



Civil Engineering (Afternoon Paper)

Test Date: 12-2-2022 Test Time: 2:30 a.m.

Stream Name: Civil Engineering (Afternoon Paper)

- Q1. In a triaxial unconsolidated undrained test or a saturated clay sample, cell pressure was 100 kpa, If deviator stress at failure was 150 kpa, then undrained shear strength. Jerny .com
- Let y be a non zero vector of sixe 2022×1 . Which of the following is correct. Q2.
 - a) y.y^T Ps invertible
 - b) y.y^T has rank 2022
 - c) y.y^T is symmetric
 - d) y^T .y is an eigen value of $y \cdot y^T$
- A sample of air analysed at 25°c and 1 atm pressure is reported to contain 0.05 ppm of SO₂. Atomic mass Q3. of S = 32, O = 16. The equivalent SO₂ concentration in μ g/m³.
- Q4. Two discrete sphere particle P & Q of equal mass density are independently released in water. Particle P & Q have dia 0.5 mm & 1mm respectively the drag force on particle Q will be times the drag force g particle P.
- Q5. The base length of runway at MSL is 1500 m. If runway located at 300 m above MSL, the actual length 2
- Q6. In a certain month, the reference crop evapotranspiration at a location is 6mm/day. If the crop coefficient and soil coefficient are 1.2 and 0.8 respectively. The actual evapotranspiration in day
- The inside diameter of sampler tube is 50 mm. The inside diameter of the cutting edge is kept such Q7. that inside clearance is 1% to minimize the friction on the sample as the sampler tube enter into soil. The inside diameter of cutting edge is.



- Q8. It is given that an aggregate mix has 260 gm of CA, 240 gm FA. The specific gravity of the coarse & find aggregates are 2.6 & 2.4 respectively. The bulk specific gravity of mix is 2.3. Find volume of voids?
- Q9. It is given that an aggregate mix has 260gm of CA, 240 gm FA. The specific gravity if the coarse & fine aggregates are 2.6 & 2.4 respectively the bulk specific gravity of mis is 2.3. Find volume of voids?
- A pair of six faced dice is rolled thrice. The probability that the sum of outcome comes to the 4 in two attempt out of three attempt.
- Q11. $[E] = \begin{bmatrix} 1 & 1 \\ 1 & -1 \end{bmatrix}$ $P = Trace [E]^8$, $Q = Trace [E]^{11}$ Then P + Q =
- Q12. $\int \left(x \frac{x^2}{2} + \frac{x^3}{3} \frac{x^4}{4} + \dots\right) dx$ equal to

a)
$$\frac{-1}{1-x^2} + C$$

a)
$$\frac{1-x^2}{1-x} + C$$

c) $\frac{-1}{1-x} + C$

b)
$$\frac{-1}{1+x^2} + C$$

d)
$$\frac{1}{1+x} + C$$

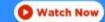
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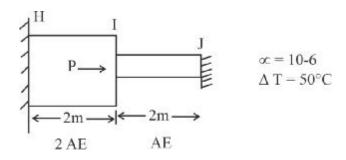




- In a certain month, the reference crop evapotranspiration at a location is 6 mn/day. If the crop co-eff and soil coeff are 1.2 po.S. Actual evapotranspiration in mm/day is
 - 6.8 a)

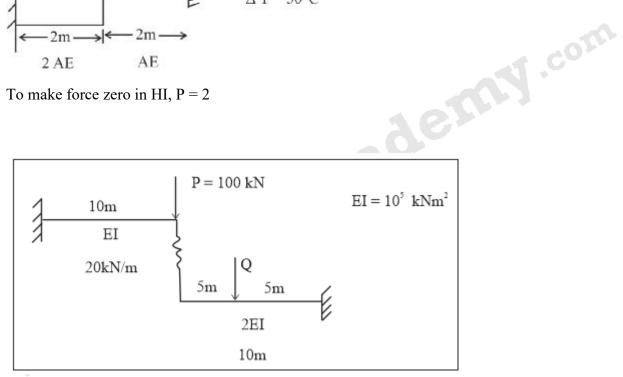
- 5.76
- d) 8

Q14.



To make force zero in HI, P = 2

Q15.



What is the value of Q.



