VANI INSTITUTE GATE/IES

HYDERABAD * BANGALORE * PUNE * CHENNAI * KOCHI * KOLKATA

GATE 2015 EXAMINATION

CIVIL ENGINEERING

Section Name: General Aptitude

01. Select the pair that best expresses a relationship similar to that expressed in the pair

Children : Pediatrcian

a) adult : orthopedist

b) females : gynecologist

c) Kidney : Nephrologist

d) Skin : Dermatologist

Ans : a

02. If ROD is written as URDG then SWAN should be written as

a) VXDQ b) VZDQ c) VZDP d) UXDQ

Ans :b

03. a function f(x) is linear and has value of 29 at x= -2 and -39 at x = 3 find its value at x = 5.

a)59 b) 45 c) 43 d) 35

Ans :c

04. Extreme focus on syllabus studying for a test has become such has a dominant concern of Indian student that they closes their minds to anything _____to the requirements of the exam.

a) related b) extraneous c) outside d) useful

Ans :b

05. The Tamil version of _____ John Abraham starrer Madras Café_____ cleared by the sensor board with no cuts last week, but the film distributor _____ no takers among the exhibitors for a release in Tamilnadu_____ this Friday.

a) Mr.. Was . found . on

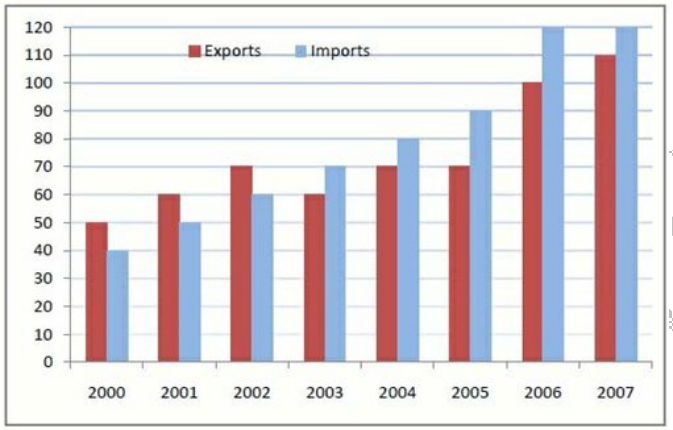
b) a.was.found.at

c) The.was.found.on

d) a. being. Find. At

Ans :b

06. The exports and imports (in crores of rupees) of a country from the year 2000 to 2007 are given in the following bar chart. In which year is combined percentage increasing imports and exports the highest.



Ans :2006

07. Most experts feel that in spit of possessing all the technical skills required be a batsman of the highest order he is unlikely to be so due to lack of requisite temperament. He was guilty of throwing away is wicket several times after working hard to lay a strong foundation is critics pointed out that until he addressed this problem. Success at the highest level will continue to elude him.

Which of the following statements below is/or logically valid can be inferred from above passage

i.He was already a successful batsman at the highest level

ii. He has to improve his temperament in order to become a great batsman

iii. He failed to make many of his good start count

iv. Improving his technical skills will guarantee success

a) III and IV

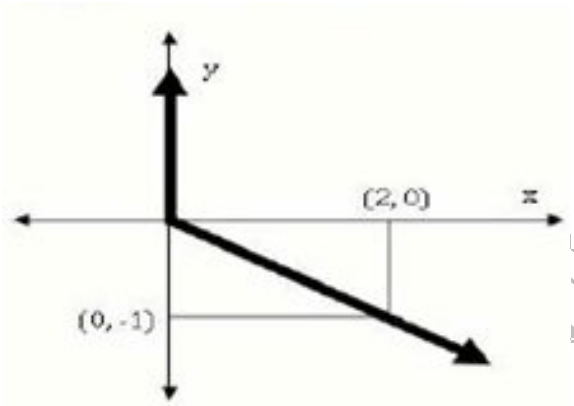
b) II and III

c) I, II and III

d) II only

Ans :b

08. Choose the most appropriate the question for the function drawn as a thick line in the plot below.



a) x = y-|y|
b) x = (-y-|y)
c) x = y+|y||
d) x = (+y+|y|)

Ans :c

09. Alexander turned his attention towards India since he had conquered Persia which one of the statement below logically valid and can be inferred from the above sentence

a) Alexander would not have turned his attention towards India had he conquered Persia

b) Alexander was not ready to rest on his laurels and wanted march to India

c) Alexander was completely in control of his army and could command it to move towards to India

d) Since Alexander kingdom extended to Indian border after the conquest of Persia he was came to move further

Ans :b

10. The Head of a newly formed government desires to appoint 5 of the 6 selected members P,Q,R,S,T and U to portfolios of home, power, defense, telecom and finance.

