



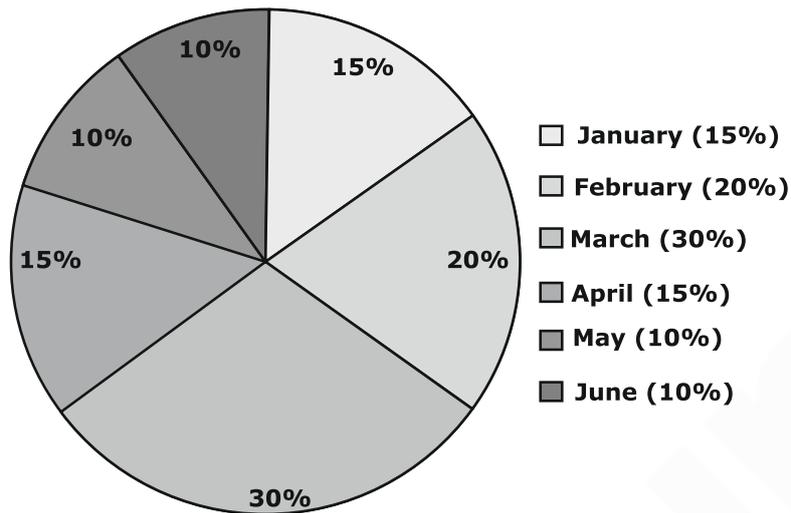
GATE 2020

Civil Engineering

Afternoon Shift

Questions

Percentage of 9 Watt LED bulbs sold by the firms X and Y from January 2018 to June, 2018



Month	Ratio of LED bulbs sold by two firms (X : Y)
January	7 : 8
February	2 : 3
March	2 : 1
April	3 : 2
May	1 : 4
June	9 : 11

A. 8750

B. 8250

C. 9750

D. 11250

Vision 2021 **Batch-3**
A Course for ESE & GATE Civil Aspirants

START FREE TRIAL

18. The following partial differential equation is defined for $u:u(x, y)$

$$\frac{\partial u}{\partial y} = \frac{\partial^2 u}{\partial x^2}; \quad y \geq 0; \quad x_1 \leq x \leq x_2$$

The set of auxiliary conditions necessary to solve the equation uniquely, is

- A. Two initial conditions and one boundary condition
 - B. Three boundary conditions
 - C. One initial condition and two boundary conditions
 - D. Three initial condition
19. Muskingum method is used in
- A. Hydrologic channel routing
 - B. hydrologic reservoir routing
 - C. Hydraulic channel routing
 - D. hydraulic reservoir routing

20. The integral

$$\int_0^1 (5x^3 + 4x^2 + 3x + 2)dx$$

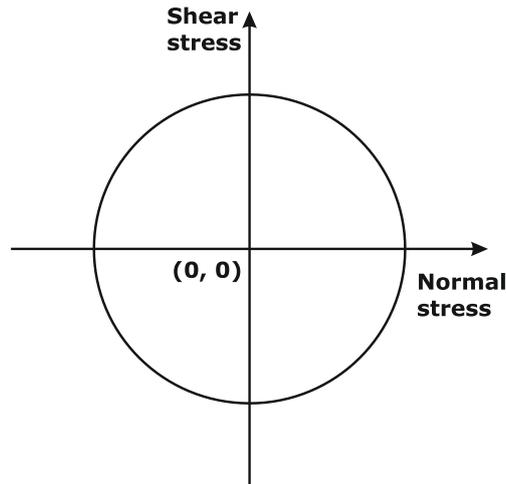
is estimated numerically using three alternative methods namely the rectangular, trapezoidal and Simpson's rules with a common step size. In this context, which one of the following statements is **TRUE**?

- A. Simpson's rule as well as rectangular rule of estimation will give NON-zero error.
 - B. Simpson's rule, rectangular rule as well as trapezoidal rule of estimation will give NON-zero error.
 - C. Only Simpson's rule of estimation will give zero error.
 - D. Only the rectangular rule of estimation will give zero error.
21. The value of $\lim_{x \rightarrow \infty} \frac{\sqrt{9x^2 + 2020}}{x + 7}$ is
- A. 3
 - B. indeterminable
 - C. $\frac{7}{9}$
 - D. 1
22. A sample of 500 g dry sand, when poured into a 2-litre capacity cylinder which is partially filled with water, displaces 188 cm³ of water. The density of water is 1 g/cm³. The specific gravity of the sand is
- A. 2.72
 - B. 2.66
 - C. 2.52
 - D. 2.55
23. A fair (unbiased) coin is tossed 15 times. The probability of getting exactly 8 Heads (*round off to three decimal places*), is _____.

