SE-sem-IV-CBSGS- Civil/Mech -AM-IV 22/11/19

Q. P. Code: 25068

Total Marks: 80 **Time: Three hours**

1. Q1 is compulsory

2. Solve any three out of the remaining from Q.2 to Q. 6.

3. Figures on the right hand side indicate marks.

4. Use of statistical tables is allowed.

Q.1. a) A continuous random variable has P.D.F. f(x) = $kx^2(1-x^3)$, 0≤ x ≤ 1, and f(x) = 0, otherwise.. Find k and mean. 5

b) If A=$\begin{bmatrix} 1 & 2 & -2 \\ -1 & 3 & 0 \\ 0 & -2 & 1 \end{bmatrix}$ then prove that $A^{-1} = A^2 - 5A + 9I$. 5

c) By using Green's theorem evaluate the integral over the square formed by the line x=±1, $y = \pm 1, \oint (x^2 + xy)dx + (x^2+y^2)dy$ 5

d) Calculate Karl Pearson's coefficient of correlation from the data. 5

x	3	5	4	6	2
y	3	4	5	2	6

2. a) Random sample of 900 items is found to have a mean of 65.3cm. Can it be regarded as a sample from a large population whose mean is 66.2 cm. and standard deviation 5cm. at 5% level of significance? 6

b) Use the Lagrange's method of multipliers to solve the NLPP, optimize

$Z= 6x_1^2 + 5x_2^2, subjected\ to\ x_1 + 5x_2 = 7, x_1, x_2 \geq 0$ 6

c) A vector field is given by $\bar{F} = (x^2 + xy^2)i + (y^2 + x^2y)j$, prove that $\bar{F}$ is irrotational, find the scalar potential 8

Q3. a) If x is a Poisson variable such that, p(x=1) = p(x=2).find E (x^2) 6

b) Evaluate by using Stokes theorem, $\oint 3ydx + 4zdy + 6ydz$ where c is the curve of the intersection of sphere $x^2 + y^2 + z^2 = 8z\ and\ z = x + 4$. 6

c) A die was thrown 132 times and the following frequencies were observed. Test the hypothesis that the die is unbiased. 8

[PTO

Number obtained	1	2	3	4	5	6	Total
Frequency	15	20	25	15	29	28	132

Q.4 a) Obtain Spearman's coefficient of rank correlation from the given data. 6

x	32	55	49	60	43	37	43	49	10	20
y	40	30	70	20	30	50	72	60	45	25

b) Use Gauss's divergence theorem to evaluate, $\iint x^2 dydz + y^2 dzdx + 2z(xy - x - y)dxdy$ and S is the surface of the cube bounded by x = 0, x = 1, y = 0, y = 1, z = 0, z = 1. 6

c) Using the Kuhn Tucker method solve the NLPP, Maximize $Z = -x_1^2 - x_2^2 - x_3^2 + 4x_1 + 6x_2$ subjected to $x_1 + x_2 \leq 2, 2x_1 + 3x_2 \leq 12, x_1, x_2 \geq 0$ 8

Q.5. a) Show that the matrix $A = \begin{bmatrix} 4 & 2 & -2 \\ -5 & 3 & 2 \\ -2 & 4 & 1 \end{bmatrix}$ is diagonalizable. Find the transforming matrix and the diagonal matrix. 6

b) Regression lines are given by $6y = 5x + 90$, $15x = 8y + 130$, $\sigma_x^2 = 16$, Find mean for x and y, correlation coefficient between x and y, and σ_y^2. 6

c) The standard deviations calculated from two random samples of sizes 9 and 13 are 1.99 and 1.9. can it be regarded as a sample drawn from the normal populations with the same standard deviations? (Given: $F_{0.025} = 3.51, with\ dof = 8 and\ 12, F_{0.025} = 4.20, with\ dof = 12\ and\ 8$) 8

