UPPCL
AE

Previous Year Paper

Civil 31 Dec 2018

Uttar Pradesh
Power Corporation Limited

Participant ID:	
Participant Name:	
Test Center Name:	
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 In the context of use of OPC and other cementitious materials used in concrete, consider the following statements:

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. 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 : **2449921220**
Status : **Answered**
Chosen Option : **4**

Q.2 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. Statement I is false, but Statement II is true

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

✘ C. Both Statement I and Statement II are false

✘ D. Both Statement I and Statement II are true

Question ID : **2449921218**
Status : **Answered**
Chosen Option : **2**

Q.3 At an internal hinge _____:

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

Question ID : **2449921208**
Status : **Answered**
Chosen Option : **1**

Q.4 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. $\frac{wL^2}{8}$
✘ B. $\frac{wL^2}{4}$
✘ C. wL^2
✔ D. $\frac{wL^2}{2}$

Question ID : **2449921205**
Status : **Answered**
Chosen Option : **3**

Q.5 Raw domestic sewage mostly contains the following forms of nitrogen:

Ans
✘ A. Nitrate-N, Nitrite-N
✘ B. Ammonia-N, Nitrate-N
✘ C. Organic-N, Nitrite-N
✔ D. Organic-N, Ammonia-N

Question ID : **2449921236**
Status : **Answered**
Chosen Option : **4**

Q.6 Determine the equivalent hydraulic conductivity of a soil layer having the average vertical and horizontal hydraulic conductivities are $1x10^{-5}$ cm/s and $2x10^{-4}$ cm/s, respectively.

Ans
✘ A. $3.5x10^{-5}$ cm/s
✘ B. $1.5x10^{-4}$ cm/s
✔ C. $4.5x10^{-5}$ cm/s
✘ D. $3.5x10^{-4}$ cm/s

Question ID : **2449921231**
Status : **Answered**
Chosen Option : **2**

Q.7 Balancing of sights means that:

Ans ✗ A.
the error of the loop closure in traverse adjustment should be zero.

✗ B.
the horizontal angles in the face left and face right conditions of theodolite should be same.

✓ C.
the distances corresponding to the fore sight and back sight in differential leveling should be equal.

✗ D.
the stadia intercepts corresponding to the upper and lower cross hairs with respect to the middle cross hairs in tacheometry should be equal.

Question ID : **2449921250**
Status : **Answered**
Chosen Option : **4**

Q.8 Piezometric head is _____.

Ans ✗ A. the sum of pressure head and datum head

✗ B. the sum of datum head and velocity head

✗ C. the sum of pressure head, datum head and velocity head

✓ D. the sum of pressure head and velocity head

Question ID : **2449921239**
Status : **Answered**
Chosen Option : **1**

Q.9 The point of contraflexure in a beam is that location where _____:

Ans ✗ A. the deflection changes sign

✗ B. the slope of the elastic curve changes sign

✗ C. the shear force changes sign

✓ D. the bending moment changes sign

Question ID : **2449921207**
Status : **Answered**
Chosen Option : **4**

Q.10 In a beam, the bending moment is maximum at the point where the shear force _____:

Ans ✗ A. is maximum

✗ B. is minimum

✓ C. changes sign

✗ D. half the total load on the beam

Question ID : **2449921201**
Status : **Answered**
Chosen Option : **3**

Q.11 The primary mode of force transmission in HSFG bolts is _____:

Ans

✗ A. tension
✗ B. bearing
✓ C. friction
✗ D. shearing

Question ID : **2449921211**
Status : **Answered**
Chosen Option : **3**

Q.12 For limit state of collapse, as per IS456:2000, the partial safety factor for material strength of steel is _____:

Ans
✗ A. 0.87
✗ B. 1.5
✓ C. 1.15
✗ D. 1.0

Question ID : **2449921213**
Status : **Answered**
Chosen Option : **3**

Q.13 Under-reinforced concrete beams fail due to _____:

Ans
✗ A. bond failure of reinforcing bars
✓ B. ductile failure of reinforcing bars
✗ C. tensile failure of concrete
✗ D. crushing of concrete

Question ID : **2449921214**
Status : **Answered**
Chosen Option : **3**

Q.14 Which one of the following of soil types is responsible for negative screen friction in piles?

