants that are both found more in the exhaust of diesel vehicles than in the exhaust of petrol vehicles.

- Ans
- A. NO, CO
  - B. PM, CO
  - C. CO, HC
  - D. NO, PM

Question ID : 2449921233

Status : Not Answered

Chosen Option : --

Q.2  
7 Creep strains in concrete structures are usually \_\_\_\_\_ :

- Ans
- A. independent of loads
  - B. caused by wind loads
  - C. caused by earthquake loads
  - D. caused by sustained loads

Question ID : 2449921219

Status : Answered

Chosen Option : 4

Q.2  
8 Which one of the following of soil types is responsible for negative skin friction in piles?

- Ans
- A. Overconsolidated clay
  - B. Dense sand
  - C. Soft clay
  - D. Stiff clay

Question ID : 2449921232

Status : Answered

Chosen Option : 3

Q.2  
9 In a Standard Penetration Test, at every 0.15 m penetration the recorded blow counts were 8, 10 and 7. Determine the N value for 60% energy efficiency.

- Ans
- A. 10
  - B. 15
  - C. 28
  - D. 42

Question ID : 2449921228

Status : Answered

Chosen Option : 2

Q.3  
0 Determine the equivalent hydraulic conductivity of a soil layer having the average vertical and horizontal hydraulic conductivities are  $1 \times 10^{-5}$  cm/s and  $2 \times 10^{-4}$  cm/s, respectively.

- Ans
- A.  $3.5 \times 10^{-5}$  cm/s
  - B.  $4.5 \times 10^{-5}$  cm/s
  - C.  $1.5 \times 10^{-4}$  cm/s
  - D.  $3.5 \times 10^{-4}$  cm/s

Question ID : 2449921231  
Status : Answered  
Chosen Option : 2

Q.3  
1 The maximum value possible for Poisson's ratio is \_\_\_\_\_ :

- Ans
- A. 0.0
  - B. 1.0
  - C. 0.5
  - D. 0.25

Question ID : 2449921204  
Status : Answered  
Chosen Option : 3

Q.3  
2 In the context of using bitumen in road construction, consider the following statements.

- Statement – 1:** Penetration grade bitumen is obtained by dissolving bitumen in a solvent.  
**Statement – 2:** A bitumen emulsion is a suspension of bitumen globules in water.

Which of the following is CORRECT?

- Ans
- A. Statement – 1 is TRUE and Statement – 2 is FALSE
  - B. Both statements are FALSE
  - C. Statement – 1 is FALSE and Statement – 2 is TRUE
  - D. Both statements are TRUE

Question ID : 2449921245  
Status : Answered  
Chosen Option : 2

Q.3  
3 In a beam, the bending moment is maximum at the point where the shear force \_\_\_\_\_ :

- Ans
- A. changes sign
  - B. is minimum
  - C. half the total load on the beam
  - D. is maximum

Question ID : 2449921201  
Status : Answered  
Chosen Option : 1

Q.3  
4

In the context of planning and scheduling of activities in project management, consider the following statements:

**Statement – 1:** In the PERT formulation, the completion time of activities is assumed to follow a Gamma distribution

**Statement – 2:** The 'forward pass' gives an estimate of the earliest time when an activity can be started.

Which of the following is CORRECT?

- Ans  A. Statement – 1 is TRUE and Statement – 2 is FALSE  
 B. Both statements are TRUE  
 C. Both statements are FALSE  
 D. Statement – 1 is FALSE and Statement – 2 is TRUE

Question ID : 2449921223

Status : Answered

Chosen Option : 3

Q.3  
5 In the context of air entrainment in fresh concrete, consider the following statements:

**Statement – 1:** Air entrainment is required in cases when concrete is likely to be subjected to alkali aggregate reaction.

**Statement – 2:** Air entrainment has the effect of increasing the workability of concrete at the same unit water content.

Which of the following is CORRECT?

- Ans  A. Statement – 1 is TRUE and Statement – 2 is FALSE  
 B. Both statements are FALSE  
 C. Both statements are TRUE  
 D. Statement – 1 is FALSE and Statement – 2 is TRUE

Question ID : 2449921222

Status : Answered

Chosen Option : 3

Q.3  
6 A catchment has an area of 100 hectares (1 hectare = 10000 m<sup>2</sup>) and runoff coefficient of 0.4. Due to a 5 cm rainfall event over the catchment, the stream flow at the outlet lasts for 10 h. What is the value of average streamflow (in m<sup>3</sup>/hour) at the outlet of the catchment for this event?