Q6.a) Find A^{50} if $A = \begin{bmatrix} 2 & 1 \\ 1 & 2 \end{bmatrix}$ 6

b) The monthly salary x in a big organization is normally distributed, with mean Rs. 3000 and standard deviation Rs 250. What should be the minimum salary of a worker in this organization so that the probability that he belongs to top 5% workers? 6

c) The heights of six randomly chosen sailors are in inches: 63, 65, 68, 69,71and 72. The heights of ten randomly selected soldiers are 61, 62, 65,66,69,69,70,71,72 and 73. Discuss in the light that this data suggests that the soldiers are on an average taller than sailors. 8

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(16) SE-Sem-IV- CBSGS-Civil-SUR-II 28/4/16

Q. P. Code: 26092

Time: 3 hours Marks: 80

1. Question **No.1** is compulsory. Attempt any **three** questions out of remaining.
2. Assume suitable data if required, state the same clearly.
3. Figures to the right indicate full marks.
4. Explain answers with neat sketches, wherever necessary

Attempt sub questions in order.

1. Write short notes on **any four** from following:
   a. Types of horizontal and vertical curves stating application of each in civil engineering (05)
   b. Reverse curve, its necessity, elements of reverse curve. (05)
   c. Batter board, boning rod. (05)
   d. Tacheometry, its principle and advantages of tacheometry (05)
   e EDM, its principle and working. (05)

2 a. List various methods of setting out of curves. Explain setting out of curve by two theodolite method. (06)
   b Describe various obstacles in laying out of simple curves. (08)
   c. Explain procedure for calculating data and setting out of vertical curve by chord gradient method. (06)

3 a. The following readings were taken with a tacheometer fitted with analectic lens. Calculate gradient between station P and Q. (10)

Investment Station	Staff station	WCB	Vertical angle	Stadia readings	Central hair reading
O	P	40°	10°	2.050	1.40
	Q	160°	-8° 30'	1.980	1.35

The RL of instrument station is 280.50 m and the height of instrument axis is 1.450m.

   b. Explain how to calculate the R L of top of tower whose base is inaccessible, with two plane method. (05)
   c. Derive an expression for calculating horizontal and vertical distance for line of sight inclined and staff held vertical. (05)

4 a. The bearings of three lines AB = 21°45', BC = 80°30', CD = 147°15'. Find the radius of curve tangential to three lines. Length BC = 450m. Also determine the tangent lengths. (08)
   b. What is compound curve? What are elements of compound curve (06)
   c. Explain setting out procedure of compound curve. (06)

5 a. A 8m wide road is to deflect through an angle of 60° with the centre line radius 300m, the chainage of point of intersection being 3600m. A transition curve is to be used at each end of the circular curve of such a length the rate of gain of radial acceleration is $0.5 m/s^3$, when the speed is 50kmph. Find: (1) Length of transition curve. (2) chainages of all the junction points. (10)
   b. Explain setting out of sewer line. (05)
   c. Describe survey project carried out by you at site for tacheometric contouring. (05)

6 a. A 3% rising gradient meets 2% down gradient. A vertical curve 200m long is to be used. The pegs are to be fixed at 20m interval. Calculate the RLs of the points on the vertical curve using tangent correction method, given that the height of collimation is 350m R L of apex is 350m and its chainage is 1000m. Tabulate the results. (10)

b. Write short note on working of digital planimeter (05)

c. Write short note on remote sensing and its applications in civil engineering (05)

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SA-I

Q. P. Code :25897

(3 Hours) (Marks-80)

76

N.B.

1) Question no.1 is **compulsory.** Attempt **any three** out of remaining five questions.
2) Figures to the write indicate full marks.
3) Assume suitable data if needed but justify the same.

Q.1 Answer **any four** from following-

(a) For a 3-hinged symmetrical parabolic arch subjected to UDL over the entire span, prove that the radial shear force at every section is zero. 5

(b) Write Prof.Perry's formula, explaining the terms involved. Also state the importance of this formula over Secant formula. 5

(c) State & explain Moment Area Theorem-II. Also draw the conjugate beams for following real beams shown below- 5