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

Question ID : **2449921232**
Status : **Answered**
Chosen Option : **2**

Q.15 Loss in pre-stress due to friction occurs _____:

Ans
✗ A. in both pre-tensioned and post-tensioned beams
✗ B. in neither pre-tensioned nor post-tensioned beams
✗ C. only in pre-tensioned beams
✓ D. only in post-tensioned beams

Question ID : **2449921216**
Status : **Answered**
Chosen Option : **1**

Q.16 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. 0.50
- ✗ B. 0.33
- ✗ C. 0.69
- ✓ D. 0.45

Question ID : **2449921227**
Status : **Answered**
Chosen Option : **1**

Q.17 The maximum value possible for Poisson's ratio is _____:

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

Question ID : **2449921204**
Status : **Answered**
Chosen Option : **4**

Q.18 Which of the following methods is NOT used for the control establishment in Surveying?

Ans
- ✗ A. Trilateration
- ✗ B. Triangulation
- ✓ C. Plane tabling
- ✗ D. Traversing

Question ID : **2449921248**
Status : **Answered**
Chosen Option : **1**

Q.19 The moment distribution method for structural analysis is _____:

Ans
- ✗ A. a force based method
- ✓ B. a displacement based method
- ✗ C. neither force nor displacement based method
- ✗ D. both force and displacement based method

Question ID : **2449921203**
Status : **Answered**
Chosen Option : **1**

Q.20 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 _____:

Ans

✔ A. $\frac{PL^3}{48EI}$

✘ B. $\frac{PL^3}{3EI}$

✘ C. $\frac{PL^3}{16EI}$

✘ D. $\frac{PL^3}{8EI}$

Question ID : **2449921206**
Status : **Answered**
Chosen Option : **1**

Q.21 The term 'alternate depth' is used in open channel flow to denote the paired flow depths _____.

Ans

✔ A. having the same specific energy for a given discharge

✘ B. having the same kinetic energy for a given discharge

✘ C. having the same specific force for a given discharge

✘ D. having the same Froude number

Question ID : **2449921240**
Status : **Answered**
Chosen Option : **1**

Q.22 What is the main reason for providing an equalization tank in the sewage treatment plant?

Ans

✘ A. Aeration of the sewage

✔ B. Damping the hourly variation in the sewage flow

✘ C. Proper mixing the sewage before further treatment

✘ D. Damping of the daily variations in the sewage flow

Question ID : **2449921237**
Status : **Answered**
Chosen Option : **3**

Q.23 A distance of 270 m is to be taped with an error of not more than ± 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. 0.25 m

✔ B. 0.05 m

✘ C. 0.20 m

✘ D. 0.15 m

Question ID : **2449921249**
Status : **Not Answered**
Chosen Option : **--**

Q.24 Creep strains in concrete structures are usually _____:

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

Question ID : **2449921219**
Status : **Answered**
Chosen Option : **3**

Q.25 The COD/BOD_5 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 lower COD/BOD_5 ratio is from an industrial source

✓ B.
The sample with lower COD/BOD_5 ratio has higher percentage of biodegradable organic matter

✗ C.
The sample with higher COD/BOD_5 ratio has more organic matter

✗ D.
The sample with higher COD/BOD_5 ratio is a sample of domestic sewage

Question ID : **2449921234**
Status : **Answered**
Chosen Option : **1**

Q.26 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. plastic moment to yield moment
✗ D. elastic modulus to plastic modulus

Question ID : **2449921215**
Status : **Answered**
Chosen Option : **3**

Q.27 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. 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 : **2449921224**
Status : **Answered**
Chosen Option : **2**

Q.28 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. Both statements are TRUE
✓ B. Statement – 1 is FALSE and Statement – 2 is TRUE
✗ C. Both statements are FALSE
✗ D. Statement – 1 is TRUE and Statement – 2 is FALSE

Question ID : **2449921245**
Status : **Answered**
Chosen Option : **4**

Q.29 A catchment has an area of 100 hectares (1 hectare = 10000 m^2) 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^3/hour) at the outlet of the catchment for this event?