U does not want any portfolio if S gets one of the five. R want either home are finance or no portfolio. Q says that if S gets either power or telecom, then she must get the other one. T insists on a portfolio if P gets one. Which is the valid distribution of portfolio

a) P- home, Q-power, R-defense, S-telecom, T-finance
b) R-home, S-power, P-defense, Q-telecom, T-finance
c) P-home, Q-power, T-defense, S-telecom, U-finance
d) Q-home, U-power, T-defense, R-telecom, P-finance

Ans :b

VANI INSTITUTE GATE/IES

HYDERABAD * BANGALORE * PUNE * CHENNAI * KOCHI * KOLKATA

CIVIL ENGINEERING

01. The integral $\int_{x1}^{x2} x^2 dx$ with x2>x1>0 is evaluated analytically as well as numerically using a single application of the trapezoidal rule. If I is the exact value of the integral obtained analytically and $\int$ is approximate value obtained using trapezoidal rule, which of the following statements is correct about their relationship.

a) $\int$ > 1 b) $\int$ <1

c) $\int$ = 1 d) in sufficient data to determine the relation ship

Ans :b

02. Workability of concrete can be measured using slump, compaction factor and vebe times consider the following statement for work ability of concrete.

I. as the slump increase the vebe time increase

II. As the slump increases, the compaction factor increases

a) Both I and 2 are true b) both and 2 are false c) 1 is true and 2 is false d) 1 is false 2 is true

Ans :c

03. Which of the following statement is FALSE

a) Plumb line is along the direction of gravity

b) Mean Sea Level (MSL) its used as a reference surface for establishing the horizontal control

c) Mean sea level is a simplification of the geoid

d) geoid is an equi-potential surface of gravity

Ans : d

04. The development length of a deformed reinforcement bar can be expressed as (1/k) (σ_s/τ_{bd}) from thr IS: 456-2000, The value of k can be calculated as _____

Ans : 6.4

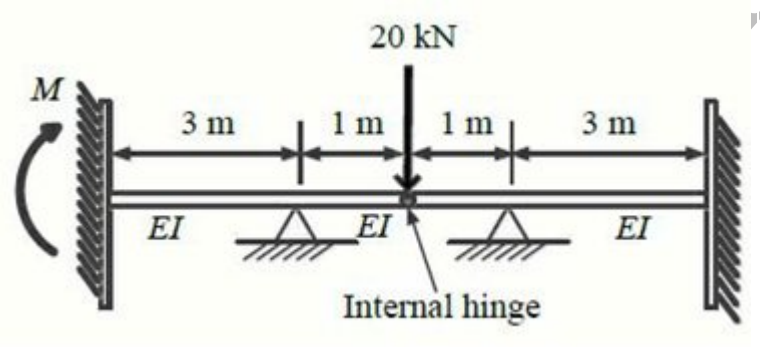
VANI INSTITUTE GATE/IES
HYDERABAD * BANGALORE * PUNE * CHENNAI * KOCHI * KOLKATA

05. Total Kjeldhal Nitrogen (TKN) concentration (mg/L as N) in domestic sewage is sun of the concentration of

a) Organic and inorganic nitrogen in sewage
b) Organic nitrogen and nitrate in sewage
c) Organic nitrogen and ammonia in sewage
d) Ammonia and nitrate in sewage

Ans :d

06.From beam shown below the value of the support moment M is _____ Kn –m



Ans :0

07. Consider the following probability mass function (p.m.f) 0f random variable X:

$$p(x,q)=\begin{cases} q & if\ X=0 \\ 1-q & if\ X=0 \\ 0 & otherwise \end{cases}$$

If q=0.4, the variance of X is _____

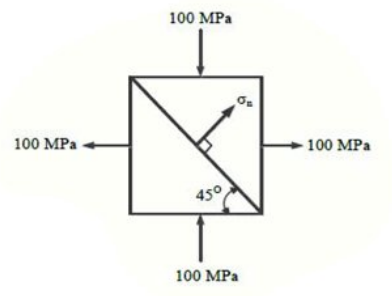
Ans :24

08. In two-dimensional steady flow field, in a certain region of the x-y phase, the velocity component in the x-direction is given by $v_x=x^2$ and the density varies as $p=\frac{1}{x}$. which of the following is a valid expression for the velocity component in the y-direction, v_y?

a) $v_y=-x/y$ b) $v_y=-x/y$ c) $v_y=-xy$ d) $v_y=xy$

Ans :3

09. Two triangular wedges are glued together as shown in the following figure. The stress acting normal to the interface, σ_n is _____MPa.