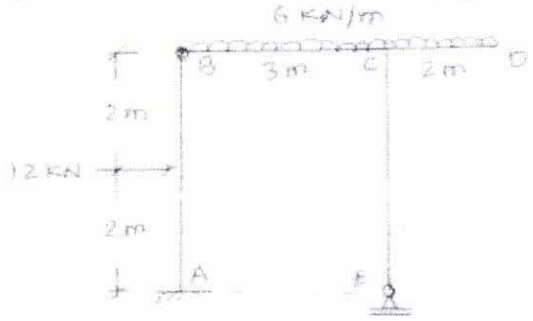
(d) Explain with neat sketches the terms-(i) Unsymmetrical bending (ii) Shear centre. Also state their significance in structural analysis. 5

(e) Write the BM equation needed as per Macaulay's method for the beam loaded as shown- 5

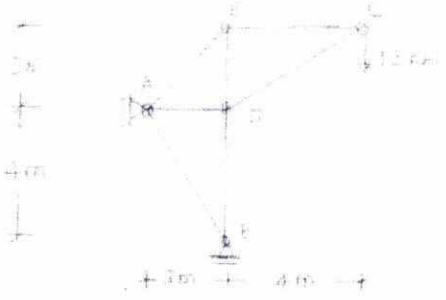
(f) State and explain-

i. Principle of superposition 5
ii. Castigliano's theorem.

Q.2 (a) For a rigid jointed plane frame shown in figure, find support reactions and draw FBD for all four members. Also draw AFD, SFD and BMD for the frame, indicating important points. Note that there is internal hinge at 'B'. 10



(b) A pin jointed truss is loaded and supported as shown in figure. Determine the horizontal deflection of joint 'C' using Unit Load Method. Take axial rigidity AE = 30,000 KN for all members. 10



Q.3 (a) An unsymmetrical 3-hinged parabolic arch is loaded as shown in figure. Find- 10

i. The position of third hinge at 'C' above the right support.
ii. Support reactions. .
iii. The position & magnitude of max +ve and max -ve BM in the arch. Also draw BMD for the arch.

Q.3 (b) A hollow circular column of length 6 m, external diameter 200 mm and internal diameter 150 mm is fixed at both ends. If the column carries a load of 180 KN applied at distance 45 mm from column axis, determine extreme fibre stresses. Also sketch the stress distribution diagram. Take E for column material as 96 GPa. 10

Q.4 (a) Using Moment Area Method **OR** Conjugate beam method, determine the location and magnitude of maximum deflection in a non-prismatic simply supported beam loaded as shown. 10

(b) A simply supported girder of span 24 m is traversed by a series of five wheel loads 10 KN,20 KN, 20 KN, 25 KN and 15 KN spaced at distances 3 m, 2 m, 2 m and 3 m respectively. If the load system is moving from left to right with 15 KN as leading load, find the location & magnitude of absolute maximum BM in the girder. 10

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SA-I

Q.5 (a) A 3-hinged stiffening girder of a suspension bridge of span 120 m is subjected to two point loads of 180 KN and 240 KN at distances 30 m and 80 m respectively from left support. The supporting cable has a central dip of 12 m. Draw SFD & BMD for the girder, indicating important points. Also find maximum & minimum cable tension. 12

(b) The T-shaped cross section of a 4 m long simply supported beam has flange & web dimensions 120 mm x 20 mm and 20 mm x 180 mm respectively. The beam carries a central point load of 40 KN inclined at angle 30^0 (clockwise) with vertical axis of cross section. Find maximum compressive and maximum tensile stresses. 8

Q.6 (a) Draw ILD for axial force in bottom chord member GH of a warren truss shown in figure. 4

(b) A rod AB of uniform cross section is fixed at 'A' and is bent in vertical plane to give the shape of quadrant of a circle of radius 'R'. At free end B a vertical load W (downward) is applied. Determine- 6

i. Strain energy stored in the rod due to bending moment
ii. Vertical deflection at B. Assume EI=Constant.

(c) Determine horizontal deflection at joint 'B' in a rigid jointed plane frame loaded as shown in figure. Take EI = 40,000 KNm^2. Use Virtual work method. 10

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(12) SE-Sem-IV_ CBSGS-Civil-B.D.D-I 12/12/17

Q.P. Code : 18499

(Time:4 Hours) (Max. Marks:80)

1. **Q.No. 1** is compulsory
2. Attempt any **Three questions** from remaining **Five** questions.
3. Assume any data suitably if not given and state it clearly.