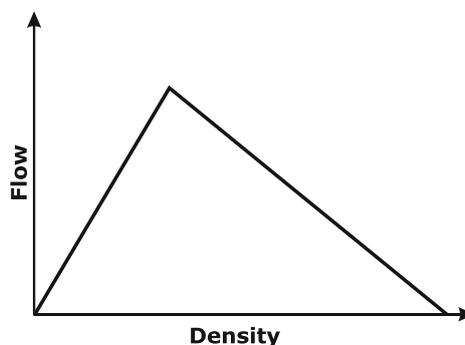
Vision 2021 **Batch-3**
A Course for ESE & GATE Civil Aspirants

START FREE TRIAL

24. The state of stress represented by Mohr's circle shown in the figure is



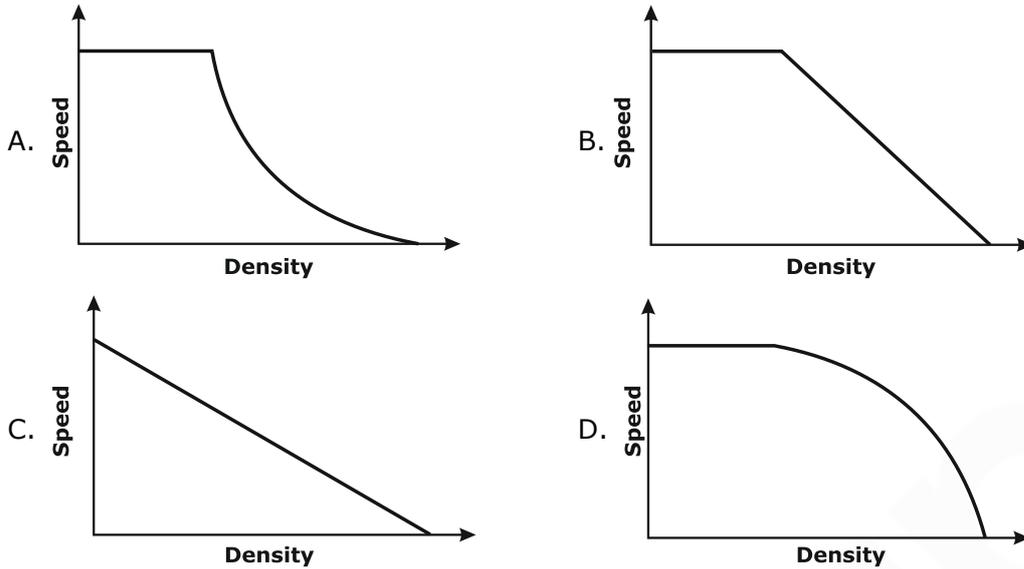
- A. pure shear
 - B. biaxial tension of equal magnitude
 - C. hydrostatic stress
 - D. uniaxial tension
25. 24-h traffic count at a road section was observed to be 1000 vehicles on a Tuesday in the month of July. If daily adjustment factor for Tuesday is 1.121 and monthly adjustment factor for July is 0.913, the Annual Average Daily Traffic (in veh/day, round off to the nearest integer) is _____.
26. 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. 42
 - B. 48
 - C. 39
 - D. 36
27. The flow-density relationship of traffic on a highway is shown in the figure



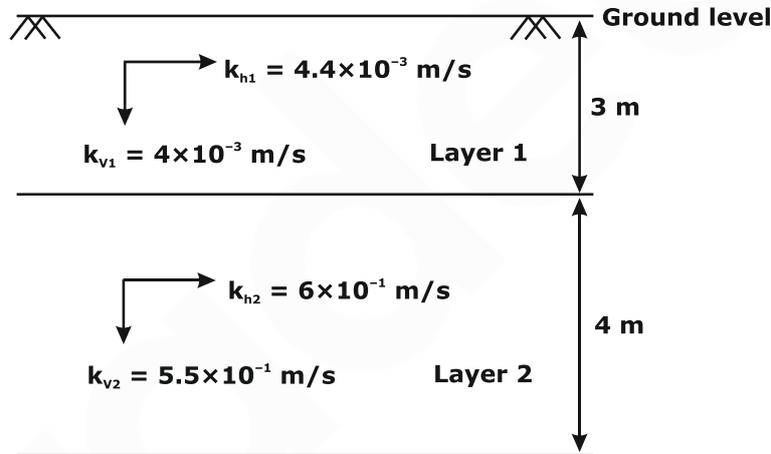
The correct representation of speed-density relationship of the traffic on this highway is

Vision 2021 **Batch-3**
A Course for ESE & GATE Civil Aspirants

START FREE TRIAL



28. Permeability tests were carried out on the samples collected from two different layers as shown in the figure (*not drawn to the scale*). The relevant horizontal (k_h) and vertical (k_v) coefficients of permeability are indicated for each layer.