Ans :100

10. The penetration value of bitmen sample tested at 25^0C is 80. When this sample is heated to 60^0C and tested again. The needle of the penetration test apparent the bitumen sample by *d* mm. The value of *d* CANNOT be less than _____mm.

Ans :80

11. For steady incompressible flow through a closed-conduit of uniform cross-section, the direction of flow will always be:

a) From higher to lower elevation b) from higher to lower pressure

c) from higher to lower velocity d) from higher to lower piezometric head

Ans :a

12. Which of the following statements is NOT correct?

a) Loose sand exhibits contractive behavior upon shearing

b) Dense sand when sheared under untrained condition, may lead to generation of negative pore pressure

c) Black cotton soil exhibits expansive behavior

d) Liquefaction is the phenomenon where cohesion less soil near the downstream side of dams or sheet-piles loses its shear strength due to high upward hydraulic gradient

Ans :a

13. In a closed loop traverse of 1km total length, the closing errors in departure and latitude are 0.3m and 0.4m, respectively. The relative precision of this traverse will be:

a) 1:5000 b) 1:4000 c) 1:3000 d) 1:2000

Ans :d

14. Solid waste generated from an industry contains only two components, X and Y as shown in the table below.

Component	**Composition (%weight)**	**Density (kg/m^3)**
X	C_1	ρ_1
Y	C_2	ρ_2

Assuming $(C_1+C_2)=100$, the composite density of the solid waste(ρ) is given by

a) $\dfrac{100}{\left(\dfrac{c_1}{\rho_1}+\dfrac{c_2}{\rho_2}\right)}$ b) $100\left(\dfrac{\rho_1}{c_1}+\dfrac{\rho_2}{c_2}\right)$

c) $100\left(c_1\rho_1+c_2\rho_2\right)$ d) $100\left(\dfrac{\rho_1\rho_2}{c_1\rho_1+c_2\rho_2}\right)$

Ans : a

15. A circular pipe has a diameter of 1m bed slope of 1 in 1000 and manning roughness coefficient = 0.01 it may be treated as an open channel flow when it is flowing just full i.,e… the water level just touches the crest the discharge is in condition is denoted by Q_{full} similarly the discharge when the pipe is flowing of and full i.e., with a flow depth of 0.5m is denoted by Q_{Half}. The ratio Q_{full} / Q_{Half} is.

a) 1 b) $\sqrt{2}$ c) 2 d) 4

Ans :d

16. Which of the following statement is TRUE per degree of disturbance of collected soil samples

a) Thinner sampler wall, lower the degree of disturbance of collected soil sample

b) Thikker the sampler wall, lower the degree of disturbance of collected soil sample

c) Thickness of the sampler wall, and the degree of disturbance of collected soil sample are un related

d) The degree of disturbance of collected soil sample is proportional to the inner diameter of the sampling tube

Ans :d

17. For What value of P the following set of equations will have no solution

2x+3y = 5

3x+py =10

Ans :4.5

18. Which of the following statements is true for the relation between discharge velocity and seepage velocity?

a) Seepage velocity is always smaller than discharge velocity

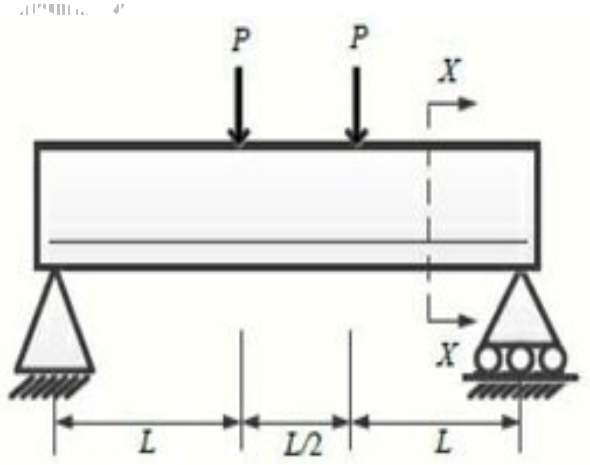
b) Seepage velocity can never be smaller than discharge velocity

c) Seepage velocity is equal to the discharge velocity

d) no relation between seepage velocity and discharge velocity can be established