1. It is proposed to construct a **RESIDENTIAL BANGALOW** in the suburban area of Thane District for an executive engineer of P.W.D.. The building is (G+1) R.C.C. framed structure, The plot size is 30 mx28 m. Following are the requirements:

(i)	Entrance Lobby	: min 3 mt wide
(ii)	Engineer's Office	: 25-30 sq mt
(iii)	Living Room	: 20-25 sq mt
(iv)	Study Room	: 12-15 sq mt
(v)	Master Bedroom	: 20-25 sq mt
(vi)	Bedroom (2 Nos)	:10-12 sq mt
(vii)	Kitchen cum Dining Room	: 20-25 sq mt
(viii)	Children room	: 10-12 sq mt.
(ix)	Stores	: 10-12 sq.mt.

Provide passages, staircase , sanitary unit, parking area etc. as per byelaws. Place the units are per their requirements on Ground and First Floor.

(a)Draw Ground floor plan. (15)

(b) Draw first floor line plan. (05)

2. (a) Explain Principles of planning with neat sketches. (10)

(b) Draw the foundation plan for the building given in Q.No.1 (10)

3. (a) Draw the detailed sectional elevation passing through staircase and other important units of building given in Q.No.1. (15)
(b) Explain Working drawing and submission drawing (05)

4. (a) Differentiate among Load Bearing, Framed and Composite structure with neat sketches and examples. (06)
(b) Draw the plan and section of pitched roof on hall measuring 8m x 8m. (08)
(c) Explain Sun Path diagram with its application in building planning (06)

5. (a) Draw the front elevation of the building given in Q.No.1. (10)

(b) Draw the site plan showing proposed built-up area, internal road, parking area, open space etc of the building given in Q.No.1. (10)

6. (a) Draw the plan and section of open well staircase for an educational building (G+1) having floor to floor height 3.6 mts. Also show design calculations. (10)
(b) What are various objects of building bye-laws. Explain Carpet area. (05)

(c) Draw roof terrace plan of the building given in Q.No.1 (05)

SE - Sem-IV - CBSGS - Civil - CT 18/04/17

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Q.P.Code:17042

DURATION : 03 HOURS MAX. MARKS : 80

INSTRUCTIONS :

1. Question number 1 is ***COMPULSORY.***
2. Attempt any ***THREE*** questions from the remaining ***FIVE*** questions.
3. Each full question carries ***EQUAL*** marks.
4. Numbers in parenthesis are right to indicate ***FULL*** marks.
5. ***ASSUME*** any suitable data wherever required.

Q.1 Attempt any *FIVE* of the following :

A) Explain Bulking Phenomenon of Sand. [04M]

B) Explain Curing of concrete. [04M]

C) Explain 'Boiling Water Method' to determining compressive strength of accelerated-cured concrete test specimens as per IS : 9013 - 2004. [04M]

D) Write a short note on High Performance Concrete. [04M]

E) Write a short note on Shotcrete. [04M]

E) Explain Concept of retrofitting in-case of UCRM load bearing structure. [04M]

Q.2 A) Design a nominal mix of M15 concrete grade for sand of zone-II grading and maximum size of CA is 40 mm to carry-out PCC work ,by using the table 9 of IS : 456 – 2000 whose clause no. is 9.3. Determine the mix proportions: 1) by mass (weight) & 2) by ratio. It is decided to use volume batch mixing on the site, find out the volumetric proportions for the mix. Take bulk densities of cement, sand and coarse aggregate as 1450 Kg./m^3 , 1600 Kg./m^3 and 1700 Kg./m^3 respectively. [10M]

B) Enlist the "Bogue's Compounds" of OPC. Explain their effects on properties of cement. [05M]

C) Define Workability of Plastic concrete. Enlist factors affecting of it and explain any one of them. [05M]

Q.3 A) The concrete mix design is carried out for M25 concrete grade as per Indian Standards. The mix proportions per m^3 of concrete is obtained as below :