The ratio of the equivalent horizontal to vertical coefficients of permeability, is

- A. 37.29
- B. 68.25
- C. 80.20
- D. 0.03

29. A 4x4 matrix [P] is given below

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

The eigenvalues of [P] are

- A. 1, 2, 3, 4
- B. 1, 2, 5, 7
- C. 3, 4, 5, 7
- D. 0, 3, 6, 6

Vision 2021

Batch-3

A Course for ESE & GATE Civil Aspirants

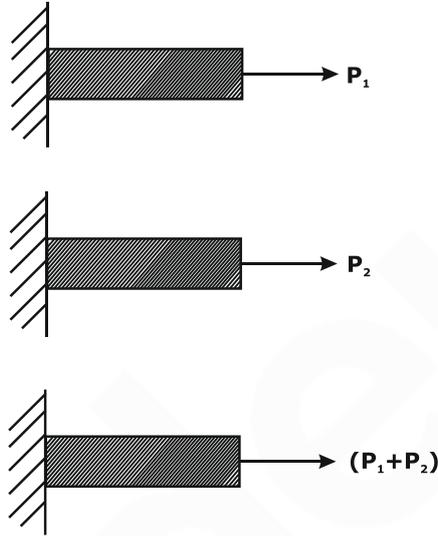
START FREE TRIAL

37. The Fourier series to represent $x-x^2$ for $-\pi \leq x \leq \pi$ is given by

$$x - x^2 = \frac{a_0}{2} + \sum_{n=1}^{\infty} a_n \cos nx + \sum_{n=1}^{\infty} b_n \sin nx$$

The value of a_0 (round off to two decimal places), is _____.

38. A prismatic linearly elastic bar of length L , cross-sectional area A , and made up of a material with Young's modulus E , is subjected to axial tensile force as shown in the figures. When the bar is subjected to axial tensile forces P_1 and P_2 , the strain energies stored in the bar are U_1 and U_2 , respectively.



If U is the strain energy stored in the same bar when subjected to an axial tensile force ($P_1 + P_2$), the correct relationship is

- A. $U > U_1 + U_2$
- B. $U = U_1 - U_2$
- C. $U < U_1 + U_2$
- D. $U = U_1 + U_2$

39. Group-I gives a list of test methods for evaluating properties of aggregates. Group-II gives the list of properties to be evaluated.

Group-I: Test methods	Group-II: Properties
P. Soundness test	1. Strength
Q. Crushing test	2. Resistance to weathering
R. Los Angeles abrasion test	3. Adhesion
S. Stripping value test	4. Hardness