- Ans  A. 2000  
 B. 4000  
 C. 400  
 D. 1000

Question ID : 2449921241

Status : Answered

Chosen Option : 1

Q.3  
7 Consider the following two statements:

**Statement I:** A semi-compact section cannot reach yield stress.

**Statement II:** A semi-compact section cannot develop plastic moment of resistance.

Which of the following is CORRECT?

- Ans  A. Statement I is true, but Statement II is false  
 B. Both Statement I and Statement II are false

- C. Both Statement I and Statement II are true  
 D. Statement I is false, but Statement II is true

Question ID : 2449921217  
 Status : Answered  
 Chosen Option : 4

Q.3  
 8 For limit state of collapse, as per IS456:2000, the partial safety factor for material strength of steel is \_\_\_\_\_:

- Ans  A. 1.15  
 B. 0.87  
 C. 1.0  
 D. 1.5

Question ID : 2449921213  
 Status : Answered  
 Chosen Option : 1

Q.3  
 9 The absolute maximum bending moment in a prismatic cantilever beam of length  $L$  under a uniformly distributed load of  $w$  per unit length is \_\_\_\_\_:

- Ans  A.  $\frac{wL^2}{2}$   
 B.  $wL^2$   
 C.  $\frac{wL^2}{4}$   
 D.  $\frac{wL^2}{8}$

Question ID : 2449921205  
 Status : Answered  
 Chosen Option : 1

Q.4  
 0 According to IS456:2000, the flexural tensile strength of concrete is \_\_\_\_\_:

- Ans  A. directly proportional to characteristic compressive strength  
 B. inversely proportional to the square root of characteristic compressive strength  
 C. directly proportional to the square root of characteristic compressive strength  
 D. inversely proportional to characteristic compressive strength

Question ID : 2449921212  
 Status : Answered  
 Chosen Option : 3

Q.4  
 1 The moment distribution method for structural analysis is \_\_\_\_\_:

- Ans  A. both force and displacement based method

- B. a displacement based method  
 C. a force based method  
 D. neither force nor displacement based method

Question ID : 2449921203  
Status : Answered  
Chosen Option : 2

Q.4  
2 The COD/BOD<sub>5</sub> ratio of two wastewater samples from different sources was measured as 1.5 and 3.0 respectively. Based on this information the following conclusion may be arrived at.

Ans  A.

The sample with higher COD/BOD<sub>5</sub> ratio has more organic matter

B.

The sample with lower COD/BOD<sub>5</sub> ratio has higher percentage of biodegradable organic matter

C.

The sample with lower COD/BOD<sub>5</sub> ratio is from an industrial source

D.

The sample with higher COD/BOD<sub>5</sub> ratio is a sample of domestic sewage

Question ID : 2449921234  
Status : Answered  
Chosen Option : 2

Q.4  
3 Loss in pre-stress due to friction occurs \_\_\_\_\_ :

Ans  A. only in post-tensioned beams

B. in neither pre-tensioned nor post-tensioned beams

C. only in pre-tensioned beams

D. in both pre-tensioned and post-tensioned beams

Question ID : 2449921216  
Status : Answered  
Chosen Option : 1

Q.4  
4 Raw domestic sewage mostly contains the following forms of nitrogen:

Ans  A. Organic-N, Nitrite-N

B. Organic-N, Ammonia-N

C. Ammonia-N, Nitrate-N

D. Nitrate-N, Nitrite-N

Question ID : 2449921236  
Status : Not Answered  
Chosen Option : --

Q.4  
5 If DL denotes dead load and EL denotes earthquake load, then the value of the load factor  $\alpha$  in the load combination  $\alpha DL + 1.5 EL$  used in structural design is \_\_\_\_\_ :

Ans  A. 1.0

B. 2.0

C. 0.9

D. 1.2

Question ID : 2449921210  
Status : Answered  
Chosen Option : 2

Q.4 Consider the following statements in the context of properties of bitumen.

6

**Statement – 1:** The softening point of bitumen is the time taken by the balls in the ring-and-ball apparatus to touch the lower plate of the apparatus.

**Statement – 2:** Oxidation leads to softening of the bitumen.

Which of the following is CORRECT?

Ans  A. Statement – 1 is TRUE and Statement – 2 is FALSE

B. Both statements are FALSE

C. Both statements are TRUE

D. Statement – 1 is FALSE and Statement – 2 is TRUE

Question ID : 2449921244  
Status : Answered  
Chosen Option : 2

Q.4 In the context of use of OPC and other cementitious materials used in concrete, consider the following statements:

7

**Statement – 1:** Bogue's equations are used to determine amounts of oxides of calcium, silicon, etc. in a given cement as the amounts of  $C_3S$ ,  $C_2S$ ,  $C_3A$  and  $C_4AF$  are known

**Statement – 2:** Particles of both OPC and flyash are spherical in shape.

Which of the following is CORRECT?