Ans :a

19. A consider the singly rain forced beam shown in the figure below.



At cross section XX, which of the following statement is true at the limit state

a) The variation of stress is linear and that of strain non-linear

b) The variation of stain is linear and that of stress is non-linear

c) The variation of both stress and strain is linear

d) The variation of both stress and strain is non-linear

Ans :b

20. The Two columns below show some parameter and their possible values

Parameter	**Value**
P- Gross command area	I – 100 Hectares/cumec
Q – Parameter wilting point	II- 6 ^{0}C
R- Duty cannel water	III- 1000 Hectares
S- Delta of wheat	IV-1000cm
	V-40cm
	IV-0.12

Which of the following option matches the parameter and the value correctly

a) P-I, Q-II, R-III, S-IV b) P-III,Q-VI,R-I,S-V

c) P-I, Q-V, R-VI,S-II d) P-III, Q-II, R-V, S-IV

Ans :d

21. A fine grained soil has 60% silt content the soil behaves as semisolid when water content is between 15% and 28%. The soil behaves fluid like when the water content is more 40%. Activity of the soil is.

a) 3.33 b) 0.42 c) 0.30 d) 0.20

Ans :d

22. Consider the following statement for air entrained concrete

I. air entertainment reduced the water demand for a given level of work ability

II. Use of air entrained concrete is environments where cycling freezing and thawing is expected

Which of the following is TRUE

a) Both I and II are true
b) Both I and II are false
c) I is true II false
d) I is false II true

Ans :a

23. In an unconsolidated undrained triaxial test it is observed that an increased in sell pressure from 150kpa to 250kpa lead to a poor pressure increase of 80kpa it is further observed that an increase of 50kpa in deviatorac stress results in an increase of 25kpa in the four pressure the value of skempton pore pressure parameter B is.

a) 0.05 b) 0.625 c) 0.8 d) 1.0.

Ans :b

24. Which of the following statement can't be used to describe free flow speed of a traffic stream.

a) u_f is the speed well flow is negligible

b) u_f is the speed well density is negligible

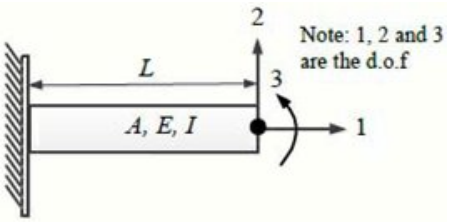
c) u_f is effected by geometry and surface condition of the road

d) u_f is the speed at which flow is maximum and density is optimum

Ans :a

VANI INSTITUTE GATE/IES
HYDERABAD * BANGALORE * PUNE * CHENNAI * KOCHI * KOLKATA

25. For the beam shown below the stiffness coefficient K_{22} can be written as



a) $\frac{6EL}{L^2}$ b) $\frac{12EL}{L^3}$ c) $\frac{3L}{L}$ d) $\frac{EL}{6L^2}$

Ans :a

26. The composition of an air entrained concrete is given below

Water : 184kg/m^3

Ordinary Portland cement : 368kgm^3

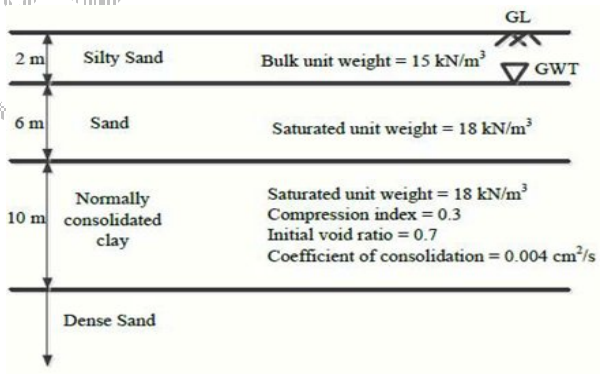
Sand : 606kgm^3

Course aggregate 1155kgm^3

Assume the specific gravity of OPC sand and course aggregate to be 3.14, 2.67 and 2.74 respectively. The air content is _____let us / m^3