Ans
✗ A. 1000
✗ B. 4000
✗ C. 400
✓ D. 2000

Question ID : **2449921241**
Status : **Answered**
Chosen Option : **4**

Q.30 Consider the following statements in the context of properties of bitumen.

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 : **3**

Q.31 In fall cone test, the depth of cone penetration corresponding to the liquid limit of any soil is_____.

Ans
✗ A. 25 mm
✓ B. 20 mm
✗ C. 10 mm

✗ D. 30 mm

Question ID : **2449921230**
Status : **Answered**
Chosen Option : **2**

Q.32 According to IS456:2000, the flexural tensile strength of concrete is _____:

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

Question ID : **2449921212**
Status : **Answered**
Chosen Option : **4**

Q.33 Name two air pollutants that are both found more in the exhaust of diesel vehicles than in the exhaust of petrol vehicles.

Ans
✗ A. PM, CO
✓ B. NO, PM
✗ C. NO, CO
✗ D. CO, HC

Question ID : **2449921233**
Status : **Answered**
Chosen Option : **1**

Q.34 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 excess voids
✓ D. action of traffic load and there being inadequate voids

Question ID : **2449921246**
Status : **Answered**
Chosen Option : **2**

Q.35

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 FALSE and Statement – 2 is TRUE
✘ B. Statement – 1 is TRUE and Statement – 2 is FALSE
✘ C. Both statements are TRUE
✘ D. Both statements are FALSE

Question ID : **2449921222**
Status : **Answered**
Chosen Option : **3**

Q.36 Pressuremeter test is used for the determination of _____ .

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

Question ID : **2449921229**
Status : **Answered**
Chosen Option : **3**

Q.37 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. Statement – 1 is FALSE and Statement – 2 is TRUE
✘ B. Both statements are FALSE
✘ C. Both statements are TRUE
✘ D. Statement – 1 is TRUE and Statement – 2 is FALSE

Question ID : **2449921221**
Status : **Answered**
Chosen Option : **4**

Q.38 If DL denotes dead load and EL denotes earthquake load, then the value of the load factor α in the load combination $\alpha DL + 1.5\ EL$ used in structural design is _____:

Ans
✘ A. 1.2
✘ B. 1.0
✔ C. 0.9
✘ D. 2.0

Question ID : **2449921210**
Status : **Answered**

Chosen Option : **1**

Q.39 For laminar flow through a circular pipe, the ratio of maximum velocity to the average velocity is _____.

Ans

✗ A. 2.5

✗ B. 1.25

✓ C. 2.0

✗ D. 1.5

Question ID : **2449921238**
Status : **Answered**
Chosen Option : **4**

Q.40 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 m^3/s, the surface overflow rate (SOR) of the tank is _____.

Ans

✗ A. 14.4 $m^3/m^2/d$

✗ B. 9.6 $m^3/m^2/d$

✗ C. 21.6 $m^3/m^2/d$

✓ D. 28.8 $m^3/m^2/d$

Question ID : **2449921235**
Status : **Answered**
Chosen Option : **4**

Q.41 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 given by _____.

Ans

✗ A. $(2b+h)^{1/6}$

✗ B. $(b+2h)^{2/3}$

✓ C. $(b+2h)^{1/6}$

✗ D. $(2b+h)^{2/3}$

Question ID : **2449921243**
Status : **Answered**
Chosen Option : **3**

Q.42 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 ρ and dynamic viscosity μ) 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.43 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. Flexural strength using a beam
✓ B. Compressive strength using a cylinder.
✗ C. Tensile strength using a cylinder
✗ D. Compressive strength using a cube

Question ID : **2449921247**
Status : **Answered**
Chosen Option : **2**

Q.44 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. 15
✓ B. 28
✗ C. 10
✗ D. 42

Question ID : **2449921228**
Status : **Not Answered**
Chosen Option : **--**

Q.45 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 true
✗ C. Both Statement I and Statement II are false
✓ D. Statement I is false, but Statement II is true

Question ID : **2449921217**
Status : **Answered**
Chosen Option : **3**

Q.46

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 FALSE and Statement – 2 is TRUE

✘ B. Both statements are FALSE

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

✘ D. Both statements are TRUE

Question ID : **2449921223**
Status : **Answered**
Chosen Option : **1**

Q.47 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. $\frac{\pi^2 EI}{L^2}$

✘ C. $\frac{\pi^2 EI}{4L^2}$

✘ D. $\frac{4\pi^2 EI}{L^2}$

Question ID : **2449921202**
Status : **Answered**
Chosen Option : **1**

Q.48 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. Both Statement I and Statement II are false

✔ 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 true

Question ID : **2449921209**
Status : **Answered**
Chosen Option : **2**

Q.49

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) 12 and 4, respectively.