Ans  A. Both statements are TRUE

B. Statement – 1 is FALSE and Statement – 2 is TRUE

C. Statement – 1 is TRUE and Statement – 2 is FALSE

D. Both statements are FALSE

Question ID : 2449921220  
Status : Answered  
Chosen Option : 3

Q.4 The maximum deflection in a simply supported beam of length  $L$  and flexural rigidity  $EI$  under a concentrated load  $P$  acting at its mid-span is \_\_\_\_\_ :

8

Ans  A.  $\frac{PL^3}{3EI}$

B.  $\frac{PL^3}{48EI}$

C.  $\frac{PL^3}{16EI}$

D.  $\frac{PL^3}{8EI}$

Question ID : 2449921206

Status : Answered

Chosen Option : 2

Q.4 Assuming elastic load-deformation behavior of a soil, determine the at-rest earth pressure coefficient of the soil having Poisson's ratio 0.31.

Ans  A. 0.45

B. 0.50

C. 0.69

D. 0.33

Question ID : 2449921227

Status : Answered

Chosen Option : 1

Q.5 Consider the following two statements, in the context of a post-tensioned beam of fixed cross-section:

**Statement I:** Bursting tensile forces will affect the end zone reinforcement

**Statement II:** Bursting tensile forces increase with increase in the size of the bearing plate

Which of the following is CORRECT?

Ans  A. Both Statement I and Statement II are true

B. Statement I is false, but Statement II is true

C. Both Statement I and Statement II are false

D. Statement I is true, but Statement II is false

Question ID : 2449921218

Status : Answered

Chosen Option : 1

Section : CE (2 Mark)

Q.1 For a steel beam of rectangular cross-section, with 20 mm width and 60 mm depth, what are the yield and plastic moments, if  $f_y = 250 \text{ N/mm}^2$  ?

Ans  A. Yield moment = 3 kN-m, Plastic moment = 4.5 kN-m

B. Yield moment = 3 kN-m, Plastic moment = 2 kN-m

C. Yield moment = 4.5 kN-m, Plastic moment = 3 kN-m

D. Yield moment = 3 kN-m, Plastic moment = 6 kN-m

Question ID : 2449921256

Status : Answered

Chosen Option : 1

Q.2 Consider the variation of the stability value of a mix with increasing bitumen content.

Which of the following is CORRECT?

Ans  A.

Stability decreases with the bitumen content and then increases.

B. Stability monotonically increases with the bitumen content.

C.

Stability increases with the bitumen content and then decreases.

D. Stability monotonically decreases with the bitumen content.

Question ID : 2449921273

Status : Answered

Chosen Option : 3

Q.3 A laboratory sample of clay of 2 cm thick takes 14.6 min. to attain 45% consolidation under double drainage condition. Determine the required time to attain same degree of consolidation for the clay of 3 m thick under single drainage condition.

Ans  A. 1 year

B. 4 years

C. 3.5 years

D. 2.5 years

Question ID : 2449921266

Status : Answered

Chosen Option : 4

Q.4 The magnetic bearing of a line in an area was found to be  $N40^{\circ}30'W$  in 2015, when the magnetic declination was  $4^{\circ}15'W$ . What would be its present magnetic bearing if the magnetic declination is  $2^{\circ}W$ ?

Ans  A.  $N40^{\circ}30'W$

B.  $N42^{\circ}45'W$

C.  $S40^{\circ}30'E$

D.  $N40^{\circ}30'E$

Question ID : 2449921275

Status : Answered

Chosen Option : 2

Q.5 It is known that a concrete mix has  $180 \text{ kg/m}^3$  of water,  $315 \text{ kg/m}^3$  of cement,  $149 \text{ kg/m}^3$  of additional fines, and  $528 \text{ kg/m}^3$  of sand. What is the coarse aggregate content in  $\text{kg/m}^3$ , if the air content in the concrete is ignored?

Assume the specific gravities of cement, fines, sand and coarse aggregate to be 3.15, 2.98, 2.64 and 2.74, respectively.

Ans  A. 1288

B. 1488

C. 1188

D. 1388

Question ID : 2449921262

Status : Answered

Chosen Option : 1

Q.6

For a project, it is estimated that the quantity of concrete to be poured, reinforcement work and shuttering work will be  $500\text{m}^3$ , 5MT and  $250\text{m}^2$ , respectively. Further, it is estimated that the unit rates for these items will be INR 5000, INR 15000 and INR 4000, respectively. Now, it is proposed that the rates for reinforcement and shuttering work be included in the concrete rate itself. The composite unit rate for the concrete works should be taken as \_\_\_\_\_ per  $\text{m}^3$ .

