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EE24BTECH11036 - Krishna Patil

1) There is no value of x that can simultaneously satisfy both the given equations . Therefore , find the 'Least Squares error' solution to the two equations , i.e. , find the value of x that minimizes the sum of squares of the errors in the two equations . _____

$$2x = 3$$
$$4x = 1$$

2) What is the minimum number of multiplications involved in computing the matrix product PQR ? Matrix P has 4 rows and 2 columns , matrix Q has 2 rows and 4 columns , and matrix R has 4 rows and 1 column. _____

3) A $1-h$ rainfall of 10 cm magnitude at a station has a return period of 50 years . The probablity that a $1-h$ rainfall of magnitude of 10 cm or more will occur in each of two successive years is :

a) 0.04
b) 0.2
c) 0.02
d) 0.0004

4) Maximum possible value of Compacting Factor for fresh (green) concrete is:

a) 0.5
b) 1.0
c) 1.5
d) 2.0

5) As per is 800 : 2007 , the cross-section in which the extreme fiber can reach the yield stress , but cannot develop the plastic moment of resistance due to failure by local buckling is classified as

a) plastic section
b) compact section
c) semi-compact section
d) slender section

6) the creep strains are

a) caused due to dead load only
b) caused due to live loads only
c) caused due to cyclic loads only
d) independent of loads

7) As per IS 456 : 2000 for $M20$ grade concrete and plain bars in tension, the design bond stress τ_{bd} = 1.2 , MPa . Further, IS 456 : 2000 permits this design bond stress value to be increased by 60% for HSD bars. The stress in the HSD reinforcing steel bars in tension, σ_s = 360 , MPa . Find the required development length, L_d, for

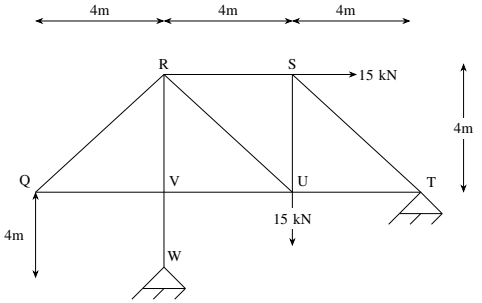
HSD bars in terms of the bar diameter, ϕ. _____

8) The 'plane section remains plane' assumption in bending theory implies:
   a) strain profile is linear
   b) stress profile is linear
   c) both stress and strain profiles are linear
   d) shear deformations are neglected

9) Two steel columns P (length L and yield strength f_y = 250 MPa) and Q (length $2L$ and yield strength f_y = 500)MPa have the same crossections and end-conditions . The ratio of buckling load of column P to that of column Q is:

   a) 0.5
   b) 1.0
   c) 2.0
   d) 4.0

10) The pin-jointed 2-D truss is loaded with a horizontal force 15 kN at joint S and another 15 kN vertical force at joint U , as shown .Find the force in member RS ($in\ kN$) and report your answer taking trnsion as positive and compression as negative . _____



11) A symmetric I-section with (width of each flange = 10 mm, depth of web = 100 mm , and thickness of web = 10 mm) of steel is subjected to a shear force of $100kN$. Find the magnitude of the shear stress in N/mm^2 in the web at its junction with the top flange. _____

12) in its natural condition , a soil sample has a mass of 1.980 kg and a volume of 0.001 m^3 . After being completely dried in an oven, the mass of the sample is 1.800 kg . Specific gravity G is 2.7 . Unit weight of water is 10 kN/m^3. The degree of saturation of the soil is:

   a) 0.65
   b) 0.70
   c) 0.54
   d) 0.61

13) The ratio of N_f/N_d is known as shape factor , where N_f is the number of flow lines and N_d is the number of equipotential drops . flow net is always drawn with a

constant b/a ratio , where b and a are distances between two consecutive flow lines and equipotential lines , respectively . Assuming that b/a ratio remains the same, the shape factor of aflow net will change if the

a) upstream and downstream heads are interchanged
b) soil in the flow space is changed
c) dimensions of the flow space are changed
d) head difference causing the flow is changed