✗ C.
The Expected time (in weeks) of completion of the activity, and the standard deviation (in weeks) 13 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 : **Not Answered**
Chosen Option : **--**

Q.50 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 4 MPa, 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 3.5 MPa

Which of the following is CORRECT?

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

Question ID : **2449921225**
Status : **Answered**
Chosen Option : **1**

Section : **CE (2 Mark)**

Q.1 Concentration of $CHCl_3$ in air was measured as 0.4 $\mu g/m^3$ at P = 1 atm. and T = 293°K.

Express the concentration in ppb(v) units.

Molar mass of $CHCl_3$ (in g/mole): 119.5; R = 82.05 x 10^{-6} mol^{-1} m^3atm K^{-1}

Ans
✗ A. 0.04
✗ B. 0.06
✗ C. 0.02
✓ D. 0.08

Question ID : **2449921269**
Status : **Not Answered**
Chosen Option : **--**

Q.2 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^3 and gravitational acceleration as 10 m/sec^2.

Ans

✗ A. 27

✓ B. 135

✗ C. 90

✗ D. 45

Question ID : **2449921270**
Status : **Answered**
Chosen Option : **3**

Q.3 The magnetic bearing of a line in an area was found to be N40°30′W in 2015, when the magnetic declination was 4°15′W. What would be its present magnetic bearing if the magnetic declination is 2°W?

Ans

✗ A. N40°30′W

✗ B. N40°30′E

✗ C. S40°30′E

✓ D. N42°45′W

Question ID : **2449921275**
Status : **Answered**
Chosen Option : **4**

Q.4 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 9.8m/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.5 The concentrations of major cations and anions (in mM) in a river water sample are as follows, $Na^+ : 0.23; Mg^{2+} : 0.15; Ca^{2+} = 0.33; K^+ : 0.03; Cl^- : 0.16; SO_4^{2-} : 0.07; HCO_3^- : 0.86$. Calculate the total hardness (in mg/L $CaCO_3$)

Ans

✗ A. 24

✓ B. 48

✗ C. 72

✗ D 96

Question ID : **2449921268**
Status : **Answered**
Chosen Option : **1**

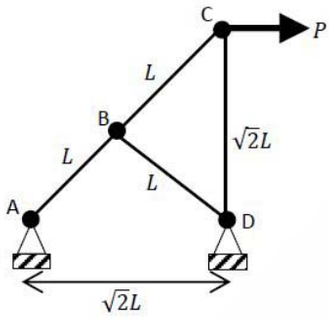
Q.6

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

Ans
- ✗ A. $y^2 + 2x^2 = constant$
- ✗ B. $6xy = constant$
- ✓ C. $y^2 - 2x^2 = constant$
- ✗ D. $2xy = constant$

Question ID : **2449921272**
Status : **Answered**
Chosen Option : **1**

Q.7 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. Zero
- ✗ B. $2P/3$
- ✗ C. P
- ✗ D. $3P/2$

Question ID : **2449921254**
Status : **Answered**
Chosen Option : **1**

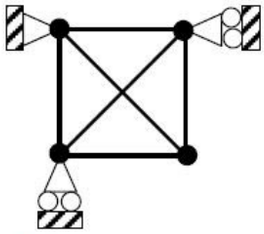
Q.8 A footing of size 4 m x 4 m carries a uniformly distributed load of 150 kN/m^2. Compute the vertical pressure at a depth of 6 m below the footing using 2:1 method.

Ans
- ✓ A. 24 kN/m^2
- ✗ B. 32.5 kN/m^2
- ✗ C. 36 kN/m^2
- ✗ D. 30 kN/m^2

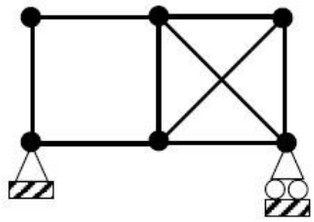
Question ID : **2449921264**
Status : **Answered**
Chosen Option : **3**

Q.9

Amongst the following two pin jointed trusses_____.