- Ans
- A. 7050
  - B. 6950
  - C. 7150
  - D. 7250

Question ID : 2449921263  
 Status : Not Answered  
 Chosen Option : --

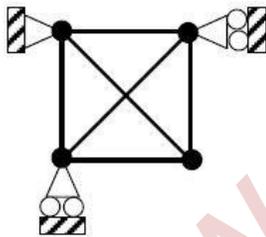
Q.7 Calculate the theoretical oxygen demand of methane ( $\text{CH}_4$ ) in  $\text{kg O}_2/\text{kg CH}_4$ .

Atomic weights: C=12; O=16; H=1.

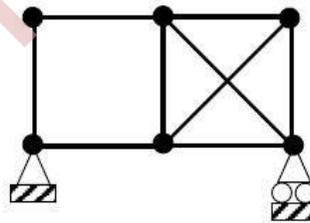
- Ans
- A. 4.0
  - B. 8.0
  - C. 2.0
  - D. 6.0

Question ID : 2449921267  
 Status : Answered  
 Chosen Option : 1

Q.8 Amongst the following two pin jointed trusses \_\_\_\_\_.



Truss I



Truss II

- Ans
- A. Truss I is stable, but Truss II is unstable
  - B. Both Truss I and Truss II are unstable
  - C. Both Truss I and Truss II are stable
  - D. Truss I is unstable, but Truss II is stable

Question ID : 2449921252  
 Status : Answered  
 Chosen Option : 3

Q.9 A vehicle is traveling at a speed of 60km per hour on a level road before brakes are applied by the driver upon seeing an obstacle to bring the vehicle to rest. If the coefficient of rolling friction and the perception reaction time are known to be 0.5 and 2.0seconds, respectively, the braking distance (in meters) is \_\_\_\_\_. (Take acceleration due to gravity to be  $9.8\text{m/s}^2$ , if required)

- Ans
- A. 33.3
  - B. 61.6

C. 28.3

D. 94.9

Question ID : 2449921274

Status : Answered

Chosen Option : 3

- Q.1  
0 A concrete beam of rectangular cross-section of 250 mm (width) by 500 mm (depth) is pre-stressed so that at a section the effective force is 250 kN at an eccentricity (along depth) of 50 mm. What is the maximum compressive stress in concrete in this section of the beam?

Ans  A. 3.2 N/mm<sup>2</sup>

B. 0.8 N/mm<sup>2</sup>

C. 2.0 N/mm<sup>2</sup>

D. 4.5 N/mm<sup>2</sup>

Question ID : 2449921255

Status : Answered

Chosen Option : 3

- Q.1  
1 An equipment that has an initial value of INR 6.5 lakhs and a service life of 5 years. Taking the salvage value of the equipment to be INR 50,000, which of the following statements is TRUE?

Ans  A.

For the 2<sup>nd</sup> year, the depreciation using the linear method is INR 1.6 lakhs, and, the depreciation using sum of years methods is INR 1.2 lakhs.

B.

For the 2<sup>nd</sup> year, the depreciation using both the linear method and the sum of years methods is INR 1.2 lakhs.

C.

For the 2<sup>nd</sup> year, the depreciation using both the linear method and the sum of years methods is INR 1.6 lakhs.

D.

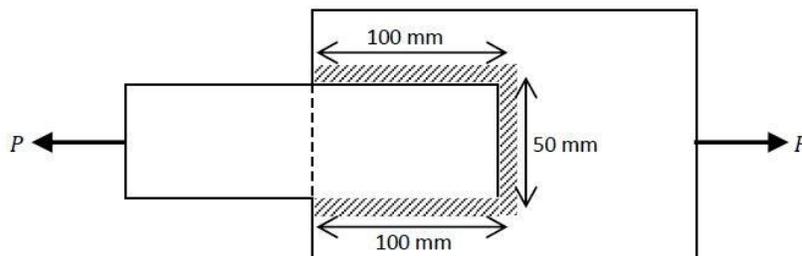
For the 2<sup>nd</sup> year, the depreciation using the linear method is INR 1.2 lakhs, and, the depreciation using sum of years methods is INR 1.6 lakhs.

Question ID : 2449921261

Status : Answered

Chosen Option : 4

- Q.1  
2 Consider the fillet welded joint shown in the figure. The welded surfaces meet at 60° – 90° (angle between fusion faces). The weld size is 8 mm and permissible stress in the weld is 110 MPa. What is the safe load  $P$  that can be transmitted by this welded joint, considering weld failure only?