Water (Kg.)	Cement (Kg.)	Sand (Kg.)	Coarse Aggregates (Kg.)
190	425	682	1064

Correct this proportions with explanation to suit the site conditions such that the free surface moisture of sand and crushed granite coarse aggregates are 2 % & 1 % respectively. Coarse aggregates contain 60 % of 20 mm size and 40 % of 12.5 mm size. Report your answers in weights as well as in ratios. [08M]

B) Define coarse aggregate. Classify coarse aggregates on the basis of surface texture. How does surface texture influences on the properties of plastic as well as hardened concretes ? [07M]

C) Define light weight concrete. Classify LWC on the basis of making method and enlist applications of aerated concrete (min. 4). [05M]

Q.4 A) Calculate approximately the ingredients of concrete, required to perform the slump cone test in the lab. If the mix proportions for M20 grade of concrete is 0.5 : 1 : 1.5 : 3. Take dimensions of slump cone is D = 200 mm, d – 100 mm and H = 300 mm. [08M]

Turn Over

B) Define admixture. Enlist chemical admixtures and explain WRAs based on, how does they works to increase workability and strength of the concrete ? [06M]

C) Define special concrete. Explain roller compacted concrete with field applications. [06M]

Q.5 A) Explain with neat sketches Routing & Sealing and Stitching methods of the crack repair techniques. [08M]

B) Define Fibre Reinforced Concrete. Explain cracking mechanism in FRC member subjected to flexure with neat labelled sketch. [07M]

C) Define Hot Weather Concreting. What are the precautions are to be taken while concreting in hot weather condition? [05M]

Q.6 A) Choose & write the correct options : [05M]

a) The Flow Table Test on fresh concrete is explained in IS _____
i) IS 456 : 2000 ii) IS 1199 : 1959 iii) IS 457 : 1957 iv) IS : 383 : 1970

b) The Flexural Tensile Strength on hardened concrete is explained in IS _____
i) IS 516 : 1959 ii) IS 10262 : 2009 iii) IS 456 : 2000 iv) IS 1199 :1959

c) The gradation of FA & CA are given in IS _____
i) IS 2386(part 1) : 1963 ii) IS 269 : 2013 iii) IS 383 : 1970 iv) IS 455 : 1989

d) The guidelines for Concrete Mix Design are given in IS _____
i) IS 10262 : 2009 ii) IS 10086 : 1982 iii) IS 10510 : 1983 iv) IS 10080 : 1982

e) Air entrainment in the concrete increases _____
i) workability, ii) strength, iii) the effect of temp. Variation, iv) the unit weight.

B) Enlist the advantages of Ready Mixed Concrete. [05M]

C) Write a note on Rebound Hammer Test on concrete. [05M]

D) Define High Strength Concrete and explain setting & hardening property of it. [05M]

Data for Nominal Mix Design [Q.2 A)]

Table 9 Proportions for Nominal Mix Concrete

(*Clauses* 9.3 *and* 9.3.1)

Grade of Concrete	Total Quantity of Dry Aggregates by Mass per 50 kg of Cement, to be Taken as the Sum of the Individual Masses of Fine and Coarse Aggregates, kg, *Max*	Proportion of Fine Aggregate to Coarse Aggregate (by Mass)	Quantity of Water per 50 kg of Cement, *Max*
(1)	(2)	(3)	(4)
M 5	800	Generally 1:2 but subject to an upper limit of 1:1½ and a lower limit of 1:2½	60
M 7.5	625		45
M 10	480		34
M 15	330		32
M 20	250		30

NOTE—The proportion of the fine to coarse aggregates should be adjusted from upper limit to lower limit progressively as the grading of fine aggregates becomes finer and the maximum size of coarse aggregate becomes larger. Graded coarse aggregate shall be used.

Example

For an average grading of fine aggregate (that is, Zone II of Table 4 of IS 383), the proportions shall be 1:1½, 1:2 and 1:2½ for maximum size of aggregates 10 mm, 20 mm and 40 mm respectively.

(46) SE-CE / Fm / Sem-IV / CBSGS 24/12/2019

Q. P. Code: 26419

(3 hours) **Total marks: 80**

N.B.: (1) Question no.1 is compulsory.