Truss I



Truss II

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

Question ID : **2449921252**
Status : **Answered**
Chosen Option : **3**

Q.10 For a project, it is estimated that the quantity of concrete to be poured, reinforcement work and shuttering work will be 500m^3, 5MT and 250 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 m^3.

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

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

Q.11 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. 0.8 N/mm^2
- ✔ B. 3.2 N/mm^2
- ✘ C. 4.5 N/mm^2
- ✘ D. 2.0 N/mm^2

Question ID : **2449921255**
Status : **Answered**
Chosen Option : **2**

Q.12 Calculate the theoretical oxygen demand of methane (CH_4) in kg O_2/kg CH_4.

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

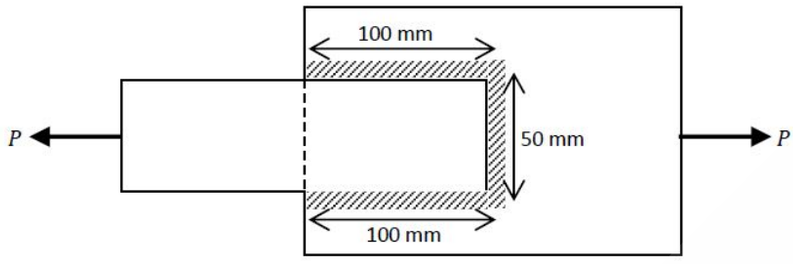
Ans
- ✘ A. 8.0
- ✘ B. 2.0

✔ C. 4.0

✘ D. 6.0

Question ID : **2449921267**
Status : **Answered**
Chosen Option : **2**

Q.13 Consider the fillet welded joint shown in the figure. The welded surfaces meet at $60^0 - 90^0$ (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. 616 kN

✔ B. 154 kN

✘ C. 315 kN

✘ D. 220 kN

Question ID : **2449921259**
Status : **Not Answered**
Chosen Option : **--**

Q.14 Consider the variation of the stability value of a mix with increasing bitumen content.

Which of the following is CORRECT?

Ans

✔ A. Stability increases with the bitumen content and then decreases.

✘ B. Stability monotonically decreases with the bitumen content.

✘ C. Stability monotonically increases with the bitumen content.

✘ D. Stability decreases with the bitumen content and then increases.

Question ID : **2449921273**
Status : **Answered**
Chosen Option : **1**

Q.15 In a two-dimensional problem, if the state of stress at a point indicates the principal stresses as $\sigma_1 = 10$ MPaand $\sigma_2 = 10$ MPa , then the maximum shear stress at that point is _____.

Ans

✘ A. 5 MPa

✔ B. Zero

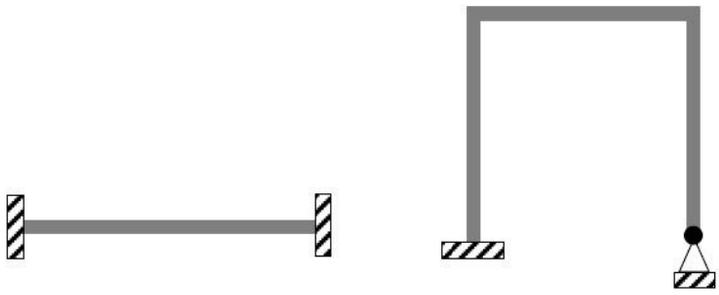
✘ C. 15 MPa

✘ D. 10 MPa

Question ID : **2449921251**
Status : **Answered**

Chosen Option : **4**

Q.16 The minimum numbers of plastic hinges necessary for the complete collapse of the following structures are_____.



Ans

✗ A. 2 for beam, and 2 for frame

✗ B. 1 for beam, and 1 for frame

✓ C. 3 for beam, and 3 for frame

✗ D. 4 for beam, and 5 for frame

Question ID : **2449921258**
Status : **Answered**
Chosen Option : **2**

Q.17 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 φ-index for the storm (in mm/hour).