Ans  A. 315 kN

B. 220 kN

C. 154 kN

D. 616 kN

Question ID : 2449921259

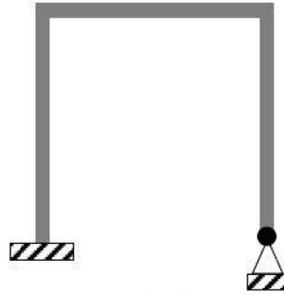
Status : Answered

Chosen Option : 3

Q.1  
3 The minimum numbers of plastic hinges necessary for the complete collapse of the following structures are \_\_\_\_\_.



BEAM



FRAME

Ans  A. 1 for beam, and 1 for frame

B. 3 for beam, and 3 for frame

C. 4 for beam, and 5 for frame

D. 2 for beam, and 2 for frame

Question ID : 2449921258

Status : Answered

Chosen Option : 2

Q.1  
4 The rainfall on two successive 6-hour periods is 2 cm and 4 cm. If the surface runoff resulting from this storm is 2.4 cm, calculate  $\phi$ -index for the storm (in mm/hour).

Ans  A. 2.4

B. 4.0

C. 3.6

D. 2

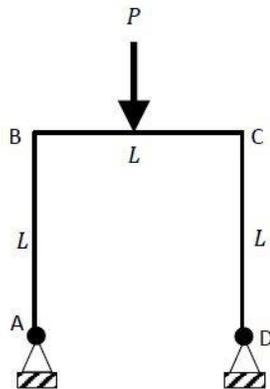
Question ID : 2449921271

Status : Answered

Chosen Option : 4

Q.1  
5

For the frame shown below: supports A and D are hinged, joints B and C are rigid joints. The beam BC is under a concentrated load  $P$  acting at mid-span of the beam. All members have the same length  $L$  and flexural rigidity  $EI$ .



Now consider the following two statements:

**Statement I:** Horizontal reactions at supports A and D are zero

**Statement II:** Vertical reactions at supports A and D are  $P/2$

Which of the following is CORRECT?

- Ans  A. Statement I is false, but Statement II is true  
 B. Both Statement I and Statement II are true  
 C. Both Statement I and Statement II are false  
 D. Statement I is true, but Statement II is false

Question ID : 2449921257

Status : Answered

Chosen Option : 2

Q.1  
6 In a two-dimensional problem, if the state of stress at a point indicates the principal stresses as  $\sigma_1 = 10 \text{ MPa}$  and  $\sigma_2 = 10 \text{ MPa}$ , then the maximum shear stress at that point is \_\_\_\_\_.

- Ans  A. 10 MPa  
 B. 15 MPa  
 C. 5 MPa  
 D. Zero

Question ID : 2449921251

Status : Answered

Chosen Option : 4

Q.1  
7 Concentration of  $\text{CHCl}_3$  in air was measured as  $0.4 \mu\text{g}/\text{m}^3$  at  $P = 1 \text{ atm}$ . and  $T = 293^\circ\text{K}$ .

Express the concentration in ppb(v) units.

Molar mass of  $\text{CHCl}_3$  (in g/mole): 119.5;  $R = 82.05 \times 10^{-6} \text{ mol}^{-1} \text{ m}^3 \text{ atm K}^{-1}$

- Ans  A. 0.04  
 B. 0.06  
 C. 0.02  
 D. 0.08

Question ID : 2449921269

Q.1  
8 A footing of size 4 m x 4 m carries a uniformly distributed load of 150 kN/m<sup>2</sup>. Compute the vertical pressure at a depth of 6 m below the footing using 2:1 method.

- Ans
- A. 24 kN/m<sup>2</sup>
  - B. 30 kN/m<sup>2</sup>
  - C. 32.5 kN/m<sup>2</sup>
  - D. 36 kN/m<sup>2</sup>

Question ID : 2449921264

Status : **Answered**

Chosen Option : 1

Q.1  
9 If the Na<sub>2</sub>O and K<sub>2</sub>O content in a given cement is 1.0% and 0.5%, the total alkali content in the cement in terms of Equivalent Na<sub>2</sub>O can be taken as \_\_\_\_\_.

- Ans
- A. 1.5%
  - B. 1.1%
  - C. 1.3%
  - D. 1.0%

Question ID : 2449921260

Status : **Answered**

Chosen Option : 1

Q.2  
0 A water tank has a square plan area of 3m x 3m and maximum depth of water as 6m. When the tank is ½ full, what is the force acting on one of the side wall (in kN)? Assume the density of water as 1000 kg/m<sup>3</sup> and gravitational acceleration as 10 m/sec<sup>2</sup>.

