

## Civil Engineering (Afternoon Paper )

Test Date: 12-2-2022

Test Time: 2:30 a.m.

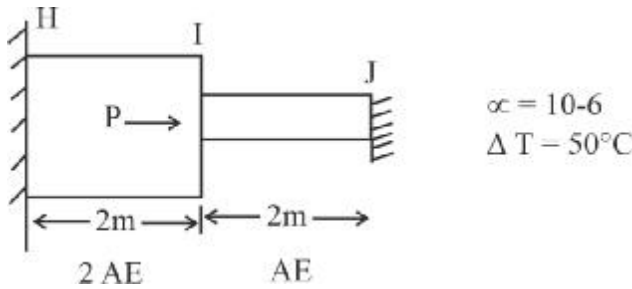
Stream Name: Civil Engineering (Afternoon Paper)

- Q1. In a triaxial unconsolidated undrained test on a saturated clay sample, cell pressure was 100 kpa, If deviator stress at failure was 150 kpa, then undrained shear strength.
- Q2. Let  $y$  be a non zero vector of size  $2022 \times 1$ . Which of the following is correct.
- $y \cdot y^T$  is invertible
  - $y \cdot y^T$  has rank 2022
  - $y \cdot y^T$  is symmetric
  - $y^T \cdot y$  is an eigen value of  $y \cdot y^T$
- Q3. A sample of air analysed at  $25^\circ\text{C}$  and 1 atm pressure is reported to contain 0.05 ppm of  $\text{SO}_2$ . Atomic mass of S = 32, O = 16. The equivalent  $\text{SO}_2$  concentration in  $\mu\text{g}/\text{m}^3$ .
- 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 on particle P.
- Q5. The base length of runway at MSL is 1500 m. If runway located at 300 m above MSL, the actual length is
- 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 is  $\frac{\text{mm}}{\text{day}}$
- Q7. The inside diameter of sampler tube is 50 mm. The inside diameter of the cutting edge is kept such 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.



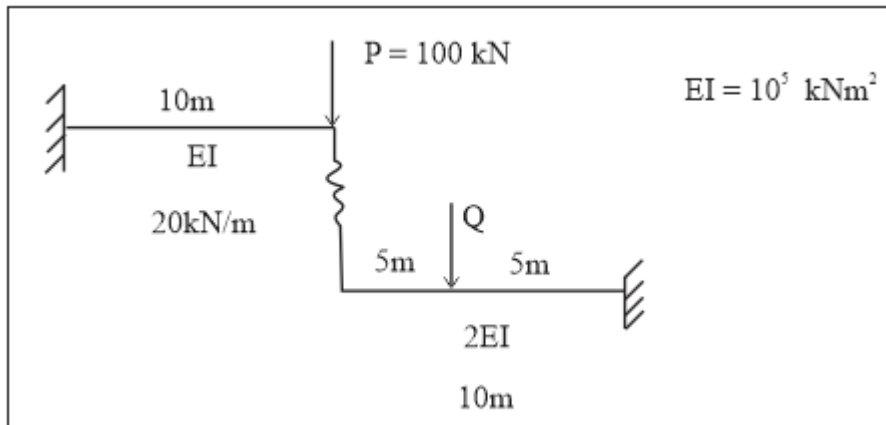
- Q13. In a certain month, the reference crop evapotranspiration at a location is 6 mm/day. If the crop co-eff and soil coeff are 1.2 po.S. Actual evapotranspiration in mm/day is \_\_\_\_\_.  
 a) 6.8                      b) 5.76                      c) 7.2                      d) 8

Q14.



To make force zero in HI,  $P = 2$

Q15.



What is the value of Q.

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- Q16. What is the dimension of dynamic viscosity  
 a)  $MLT^{-1}$                       b)  $ML^{-1}T^{-1}$                       c)  $ML^0T^{-1}$                       d)  $ML^{-2}T^{-2}$
- Q17. The tensioned member have span 15m, Area =  $450 \times 450$  mm is prestressed with three steel tenders, each of  $200 \text{ mm}^2$ , 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:  
 a) 28.32 Mpa                      b) 42.48 Mpa                      c) 14.15 Mpa                      d) 7.08 Mpa
- Q18. 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  $30 \text{ m}^3/\text{s}$ , energy loss in the jump 1.6 m. Froude number at the jump is ( $g = 10 \text{ m/s}^2$ )
- Q19. For traffic stream  $V$  is space mean speed,  $k$  is the density,  $q$  is the flow,  $V_f$ ,  $k_j$  jam density. Speed decreases linearly with flow, which of the following is correct.  
 a)  $q = v_f V - \left(\frac{v_f}{k_j}\right) k^2$                       b)  $q = k_j k - \left(\frac{v_f}{k_j}\right) k^2$   
 c)  $q = v_f V - \left(\frac{k_f}{v_j}\right) v^2$                       d)  $q = v_j v - \left(\frac{k_j}{v_f}\right) v^2$
- Q20. The rectangular channel, a hump is provided which of the following statements are correct for chocked and unchoked condition?  
 a) For chocked and ' $y_1$ ' decreased for supercritical flow and increases for supercritical flow  
 b) For chocked ' $y_1$ ' increases for supercritical flow and decreases for supercritical flow  
 c) In unchoked condition ' $y_1$ ' remains constant  
 d) In chocked condition ' $y_1$ ' 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  $T = n$  &  $n \rightarrow \infty$ , the structures hydrologic risk of failure in percentage is \_\_\_\_\_.
- Q22. If M.B of sun at a place at noon is  $52^\circ$  E the mag declination (degrees)  
 a)  $4^\circ$ E                      b)  $4^\circ$ W                      c)  $2^\circ$ W                      d)  $2^\circ$ E