The correct match of test methods under Group-I to properties under Group-II, is

- A. P-2; Q-1; R-4; S-3
- B. P-2; Q-4; R-3; S-1
- C. P-4; Q-1; R-2; S-3
- D. P-3; Q-4; R-1; S-2

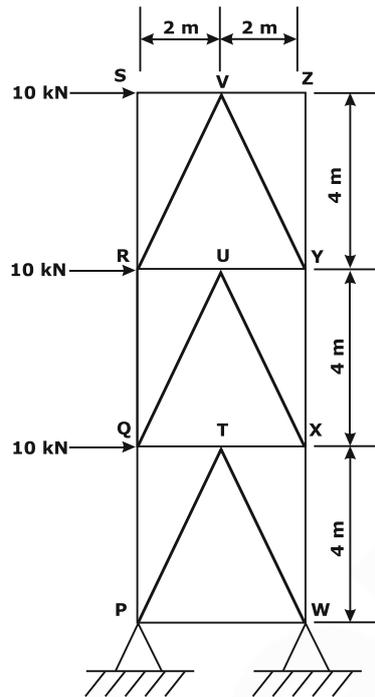
Vision 2021

Batch-3

A Course for ESE & GATE Civil Aspirants

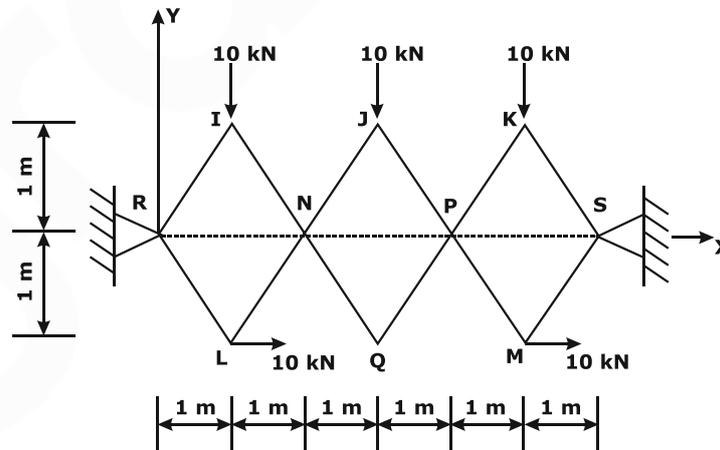
START FREE TRIAL

40. The plane truss has hinge supports at P and W and is subjected to the horizontal forces as shown in the figure (not drawn to the scale)



Representing the tensile force with '+' sign and the compressive force with '-' sign, the force in member XW (in kN, round off to the nearest integer), is _____.

41. Joints I, J, K, L, Q and M of the frame shown in the figure (not drawn to the scale) are pins. Continuous members IQ and LJ are connected through a pin at N. Continuous members JM and KQ are connected through a pin at P. The frame has hinge supports at joints R and S. The loads acting at joints I, J and K are along the negative Y direction and the loads acting at joints L and M are along the positive X direction.

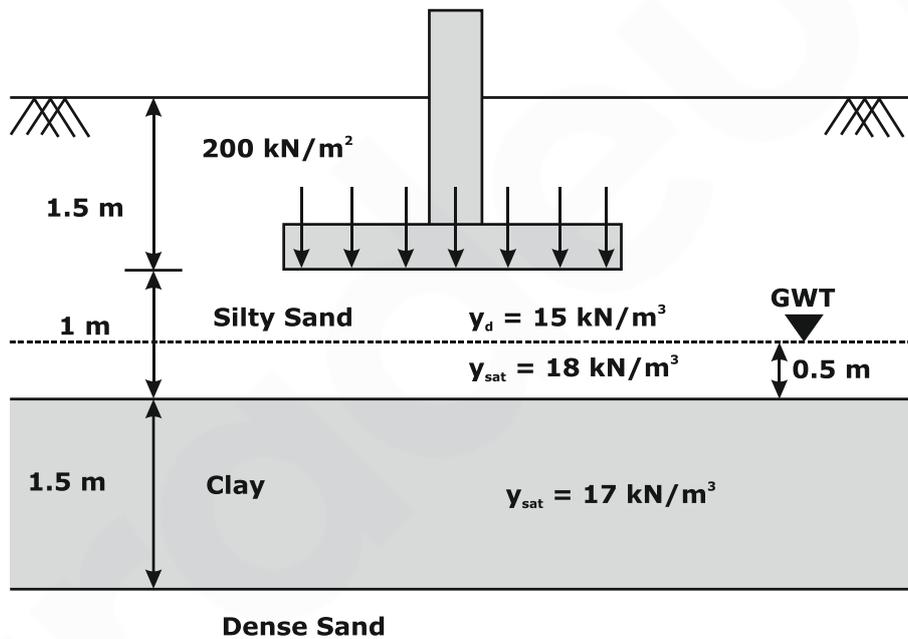


The magnitude of the horizontal component of reaction (in kN) at S, is

- A. 5
- B. 10
- C. 20
- D. 15

Vision 2021 **Batch-3**
 A Course for ESE & GATE Civil Aspirants
 START FREE TRIAL

42. A 5 m high vertical wall has a saturated clay backfill. The saturated unit weight and cohesion of clay are 18 kN/m^3 and 20 kPa , respectively. The angle of internal friction of clay is zero. In order to prevent development of tension zone, the height of the wall is required to be increased. Dry sand is used as backfill above the clay for the increased portion of the wall. The unit weight and angle of internal friction of sand are 16 kN/m^3 and 30° , respectively. Assume that the back of the wall is smooth and top of the backfill is horizontal. To prevent the development of tension zone, the minimum height (in m, round off to one decimal place) by which the wall has to be raised, is
43. A footing of size $2 \text{ m} \times 2 \text{ m}$ transferring a pressure of 200 kN/m^2 , is placed at a depth of 1.5 m below the ground as shown in the figure (not drawn to the scale). The clay stratum is normally consolidated. The clay has specific gravity of 2.65 and compression index of 0.3 .