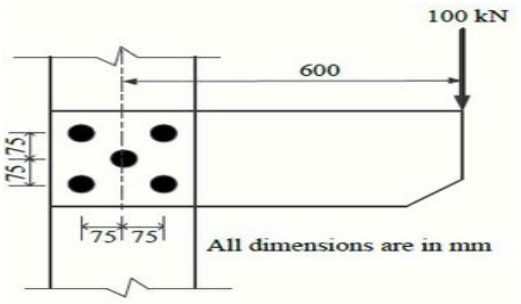
Ans :105

27. A water tank is to be constructed on the soil deposit shown in the figure below. A circular footing of diameter 3m and depth of embedment 1m has been designed to support the tank. The total vertical load to be taken by the footing is 1500kn. Assume the unit weight of water has 10kn/m^3 and load dispersion pattern has 2v : 1H. the expected settlement the tank due to primary consolidation of the clay layer is ____mm.



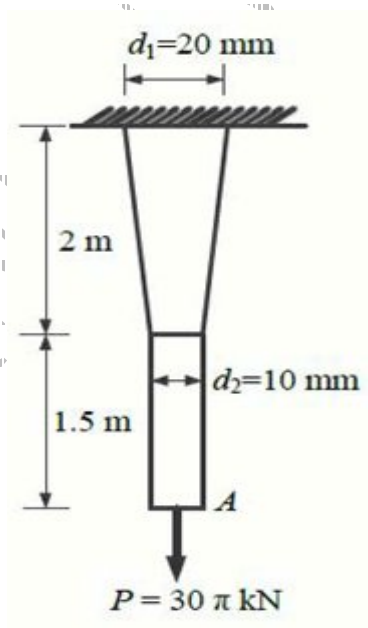
Ans :49.6

28. A bracket plate connected to a column flange transmits a load of 100kn as shown in the following figure. The maximum force for which the bolt should be designed ____ an



Ans :20

29. A tapered circular road of diameter varying from 20mm to 10mm is connected another uniform circular rod of diameter 10mm as shown in the following figure. Both bars are made or same material with the modules of elasticity E = 2×10^5mpa. When subject to a load P =30πkn. The deflection at point A is _____mm.



Ans : .015

30. Consider the following differential equation x(ydx+xdy) cos yyx = (xdy-ydx) sin y/x. which of the following is the solution of above equation (c is an arbitrary constant).

a) xyy/cos y/x = c

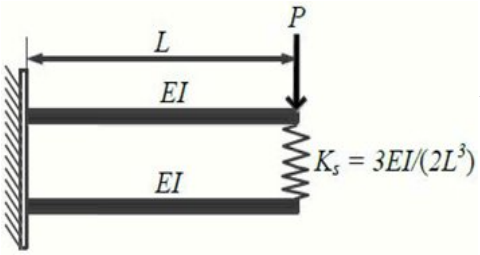
b) x/y sin y/x = c

c) xy cos y/x = c

d) xy sin y/x = c

Ans :c

31. Two beams are corrected by a linear stream as shown in the following figure for a loan P as shown in the figure the percentage of the applied load P carried by the spring is _____.



Ans :50

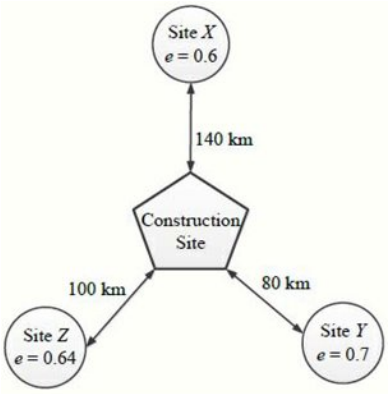
32. In a survey work three independent angle XYNZ were observed with weight $W_X W_Y W_Z$ respectively. The wait of the sum of angles XYZ is given by.