- Ans
- A. 135
  - B. 27
  - C. 45
  - D. 90

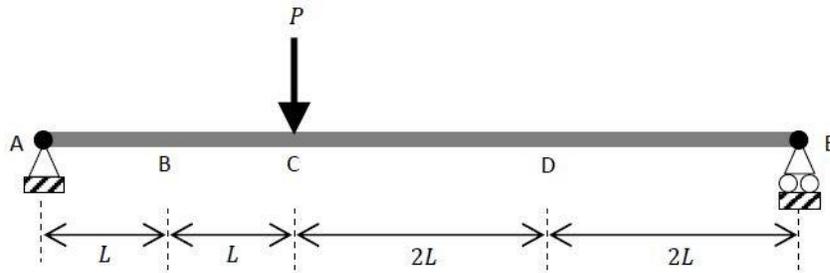
Question ID : 2449921270

Status : **Answered**

Chosen Option : 1

Q.2  
1

For the beam shown below, support A is hinge and E is roller. The beam has a constant  $EI$ . A concentrated load  $P$  acts on the beam at point C.



Now consider the following two statements:

**Statement I:** Bending moment reaches maximum at point C

**Statement II:** Slope reaches maximum at point A

Which of the following is CORRECT?

- Ans  A. Both Statement I and Statement II are true  
 B. Statement I is true, but Statement II is false  
 C. Statement I is false, but Statement II is true  
 D. Both Statement I and Statement II are false

Question ID : 2449921253

Status : Answered

Chosen Option : 1

Q.2  
2 The concentrations of major cations and anions (in mM) in a river water sample are as follows,  
 $\text{Na}^+ : 0.23; \text{Mg}^{2+} : 0.15; \text{Ca}^{2+} = 0.33; \text{K}^+ : 0.03; \text{Cl}^- : 0.16; \text{SO}_4^{2-} : 0.07; \text{HCO}_3^- : 0.86$ . Calculate the total hardness (in mg/L  $\text{CaCO}_3$ )

- Ans  A. 72  
 B. 96  
 C. 48  
 D. 24

Question ID : 2449921268

Status : Answered

Chosen Option : 4

Q.2  
3 What is the equation of streamlines in a 2-dimensional flow if the velocity components are given by  $u = 2y, v = 4x$  ?

- Ans  A.  $6xy = \text{constant}$   
 B.  $y^2 - 2x^2 = \text{constant}$   
 C.  $2xy = \text{constant}$   
 D.  $y^2 + 2x^2 = \text{constant}$

Question ID : 2449921272

Status : Answered

Chosen Option : 2

Q.2  
4

If the ultimate bearing capacity of a 1 m wide strip footing resting on the ground surface is 250 kN/m<sup>2</sup>, what will be the allowable bearing pressure of a 3 m x 3 m square footing resting on the same surface with factor of safety 2.5? Use Terzaghi's bearing capacity theory and assume the soil is cohesionless.

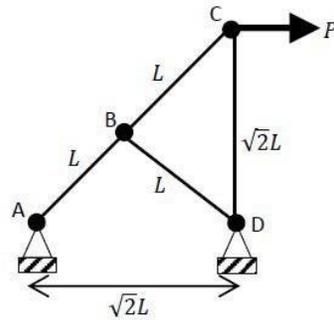
- Ans
- A. 240 kN/m<sup>2</sup>
  - B. 250 kN/m<sup>2</sup>
  - C. 600 kN/m<sup>2</sup>
  - D. 440 kN/m<sup>2</sup>

Question ID : 2449921265

Status : Answered

Chosen Option : 1

- Q.2 In the pin jointed truss shown below: members AB, BC and BD are of length  $L$ , while member CD is of length  $\sqrt{2}L$ . Joints A, B and C are in a straight line. All members have the same  $AE$ . A force  $P$  acts at joint C as shown. What is the magnitude of the horizontal reaction at support D?



- Ans
- A.  $P$
  - B. Zero
  - C.  $2P/3$
  - D.  $3P/2$

Question ID : 2449921254

Status : Answered

Chosen Option : 2

Section : Hindi

- Q.1 दिए गए विकल्पों में से कौन सा वाक्यांश नीचे लिखे शब्द का सही अर्थ है?

शब्द:- अनमोल

- Ans
- A. अनदेखी वस्तु
  - B. अत्यधिक मूल्य वाली वस्तु
  - C. बिना मोल भाव किये
  - D. कम मूल्य वाली वस्तु

Question ID : 2449921277

Status : Answered

Chosen Option : 2

Q.2

दिए गए वाक्यांशों में से सर्वोचित वाक्यांश चुनकर नीचे दिए गए मुहावरे को पूरा करें ।

मुहावरा: ना नौ मन तेल होगा \_\_\_\_\_

- Ans
- A. ना दस मन गुड़ होगा
  - B. ना पकवान बनेगा
  - C. ना राधा नाचेगी
  - D. ना राधा पकवान बनाएंगी

Question ID : 2449921279

Status : Answered

Chosen Option : 3

Q.3 दिए गए विकल्पों में से कौन सा विकल्प दिए हुए शब्द का पर्यायवाची नहीं है?