Ans

✗ A. 2

✗ B. 4.0

✗ C. 2.4

✓ D. 3.6

Question ID : **2449921271**
Status : **Answered**
Chosen Option : **4**

Q.18 If the Na_2O and K_2O content in a given cement is 1.0% and 0.5%, the total alkali content in the cement in terms of Equivalent Na_2O can be taken as _____.

Ans

✓ A. 1.3%

✗ B. 1.1%

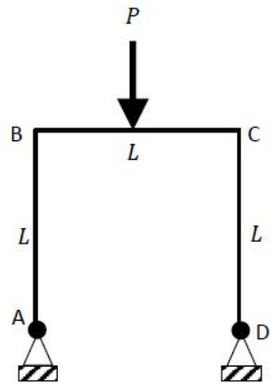
✗ C. 1.0%

✗ D. 1.5%

Question ID : **2449921260**
Status : **Not Answered**
Chosen Option : **--**

Q.19

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. 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 : **2449921257**
Status : **Answered**
Chosen Option : **1**

Q.20 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 2nd 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.

✗ B.
For the 2nd 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.

✗ C.
For the 2nd year, the depreciation using both the linear method and the sum of years methods is INR 1.6 lakhs.

✗ D.
For the 2nd year, the depreciation using both the linear method and the sum of years methods is INR 1.2 lakhs.

Question ID : **2449921261**
Status : **Answered**
Chosen Option : **4**

Q.21 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 = 6 kN-m

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

✗ D. Yield moment = 3 kN-m, Plastic moment = 2 kN-m

Question ID : **2449921256**
Status : **Answered**
Chosen Option : **2**

Q.22 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. 4 years

✓ B. 2.5 years

✗ C. 1 year

✗ D. 3.5 years

Question ID : **2449921266**
Status : **Not Answered**
Chosen Option : **--**

Q.23 If the ultimate bearing capacity of a 1 m wide strip footing resting on the ground surface is 250 kN/m^2, 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. 440 kN/m^2

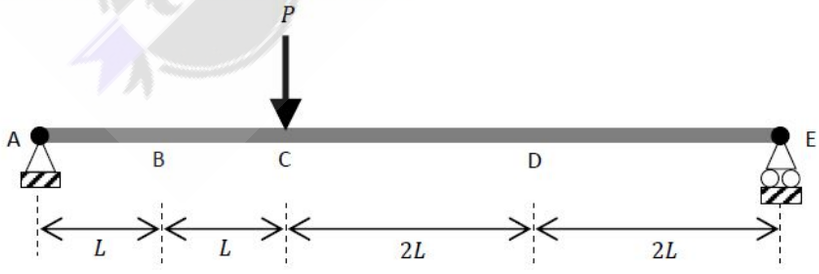
✓ B. 240 kN/m^2

✗ C. 600 kN/m^2

✗ D. 250 kN/m^2

Question ID : **2449921265**
Status : **Not Answered**
Chosen Option : **--**

Q.24 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 false

✗ 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 true

Question ID : **2449921253**
Status : **Answered**
Chosen Option : **4**

Q.25 It is known that a concrete mix has 180 kg/m^3 of water, 315 kg/m^3 of cement, 149 kg/m^3 of additional fines, and 528 kg/m^3 of sand. What is the coarse aggregate content in 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**

Section : **Hindi**

Q.1 दिए गए विकल्पों में से कौन सा विकल्प दिए हुए शब्द का पर्यायवाची नहीं है?

शब्द:- पर्वत

Ans

✓ A. सर

✗ B. भूधर

✗ C. शैल

✗ D. गिरि

Question ID : **2449921278**
Status : **Answered**
Chosen Option : **1**

Q.2 दिए गए विकल्पों में से कौन सा विकल्प नीचे लिखे शब्द का सही सन्धि-विग्रह है?