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COURSE FEATURES





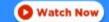








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- What is the dimension of dynamic viscosity
 - a) MLT^{-1}

- b) $ML^{-1}T^{-1}$
- c) $ML^{0}T^{-1}$
- d) $ML^{-2}T^{-2}$
- Q17. The tensioned member have span 15m, Area = 450×450 mm is prestressed with three steel tenders, each of 200 mm2, straight and located 125 mm from bottom. The tendons are tensioned one after another to a stress of 1500 mpa. Assume prestress to be same in all tender and modular ratio is 6. The average loss of prestress due to elastic deformation of concrete, considering all three tendon is:
 - 28.32 Mpa
- b) 42.48 Mpa
- c) 14.15 Mpa
- d) 7.08 Mpa
- A hydraulic jump takes place in 6 m wide Rectangular Channel at point where upstream depth is 0.5 m (just before jump). If the discharge in the channel is 30 m/s2, energy loss in the jump 1.6 m. Froude number at the jump is $(g = 10 \text{ m/s}^2)$
- For traffic stream V is space mean speed, k is the density, q is the flow, V_f, k_j jam density. Speed decreases O19. linearly with flow, which of the following is correct.
 - a) $q = v_f V \left(\frac{v_f}{k_j}\right) k^2$ c) $q = v_f V \left(\frac{k_f}{v_j}\right) v^2$

b) $q = k_j k - \left(\frac{v_f}{k_j}\right) k^2$ d) $q = v_i v - \left(\frac{k_j}{v_f}\right) v^2$

- The rectangular channel, a hump is provided which of the following statements are correct for chocked Q20. and unchoked condition?
 - For choked and 'y₁' decreased for supercritical flow and increases for supercritical flow
 - b) For choked 'y₁' increases for supercritical flow and decreases for supercritical flow
 - In unchoked condition 'y₁' remains constant
 - In chocked condition 'y₁' remains at critical
- Q21. The flood control structure having an expected life of n years is designed by considering a flood of return period T years. When $T = n \& n \to \infty$, the structures hydrologic risk of failure in percentage
- If M.B of sun at a place at noon is 52° E the mag declination (degrees) Q22.
 - 4°E
- 4°W b)
- c) 2°W
- d) 2°E

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- Q23. Both the numerator and the denominator of $\frac{3}{4}$ are increased by a positive integer and those of $\frac{15}{17}$ are decreased by the same integer. This operation results in same value for both the fractions what is the value of x?
 - a) 2

b) 3

- c) 1
- d) 4

- Q24. $x : y : z = \frac{1}{2} : \frac{1}{3} : \frac{1}{4}$. What is the value of $\frac{x+z-y}{y}$
 - a) 0.75

- b) 3.25
- c) 1.25
- d) 2.25
- Q25. A process equipment emits 5 kg/h of VOC. If a placed over the process organic captures 95% of the VOC, then the fugitive emission in kg/h is:
- Q26. Two discrete sphere particles P and Q of equal mass density are independently released in water. Particle P and particle Q have diameter of 0.5 mm and 1 mm respectively. Assume stoke law valid. The drag force on particle Q will be times the drag force of particle P.
- Q27. If 100 mg HNO₃ is mixed to make 1 liter solution. Then Ph value of the solution is?
- Q28.



Shape factor = ?

$$fy = 250 \text{ mpa}$$

$$a = 100 \text{ mm}$$

Q29. Determine power of a pump required whose efficiency is 80%. Given delta of crop 144 cm and area to be irrigated 108 ha and base period 120 days and water application efficiency 80% lowest level of water below ground level is 10 m. [1 hp = 746 watt]



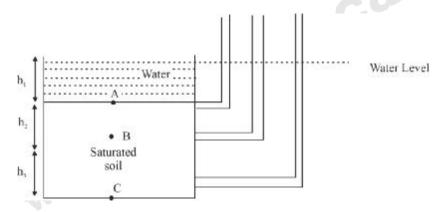
- A uniform rod KJ of weight W shown in the figure rests against a frictionless vertical wall at the plant K and rough horizontal surface at point J. It is given w = 10 kN, a = 4m, b = 3mThe minimum coefficient of static friction at J required for equilibrium
- Q31. If mass is halved 'k' is double then effect on 'w' and 'T'.
- O32. On a single lane road, the density of traffic is 40 veh/km. The time mean speed and space mean speed are 40 kmph and 30 kmph respectively. What will be the average headway in (sec) between the vehicle.
 - a) 2.25

- b) 6.25×10^{-4}
- c) 8.33×10^{-4}
- d) 3.00
- Q33. A group pile of total 16 piles are arranged in a square format. The c/c dis. 3m. d = 1m, I = 20m. The COIN design capacity of each pile is 1000 kN. The pile group efficiency (ng) is given

$$\eta_{g}=1-\frac{\theta}{90}\!\!\left[\frac{(n-1)\!m+(m-1)\!n}{mn}\right]\theta=\tan^{-1}\!\!\left(\frac{d}{s}\right)$$

m, n are no. of rows & column in plan. The design value of pile group capacity (kN)

Q34.



A soil sample water column of height h. The effective stress at point A, B, C are σ'_A , σ'_B , σ'_C , respectively γ_{sat} γ' be saturated and submerged unit weight γ_{w} is the unit weight of water. Which expression correctly $(\sigma'_A, \sigma'_B, \sigma'_C)$?

a) $(h_1 + h_2 + h_3) \gamma'$ b) $(h_2 + h_3)(\gamma_{sat} - \gamma_w)$

 $(h_1 + h_2 + h_3) \gamma_{sat}$ c)

d) $(2h_2 + h_3) \gamma'$