शब्द:- पर्वत

- Ans
- A. गिरि
  - ✓ B. सर
  - ✗ C. भूधर
  - ✗ D. शैल

Question ID : 2449921278

Status : Answered

Chosen Option : 2

Q.4 नीचे दिए गए दोनों वाक्यों को पढ़िए ।

वाक्य १. "निर्मला" उपन्यास के लेखक मुंशी प्रेमचंद हैं ।

वाक्य २. "कामायनी" महाकाव्य के लेखक कालिदास हैं ।

नीचे दिए गए विकल्पों में से कौन सा विकल्प सही है?

- Ans
- ✗ A. वाक्य २ सही है किन्तु वाक्य १ सही नहीं है
  - ✓ B. वाक्य १ सही है किन्तु वाक्य २ सही नहीं है
  - ✗ C. दोनों वाक्य सही नहीं हैं
  - ✗ D. दोनों वाक्य सही हैं

Question ID : 2449921280

Status : Not Answered

Chosen Option : --

Q.5 दिए गए विकल्पों में से कौन सा विकल्प नीचे लिखे शब्द का सही सन्धि-विग्रह है?

शब्द:- तल्लीन

- Ans
- A. तत + लीन
  - ✗ B. तल + लीन
  - ✓ C. तत् + लीन
  - ✗ D. तल्ल + ईन

Question ID : 2449921276

Status : Answered

Section : GK

Q.1 Vijay Amritraj is primarily associated with which of the following sports?

- Ans
- A. Chess
  - B. Badminton
  - C. Lawn tennis
  - D. Cricket

Question ID : 2449921285  
Status : Answered  
Chosen Option : 1

Q.2 What is an icicle-like formation of calcium carbonate descending from the roof or sides of a cavern called?

- Ans
- A. Atoll
  - B. Fjord
  - C. Trench
  - D. Stalactite

Question ID : 2449921290  
Status : Answered  
Chosen Option : 3

Q.3 The 182m high Statue of Unity depicts which of the following persons?

- Ans
- A. Mahatma Gandhi
  - B. Subhash Chandra Bose
  - C. Jawaharlal Nehru
  - D. Vallabhbhai Patel

Question ID : 2449921281  
Status : Answered  
Chosen Option : 4

Q.4 Mrs. Indira Gandhi did not contest any Lok Sabha election from which of the following constituencies?

- Ans
- A. Rae Bareilly
  - B. Chikmagalur
  - C. Medak
  - D. Lucknow

Question ID : 2449921286  
Status : Not Answered  
Chosen Option : --

Q.5

Ans

- A. Jeffrey Archer
- B. J. K. Rowling
- C. Gabriel Garcia Márquez
- D. J.R.R. Tolkien

Question ID : 2449921287

Status : Answered

Chosen Option : 2

Q.6 Who was the first person to orbit the earth in a space-craft?

Ans

- A. Yuri Gagarin
- B. Neil Amstrong
- C. Micheal Collins
- D. Rakesh Sharma

Question ID : 2449921288

Status : Answered

Chosen Option : 1

Q.7 Which of the following countries are separated by the Radcliffe Line?

Ans

- A. India and Pakistan
- B. Hong Kong and (Mainland) China
- C. China and Nepal
- D. North and South Korea

Question ID : 2449921284

Status : Answered

Chosen Option : 1

Q.8 Which of the following rivers flow into the Arabian Sea?

Ans

- A. Cauvery
- B. Narmada
- C. Godavari
- D. Krishna

Question ID : 2449921289

Status : Answered

Chosen Option : 2

Q.9 Geneva Conventions deal with which of the following?

Ans

- A. Copyright laws
- B. Treatment of Prisoners of War
- C. Agreement on global warming
- D. Minimization of environmental damage

Question ID : 2449921283  
Status : Answered  
Chosen Option : 3

Q.1  
0 Sher Shah Suri's tomb is located in which place?