a) $1/\left(\frac{1}{W_X}+\frac{1}{W_Y}+\frac{1}{W_Z}\right)$ b) $\left(\frac{1}{W_X}+\frac{1}{W_Y}+\frac{1}{W_Z}\right)$

c) $W_X+W_Y+W_Z$ D) $W_X^2+W_Y^2+W_Z^2$

Ans :d

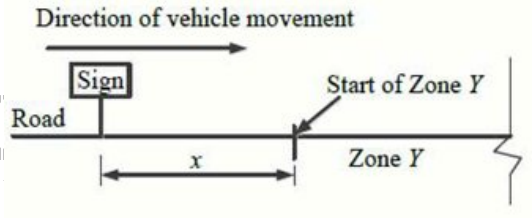
33. An earth embankment is to be constructed with compacted cohesion less soil the volume of the embankment is $5000m^3$ and the target dry unit weight is 1.62 kn $/m^3$. Three near by sites have been identified from where the required soil can be transported to the construction site. The white ratios of different sites shown in the figure. Assume the specific gravity of soil to the 2.7 per all three sites. If the cost transportation per km is twice the cost of excavation for m^3 of barrow pits with site would you choose as the most economic solution(use unit weight of water = $10km/m^3$).



a) Site X b) Site Y c) Z d) any of the site

Ans :c

34. A sign is required to be put of asking drivers to slow down to 30km per hour before entering zone Y on this road. Vehicles require 174m to slow down to 30km/h. the distance of 174m includes distance travel during the perception reaction time of drivers. The sign can be lead by 6/6 vision drivers from a distance 48m. the sign is placed at a distance of xm from the start of zone Y. so that even a 6/9 vision drivers can slow down to 30km/h before entering the job. The minimum value of x is _____m.



Ans :45

35. In a catchment there are four rain gauge stations PQR&S normal annual precipitation values at the station are 78mm, 850m, 950mm & 980mm respectively. In the year2013 station QR&S were operative but P was not using the normal ratio method. The precipitation at station P for the 2013 has been estimated 860mm. if the precipitation at station Q&R for the year 2013 were 90mm and 1010mm precipitation. What was the observed precipitation S per the year.

Ans :540

36. A 20m thick clay layer is sand which between a silty and layer and a gravelly sand layer the layer of experience 30mm. settlement in 2 year.

Given

$$T_v = \begin{cases} \frac{\pi}{4}\left(\frac{U}{100}\right)^2 & for\ U \le 60\% \\ 1.781 - 0.933\log_{10}(100 - U) & for\ U > 60\% \end{cases}$$

Where T_v is the time factor and U is the degree of consolidation in %

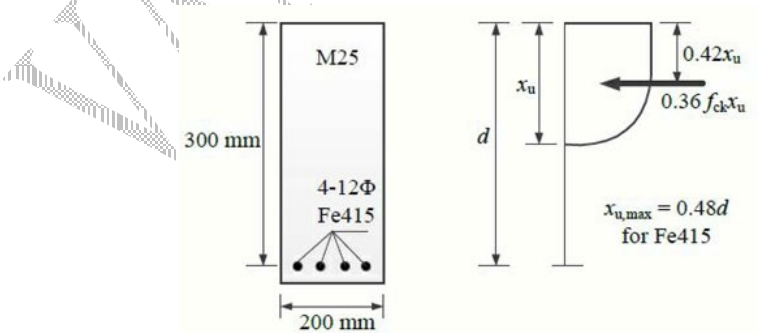
If the coefficient of consolidation of the layer is 0.003 cm^3/s_2 the deposit will experience a total of 50mm settlement in the next _____years.

Ans :3.3

37. The directional derivative of the field $u(x,y,z) = x^2-3yz$ in the direction of the vector (I+J-2K) at point (2,-1,4) is _____.

Ans :6.53

38. Consider the singly rain forced beam section given below the stress blocked parameters for the cross section IS : 45X-2000 are also given below. The moment of resistance for the given section by the limit state method is _____kn-m.



Ans :25.50

39. The acceleration time relationship for a vehicle subjected to non-uniform acceleration is $dv/dt = (\alpha - \beta v_0)\, e^{-\beta r}$

Where v is the speed in m/s t is the time s, α&βr parameters and v_0 is initial speed m/s if the accelerating behavior of vehicle whose driver intense to overtake a slow moving vehicle a head is described as $dv/dt = \alpha - \beta v$.

Considering $\alpha = 2 m/s^2$ $\beta = 0.05 s^{-1}$ and $dv/dt = 1.3 m/s^2$ at 3= ts the distance travelled the vehicle in 35s is _____.