Considering 2:1 (vertical to horizontal) method of load distribution and $\gamma_w = 10 \text{ kN/m}^3$, the primary consolidation settlement (in mm, round off to two decimal places) of the clay stratum is _____.

44. A hydraulic jump occurs in a triangular (V-shaped) channel with side slopes 1:1 (vertical to horizontal). The sequent depths are 0.5 m and 1.5 m . The flow rate (in m^3/s , round off to two decimal places) in the channel is _____.
45. The planar structure RST shown in the figure is roller-supported at S and pin-supported at R. Members RS and ST have uniform flexural rigidity (EI) and S is a rigid joint. Consider only bending deformation and neglect effects of self-weight and axial stiffening.

Vision 2021

Batch-3

A Course for ESE & GATE Civil Aspirants

START FREE TRIAL

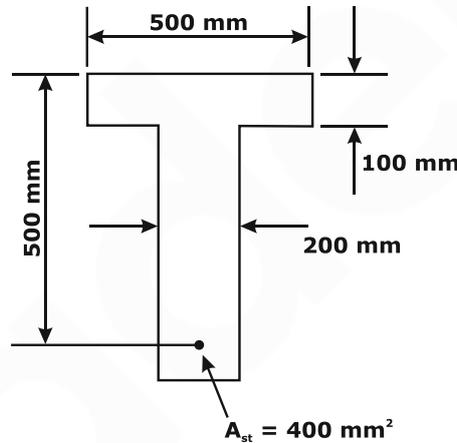
53. Alkalinity of water, in equivalent/litre (eq/litre), is given by

$$\{HCO_3^-\} + 2\{CO_3^{2-}\} + \{OH^-\} - \{H^+\}$$

Where, { } represents concentration in mol/litre. For a water sample, the concentrations of $HCO_3^- = 2 \times 10^{-3}$ mol/litre, $CO_3^{2-} = 3.04 \times 10^{-4}$ mol/litre and the pH of water = 9.0. The atomic weights are: Ca = 40; C = 12; and O = 16. If the concentration of OH^- and H^+ are NEGLECTED, the alkalinity of the water sample (in mg/litre as $CaCO_3$), is

- A. 50.0
- B. 130.4
- C. 100.0
- D. 65.2

54. The cross-section of the reinforced concrete beam having an effective depth of 500 mm is shown in the figure (not drawn to the scale). The grades of concrete and steel used are M35 and Fe550, respectively. The area of tension reinforcement is 400 mm^2 . It is given that corresponding to 0.2% proof stress, the material safety factor is 1.15 and the yield strain of Fe550 steel is 0.0044.



As per IS 456:2000, the limiting depth (in mm, round off to the nearest integer) of the neutral axis measured from the extreme compression fiber, is _____.

55. A theodolite was set up at a station P. The angle of depression to a vane 2 m above the foot of a staff held at another station Q was 45° . The horizontal distance between stations P and Q is 20 m. The staff reading at a benchmark S of RL 433.050 m is 2.905 m. Neglecting the errors due to curvature and refraction, the RL of the station Q (in m), is

- A. 413.955
- B. 413.050
- C. 431.050
- D. 435.955

Vision 2021 **Batch-3**
A Course for ESE & GATE Civil Aspirants

START FREE TRIAL



OUR TOP GRADIANS IN GATE 2020



Avinash Verma

AIR-9

ME



Monarch Joshi

AIR-25

ME



Kartikay Kaushik

AIR-26

CE



Ajay Gupta

AIR-35

ME



Varun Tiwari

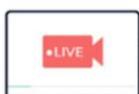
AIR-35

CE

Classroom 

Vision 2021-Course for ESE & GATE (Batch-3)

Civil Engineering



750+hrs
Live Class



7000+
Practise
Question



Test Series

Vision 2021

A Course for **ESE & GATE** Civil Aspirants
Batch-3

Why take this course?

- > **650+ Hours** of Live Classes for ESE & GATE Technical Syllabus
- > **150+ Hours** of Live Classes for ESE Prelims Paper 1 Syllabus
- > **750+ Quizzes & Conventional Assignments** for Practice
- > Subject & Full-Length **Mock Tests** for GATE & ESE



Abhinav Negi | Joshit Kumar Singh | Venkata Tilak Uppalapati | Rakesh Talreja