शब्द:- तल्लीन

Ans

✗ A. तल्ल + ईन

✓ B. तत् + लीन

✗ C. तत + लीन

✗ D. तल + लीन

Question ID : **2449921276**
Status : **Answered**
Chosen Option : **2**

Q.3 दिए गए वाक्यांशों में से सर्वोचित वाक्यांश चुनकर नीचे दिए गए मुहावरे को पूरा करें ।

मुहावरा: ना नौ मन तेल होगा _____

Ans

✗ A. ना पकवान बनेगा

✗ B. ना दस मन गुड़ होगा

✓ C. ना राधा नाचेगी

✗ D. ना राधा पकवान बनाएंगी

Question ID : **2449921279**
Status : **Answered**
Chosen Option : **3**

Q.4 दिए गए विकल्पों में से कौन सा वाक्यांश नीचे लिखे शब्द का सही अर्थ है?

शब्द:- अनमोल

Ans

✗ A. बिना मोल भाव किये

✓ B. अत्यधिक मूल्य वाली वस्तु

✗ C. कम मूल्य वाली वस्तु

✗ D. अनदेखी वस्तु

Question ID : **2449921277**
Status : **Answered**
Chosen Option : **1**

Q.5 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. दोनों वाक्य सही हैं

✗ B. वाक्य २ सही है किन्तु वाक्य १ सही नहीं है

✓ C. वाक्य १ सही है किन्तु वाक्य २ सही नहीं है

✗ D. दोनों वाक्य सही नहीं हैं

Question ID : **2449921280**
Status : **Answered**
Chosen Option : **3**

Section : **GK**

Q.1 अंतरिक्ष-यान से पृथ्वी की परिक्रमा करने वाले पहले व्यक्ति कौन थे?

Ans

✗ A. माइकेल कॉलिन्स

✗ B. राकेश शर्मा

✓ C. युरी गगारिन

✗ D. नील आर्मस्ट्रांग

Question ID : **2449921288**
Status : **Answered**
Chosen Option : **3**

Q.2 The 182m high Statue of Unity depicts which of the following persons?

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

Question ID : **2449921281**
Status : **Answered**
Chosen Option : **2**

Q.3 Sher Shah Suri's tomb is located in which place?

Ans
✗ A. Agra
✗ B. Kabul
✓ C. Sasaram
✗ D. Lahore

Question ID : **2449921282**
Status : **Answered**
Chosen Option : **3**

Q.4 Geneva Conventions deal with which of the following?

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

Question ID : **2449921283**
Status : **Answered**
Chosen Option : **1**

Q.5 Who is the author of 'The Lord of the Rings'?

Ans
✗ A. Gabriel Garcia Márquez
✗ B. Jeffrey Archer
✓ C. J.R.R. Tolkien
✗ D. J. K. Rowling

Question ID : **2449921287**
Status : **Answered**
Chosen Option : **4**

Q.6 What is an icicle-like formation of calcium carbonate descending from the roof or sides of a cavern called?

Ans
✓ A. Stalactite
✗ B. Atoll

✗ C. Trench

✗ D. Fjord

Question ID : **2449921290**
Status : **Answered**
Chosen Option : **1**

Q.7 Vijay Amritraj is primarily associated with which of the following sports?

Ans

✗ A. Chess

✓ B. Lawn tennis

✗ C. Badminton

✗ D. Cricket

Question ID : **2449921285**
Status : **Answered**
Chosen Option : **1**

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

Ans

✗ A. Godavari

✗ B. Krishna

✗ C. Cauvery

✓ D. Narmada

Question ID : **2449921289**
Status : **Answered**
Chosen Option : **4**

Q.9 Which of the following countries are separated by the Radcliffe Line?

Ans

✗ A. China and Nepal

✗ B. North and South Korea

✗ C. Hong Kong and (Mainland) China

✓ D. India and Pakistan

Question ID : **2449921284**
Status : **Answered**
Chosen Option : **4**

Q.10 Mrs. Indira Gandhi did not contest any Lok Sabha election from which of the following constituencies?