- Ans  A. Kabul  
 B. Sasaram  
 C. Agra  
 D. Lahore

Question ID : 2449921282  
Status : Answered  
Chosen Option : 2

Section : Reasoning (1 Mark)

Q.1 A courier delivery person has to deliver six items. The items are: TV, Food Processor, Laptop, Washing Machine, Fridge and Microwave Oven. He has the following constraints put on him by the shop owner for his delivery-sequence:

- Laptop has to be delivered immediately after Food Processor
- Microwave Oven has to be delivered earlier than Laptop
- Fridge has to be delivered earlier than TV
- Fridge has to be delivered either immediately before or immediately after Washing Machine

If the TV was delivered before the Microwave Oven, what was the delivery-sequence of the Food Processor?

- Ans  A. fourth  
 B. fifth  
 C. second  
 D. third

Question ID : 2449921295  
Status : Answered  
Chosen Option : 2

Q.2 Study the following sequence of characters carefully and answer the question given below:

2 S L A B N # D O @ 7 5 F U C E H 3 4 & 8 V W 6 \* 9 M R P

How many consonants are there in the sequence, each of which is immediately preceded by a number but not immediately followed by another consonant?

- Ans  A. two  
 B. three  
 C. one  
 D. zero

Question ID : 2449921294  
Status : Answered  
Chosen Option : 3

Q.3

The determinant of the matrix  $\begin{bmatrix} 1.0 & 1.1 & 1.2 \\ 0 & 3.0 & 3.1 \\ 0 & 0 & 5.2 \end{bmatrix}$  is:

- Ans
- A. 12.2
  - B. 10.4
  - C. 18.5
  - D. 15.6

Question ID : 2449921292

Status : Answered

Chosen Option : 4

Q.4 If  $A \sin ax + B \cos ax = C \sin(ax + \phi)$ , then:

- Ans
- A.  $A = C \cos \phi$  and  $B = C \sin \phi$
  - B.  $A = C \sin \phi$  and  $B = C \cos \phi$
  - C.  $A = C \cos \phi$  and  $B = -C \sin \phi$
  - D.  $A = C \sin \phi$  and  $B = -C \cos \phi$

Question ID : 2449921293

Status : Answered

Chosen Option : 1

Q.5 What is the sum of the following series:

$$1 + 3 + 5 + 7 + \dots + 93 + 95 + 97 + 99$$

- Ans
- A. 2500
  - B. 3500
  - C. 2000
  - D. 3000

Question ID : 2449921291

Status : Answered

Chosen Option : 1

Section : Reasoning (2 Mark)

Q.1 The set of equations  $x^2 + y^2 = 1$  and  $x + y = 2$  has how many real solutions?

- Ans
- A. 2 solutions
  - B. 1 solution
  - C. Infinite number of solutions
  - D. No solution

Question ID : 2449921299

Status : Answered

Chosen Option : 4

Q.2 If  $i = \sqrt{-1}$ , then  $\frac{3+i}{1-i}$  equals:

- Ans
- A.  $-1 + 2i$
  - B.  $1 - 2i$
  - C.  $-1 - 2i$
  - D.  $1 + 2i$

Question ID : 2449921297  
 Status : Answered  
 Chosen Option : 4

Q.3 The value of  $\frac{\sin x}{x}$  at  $x = 0$  is:

- Ans
- A. 0
  - B. Infinity
  - C. Not defined
  - D. 1

Question ID : 2449921296  
 Status : Answered  
 Chosen Option : 3

Q.4 Seven friends, Anil, Sunil, Rohit, Puja, Shalini, Pradhi and Gaurav bought seven cars during a week but each one bought their cars on a different day of the week. Each of them also bought a different brand of car. The brands are: Maruti, Honda, Toyota, Renault, Tata, Mahindra and Hyundai. Consider the week started on a Monday and ended on the following Sunday. The following information are known:

Rohit bought a Hyundai on Monday  
 On Sunday, one of them bought a Renault.  
 Shalini bought her car just the day after Anil and just the day before Gaurav  
 Anil bought a Mahindra car  
 Puja bought a Tata car on Friday  
 Sunil did not buy either a Toyota or a Renault  
 Gaurav bought a Maruti

Which of the following statement is incorrect?

- Ans
- A. On Wednesday, Shalini bought a Toyota
  - B. On Tuesday, Anil bought a Mahindra
  - C. On Sunday, Pradhi bought a Renault
  - D. On Thursday, Sunil bought a Maruti

Question ID : 2449921300  
 Status : Answered  
 Chosen Option : 4

Q.5 The transpose of the matrix  $\begin{bmatrix} 1 & 0 & 0 \\ 0 & \cos \theta & -\sin \theta \\ 0 & \sin \theta & \cos \theta \end{bmatrix}$  is equal to its inverse for:

- Ans
- A. Only for  $\theta$  between 0 and  $-\pi/2$
  - B. Only for  $\theta$  between 0 and  $\pi/2$
  - C. No value of  $\theta$
  - D. Any value of  $\theta$

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