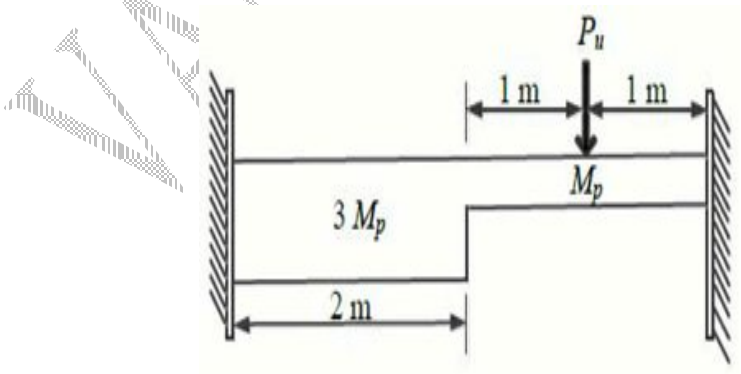
Ans :655.025

40. Consider a primary sedimentation tank in a water treatment plant with surface overflow rate of $40 m^3/m^2$ d the diameter of the spherical particle which will have 90% theoretical removal efficiency in this tank is _____ μm Assume that settling velocity of the particles in water is describe by stock law.

Given density of water = $1000 kg/m^3$ density of particle = $2650 kg/m^3$, g = $9.81 m/s^2$, Kinematic viscosity of water = $1.10 \times 10^{-6} m^2/s$.

Ans : .002

41. for formation of collaps mechanism in the following figure. The minimum value of P_u is cm_p/L. M_p and $3M_p$ denote the plastic movement capacities of beam section as shown in the figure. The value of c is _____.



Ans :12

42. Two reservoirs are connected through a 930m long, 0.3m diameter pipe which has gate valve. The pipe entrance is sharp(loss coefficient = 0.5) and the valve is half open (loss coefficient = 5.5) the head difference between the two reservoirs is 20m. assume the friction factor for the pipe has 0.03 and g = 10 m/s^2. The discharge in the pipe accounting for all minor and major losses is _____ m^3/s.

Ans : .07

43. The smallest and largest Eigen values of the following matrix are:

$$\begin{bmatrix} 3 & -2 & 2 \\ 4 & -4 & 6 \\ 2 & -3 & 5 \end{bmatrix}$$

a) 1.5 and 2.5 b) 0.5 and 2.5 c) 1.0 and 3.0 d) 1.0 and 2.0

Ans :d

44. A hydraulic jump is formed in a 2m wide rectangular channel which is horizontal and frictional the post jump depth and the velocity are 0.8m and 1m/s respectively. The pre jump velocity is _____ m/s(us g= $10m/s^2$).

Ans : .8

45. A short reach of a 2m wide rectangular open channel has its bed level rising in the direction of flow at a slope of 1 in 10000 it carries a discharge of $4m^3/s$ and its manning roughness coefficient is 0.01 the flow in the reach is gradually varying at a certain section in this reach the depth of flow was measured as 0.05m. the rate of change of water depth with distance dy/dx. At the section is _____ (use g = $10ms^2$).

Ans :45

46. A non Homogeneous soil deposit consists of a silt layer sandwich between a fine-sand layer at top and a clay layer below. Permeability of the silt layer is 10 times the permeability of the clay layer and one-tenth of the permeability of the sand layer. Thickness of the silt year is 2 times the thickness of the and layer and two-third of the thickness of the clay layer. The ratio of equivalent horizontal and equivalent vertical permeability of the deposit is _____.

Ans :1

47. The 4-hr hydrograph for a catchment is given in the table below. What would be the maximum ordinate of the S-curve (in m^3/s) derived from this hydrograph?

Time (hr)	0	2	4	6	8	10	12	14	16	18	20	22	24
Unit hydrograph ordinate (m^3/s)	0	0.6	3.1	10	13	9	5	2	0.7	0.3	0.2	0.1	0

Ans :1.83

48. In a region with magnetic declination of 2^0E. the magnetic Fore bearing (FB) of a line AB was measured as N$79^0$50'E. There was local attraction at A. To determine the correct magnetic bearing of the line, a point O was selected at which there was no local attraction. The magnetic FB of line AO and OA were observed to be S$52^0$40'E and N$50^0$20'W, respectively. What is the true FB of line AB?

a) N$81^0$50'E b) N$82^0$10'E c) N$84^0$10'E d) N$77^0$50'E

Ans :b

49. On a circular curve, the rate of super elevation is e. While negotiating the curve a vehicle comes to a stop. It is seen that the stopped vehicle does not slide inwards(in the radial direction). The coefficient of side friction is *f*. which of the following is true:

a) $e \le f$ b) $f < e < 2f$ c) $e \ge 2f$ d) None of the above

Ans :a

50. The drag force, F_D, on a sphere kept in a uniform flow field depends on the diameter of the sphere, D; flow velocity, *V*; fluid density, *p* ; and dynamic viscosity,μ. Which of the following options represents the non-dimensional parameters which could be used to analyze this problem?