(2) Attempt any 3 questions out of the remaining 5 questions.

(3) Assume data wherever necessary and clearly mention the assumptions made.

(4) Draw neat figures as required.

Q1 Solve any four from the following **20**

a Define and explain the terms (i) Hydraulic gradient line and (ii) Total energy line.

b Write a note on Water Hammer & Control measures.

c Define Mach Cone, Mach angle, Zone of action and Zone of Silence.

d Explain Prandtl's Mixing Length Theory.

e Explain the term co-efficient of friction. On what factors does this co-efficient depend?

Q2 a The difference of water levels of two water reservoirs is 8 m. They are connected by a 40 m long pipe. For the first 25 m length, the diameter of the pipe is 120 mm and for the remaining length, the diameter is 200 mm, the change in diameter being sudden. Find the discharge into the lower reservoir. Take f = 0.008. **10**

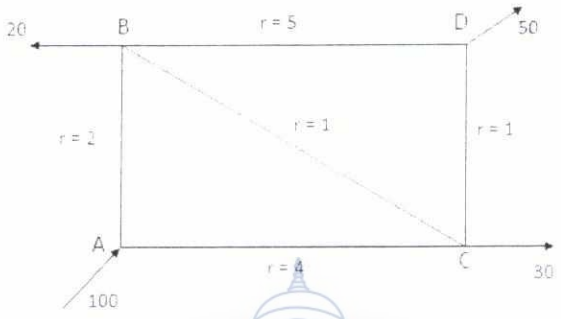
b. A syphon pipe 800 m long connects two reservoirs whose water surface levels differ by 9 m. The diameter of the pipe is 400 mm. Taking f = 0.008, find the discharge. If the summit of the syphon pipe is 6 m above the surface level of the upper reservoir, calculate the maximum length of the inlet leg for the pipe to run full. Neglect all losses other than friction. Take atmospheric pressure head = 10.3 m of water and separation pressure head = 2.3 m of water. **10**

Q3 a Two sharp ended pipes of diameters 50 mm and 100 mm respectively, each of length 100 m are connected in parallel between two reservoirs which have a difference of level of 10 m. If the co-efficient of friction for each pipe is (4f) 0.32, calculate the rate of flow for each pipe and also the diameter of a single pipe 100 m long which would give the same discharge, if it were substituted for the original two pipes. **10**

b Find the maximum power transmitted by a jet of water discharging freely out of a nozzle fitted to a pipe = 300 m long and 100 mm diameter with co-efficient of friction as 0.01. The available head at the nozzle is 90 m. **5**

c Show that the diameter of nozzle for maximum transmission of power is given by $d = \left[\frac{D^5}{8fL}\right]^{1/4}$ **5**

Q4 a For a pipe network shown below, determine the flow in each pipe. The value of n may be assumed as 2.0. 10



b Calculate the stagnation pressure, temperature and density on the stagnation point on the nose of a plane, which is flying at 800 km/hour through still air having a pressure 8.0 N/cm^2 (abs) and temperature -10^{0}C. Take R = 287 L/Kg K and k= 1.4. 10

Q5 a Determine (i) the pressure gradient, (ii) the shear stress at the two horizontal parallel plates and (iii) the discharge per meter width for the laminar flow of oil with a maximum velocity of 2m/s between two horizontal fixed plates which are 100 mm apart. Given μ = 2.4525 Ns/m^2. 10

b Prove that the velocity distribution for viscous flow between two parallel plates when both plates are fixed across a section is parabolic in nature. Also prove that maximum velocity is equal to one and a half times the average velocity. 10

Q6 a For turbulent flow in a pipe of diameter 300 mm, find the discharge when the centre-line velocity is 2 m/s and the velocity at a point 100 mm from the centre as measured by pitot tube is 1.6 m/s. 10

b A rough pipe of diameter 400 mm and length 1000 m carries water at the rate of 0.4 m^3/s. the wall roughness is 0.012 mm. Determine the co-efficient of friction, wall shear stress, centre-line velocity and velocity at a distance of 150 mm from the pipe wall. 10

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