Ans

✗ A. Rae Bareilly

✓ B. Lucknow

✗ C. Chikmagalur

✗ D. Medak

Question ID : **2449921286**
Status : **Answered**

Chosen Option : **2**

Section : **Reasoning (1 Mark)**

Q.1 किसी कुरियर कंपनी के कर्मचारी को छह वस्तुएँ यथा - टीवी, फूड प्रोसेसर, लैपटॉप, वॉशिंग मशीन, फ्रिज और माइक्रोवेव ओवन वितरित करना है। दुकानदार ने कुरियर कंपनी के कर्मचारी को निम्नलिखित अनुक्रम में वस्तुएँ वितरित करने को कहा है:

फूड प्रोसेसर के तुरंत बाद लैपटॉप का वितरण किया जाना है।

माइक्रोवेव ओवन लैपटॉप से पहले वितरित किया जाना है।

फ्रिज टीवी से पहले वितरित किया जाना है।

फ्रिज को या तो वॉशिंग मशीन के तुरंत पहले या तुरंत बाद वितरित किया जाना है।

यदि टीवी माइक्रोवेव ओवन से पहले वितरित किया गया था, तो फूड प्रोसेसर के वितरण का क्रम क्या था?

Ans
- ✔ A. पाँचवा
- ✘ B. दूसरा
- ✘ C. चौथा
- ✘ D. तीसरा

Question ID : **2449921295**
Status : **Answered**
Chosen Option : **1**

Q.2 What is the sum of the following series:

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

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

Question ID : **2449921291**
Status : **Answered**
Chosen Option : **4**

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. 15.6
- ✘ D. 18.5

Question ID : **2449921292**
Status : **Answered**
Chosen Option : **3**

Q.4 Study the following sequence of characters carefully and answer the question given below:

2 $ 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. zero

✗ B. two

✗ C. three

✓ D. one

Question ID : **2449921294**
Status : **Answered**
Chosen Option : **2**

Q.5 If $A \sin \alpha x + B \cos \alpha x = C \sin(\alpha x + \phi)$, then

Ans

✓ A. $A = C \cos \phi$ and $B = C \sin \phi$

✗ B. $A = C \sin \phi$ and $B = C \cos \phi$

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

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

Question ID : **2449921293**
Status : **Answered**
Chosen Option : **1**

Section : **Reasoning (2 Mark)**

Q.1 अनिल, सुनील, रोहित, पूजा, शालिनी, परिधी और गौरव (सात दोस्तों) ने एक सप्ताह के दौरान सात कारें खरीदीं। प्रत्येक ने सप्ताह के अलग-अलग दिनों में अपनी कारें खरीदीं। उनमें से प्रत्येक ने कार के अलग-अलग मॉडल यथा- मारुति, होंडा, टोयोटा, रेनॉल्ट, टाटा, महिंद्रा और हुंडई को खरीदा। सोमवार से आरंभ तथा रविवार को समाप्त होने वाले सप्ताह पर विचार करते हुए निम्नलिखित जानकारी पर ध्यान दें:

रोहित ने सोमवार को हुंडई कार खरीदी।

रविवार को एक दोस्त ने रेनॉल्ट कार खरीदी।

शालिनी ने अनिल से ठीक एक दिन बाद और गौरव से ठीक एक दिन पहले अपनी कार खरीदी।

अनिल ने महिन्द्रा कार खरीदी।

पूजा ने शुक्रवार को टाटा कार खरीदी।

सुनील ने न तो टोयेटा कार खरीदी और न ही रेनाल्ट कार

गौरव ने मारूति कार खरीदी।

निम्नलिखित कथनों में कौन-सा गलत है?

Ans

✗ A. परिधी ने रविवार को रेनाल्ट कार खरीदी

✗ B. शालिनी ने बुधवार को टोयोटा कार खरीदी

✓ C. सुनील ने बृहस्पतिवार के मारूति कार खरीदी

✗ D. अनिल ने मंगलवार को महिंद्रा कार खरीदी

Question ID : **2449921300**
Status : **Answered**

Chosen Option : **3**

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 : **1**

Q.3 The set of equations $x^2 + y^2 = 1$ and $x + y = 2$ has how many real solutions?

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

Question ID : **2449921299**
Status : **Answered**
Chosen Option : **2**

Q.4 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 θ between 0 and $\pi/2$
- ✘ B. Only for θ between 0 and $-\pi/2$
- ✔ C. Any value of θ
- ✘ D. No value of θ

Question ID : **2449921298**
Status : **Not Answered**
Chosen Option : **--**

Q.5 The value of $\frac{\sin x}{x}$ at $x = 0$ is:

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

Question ID : **2449921296**
Status : **Answered**
Chosen Option : **4**