a) $\frac{F_D}{VD}$ *and* $\frac{\mu}{pVD}$ b) $\frac{F_D}{\rho VD^2}$ *and* $\frac{\rho VD}{\mu}$

c) $\frac{F_D}{\rho V^2 D^2}$ *and* $\frac{\rho VD}{\mu}$ d) $\frac{F_D}{\rho V^3 D^3}$ *and* $\frac{\mu}{\rho VD}$

Ans :b

VANI INSTITUTE GATE/IES
HYDERABAD * BANGALORE * PUNE * CHENNAI * KOCHI * KOLKATA

51. Consider the following complex function

$$f(z)=\frac{9}{(z-1)(z+2)^2}$$

Which of the following is one of the residues of the above function

a) -1 b) 9/16 c) 2 d) 9

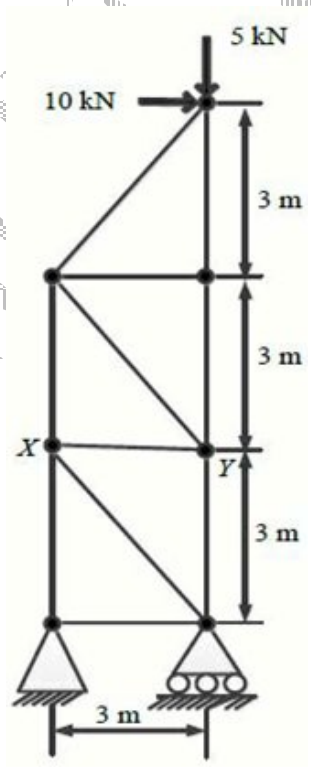
Ans : - 1

52. The concentration of sulfur dioxide in ambient atmosphere was measured as $30\mu g/m^3$. Under the same condition the above SO_2 concentration expressed in ppm is _____.

Given p/(rt) = 41.6 mol/m^3 where p = pressure t = temperature r= universal gas constant molecular wait of SO_2= 65.

Ans :b

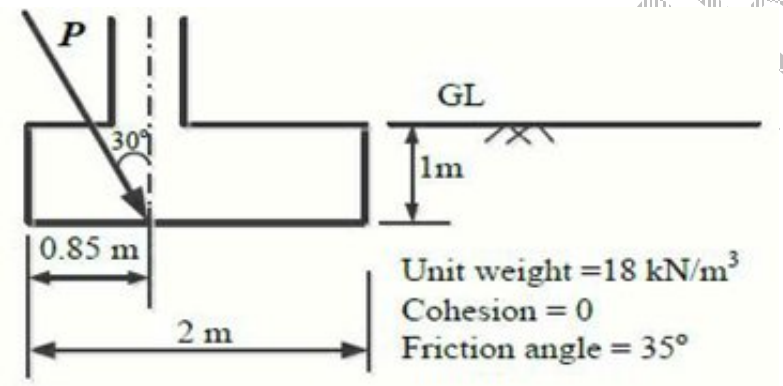
53. For the 2D truss with the applied load shown below. The strain energy in the member XY is _____. kn-m for member XY assume AE = 60kl where A is cross section area and E is modulus of elasticity.



Ans :0.35

54. A square footing (2m x 2m) is subjected to an inclined point load p has shown in the figure below. The water table is located well below the base of the footing. Considering one way eccentricity the net safe load carrying capacity of the following a factory of safety 3.0 is _____ kn.

The fallowing factors may be used down barring capacitor : N_q =33.3, N_γ=37.16 shape factor : F_{qs}= $F_{\gamma s}$ =1.315, depth factor : F_{qd} = $F_{\gamma d}$ = 1.113 inclination factors : f_{qt} = 0.4444, $f_{\gamma i}$=0.02.



Ans :14.8

55. The quadratic equation x^2-4x+4=0 is to be solved numerically starting with initial guess x_0 = 3. The Newton rapshon method is applied to get a new estimate and then the secant method is applied once using the initial guess and this new estimate. The estimated value of the route after the application of the secant method is _____.

Ans : 2.75