



AIKTC/KRRC/SoET/ACKN/QUES/2018-19/

Date: _____

School: SoET-CBSGS Branch: CIVIL ENGG.

SEM: IV

To,
Exam Controller,
AIKTC, New Panvel.

Dear Sir/Madam,

Received with thanks the following Semester/Unit Test-I/Unit Test-II (Reg./ATKT) question papers from your exam cell:

Sr. No.	Subject Name	Subject Code	Format		No. of Copies
			SC	HC	
1	Applied Mathematics- IV	CE-C401		✓	02
2	Surveying- II	CE-C402		✓	02
3	Structural analysis- I	CE-C403		✓	02
4	Building design and drawing	CE-C404		✓	02
5	Concrete technology	CE-C405		✓	02
6	Fluid mechanics- II	CE-C406		✓	02

Note: SC – Softcopy, HC - Hardcopy

(Shaheen Ansari)
Librarian, AIKTC

Duration: 3 hours

Total Marks: 80

- Note: 1. Question No. 1 is compulsory
 2. Attempt any Three questions from the remaining Five questions.
 3. Use of statistical table is allowed

- Q.1.a. If the product of eigen values of $\begin{bmatrix} 6 & -2 & 2 \\ -2 & 3 & -1 \\ 2 & -1 & 3 \end{bmatrix}$ is 16, find the third eigen value (5)
- b. If X is a Poisson variate such that $P(X=1) = P(X=2)$. Find $E(X^2)$ (5)
- c. Find the angle between the normals to the surface $xy = z^2$, at the points (1, 4, 2) & (-3, -3, 3) (5)
- d. A random sample of 50 items given the mean 6.2 and variance 10.24. Can it be regarded as drawn from a Normal population with mean 5.4? (5)

- Q.2.a. A vector field is given by $\vec{F} = (y \sin z - \sin x) \mathbf{i} + (x \sin z + 2yz) \mathbf{j} + (xy \cos z + y^2) \mathbf{k}$, prove that it is irrotational and hence, find its scalar potential (6)
- b. Following results were obtained from 2 samples each drawn from the different population A & B. (6)

Population	A	B
Sample size	25	17
Sample SD	4	3

- c. Test the hypothesis that variance of A is less than or equal to variance of B (8)
- Show that the matrix $A = \begin{bmatrix} -9 & 4 & 4 \\ -8 & 3 & 4 \\ -16 & 8 & 7 \end{bmatrix}$ is diagonalisable. Find the diagonal form D and the diagonalising matrix M

- Q.3.a. In a distribution exactly normal, 7% of items are under 35 and 89% are under 63. What are the mean and standard deviation? (6)
- b. Using the method of Lagrange's multipliers, solve the following NLPP (6)
- Optimise $Z = 12x_1 + 8x_2 + 6x_3 - x_1^2 - x_2^2 - x_3^2 - 23$
 Subject to $x_1 + x_2 + x_3 = 10$
 $x_1, x_2, x_3 \geq 10$
- c. Evaluate $\int_C \vec{F} \cdot d\vec{r}$ where $\vec{F} = yz \mathbf{i} + xz \mathbf{j} + xy \mathbf{k}$ and C is the portion of the curve $\vec{r} = a \cos t \mathbf{i} + b \sin t \mathbf{j} + ct \mathbf{k}$ from $t = 0$ to $t = \pi/4$ (8)

- Q.4.a. The height of 6 randomly chosen sailors are in inches: 63, 65, 68, 69, 71, 72. The heights of 10 randomly chosen soldiers are: 61, 62, 65, 66, 69, 69, 70, 71, 72, 73. Discuss in the light that these data throw on the suggestion that the soldiers on an average are taller than the sailors. (6)
- b. Obtain the rank correlation from the following data (6)

X	10	12	18	18	15	40
Y	12	18	25	25	50	25

- c. If $A = \begin{bmatrix} 0 & 1 \\ -1 & 0 \end{bmatrix}$, find e^{At} (8)

Q.5.a Out of 800 families with 5 children each, how many would you expect to have (1) 3 boys & 2 girls (2) 5 girls (3) 5 boys (6)

b In an experiment on immunization of cattle from TB, the following results were obtained. (6)

	Affected	Not Affected	Total
Inoculated	267	27	294
Not Inoculated	757	155	912
Total	1024	182	1206

Use Chi-square test to determine the efficacy of vaccine in preventing TB

c Using Kuhn-Tucker conditions, solve the following NLPP (8)

Maximize $Z = 10x_1 + 10x_2 - x_1^2 - x_2^2$

Subject to $x_1 + x_2 \leq 8$

$-x_1 + x_2 \leq 5$

Q.6.a Using Green's theorem, evaluate $\oint_C (e^{x^2} - xy) dx - (y^2 - nx) dy$ where C is the circle $x^2 + y^2 = a^2$ (6)

b Suppose that in a certain region, the daily rainfall (in inches) is a continuous random variable X with probability density function f(x) is given by (6)

$$f(x) = \frac{3}{4} (2x - x^2), 0 \leq x \leq 2$$

$$= 0, \text{ elsewhere}$$

Find the probability that on a given day in this region, the rain fall is (1) not more than 1 inch (2) greater than 1.5 inches (3) between 0.5 and 1.5 inches

c Find the coefficient of regression and hence the equations of the lines of regression for the following data. (8)

X	78	36	98	25	75	82	90	62	65	39
Y	84	51	91	60	68	62	86	58	53	47

Estimate the value of y when x = 50 and also estimate the value of x when y = 90

3 Hours

Total Marks:80

- N.B. (1) Question no. 1 is compulsory
 (2) Attempt any three questions out of remaining five questions
 (3) Assume any additional data, if necessary, and state it clearly
 (4) Explain answers with neat sketches, wherever necessary

1. Attempt any four from following:
- Compare Compound curve and Composite curve (05)
 - Compare Fixed hair method and movable hair method of tacheometry (05)
 - Compare Transit Theodolite And Electronic theodolite (05)
 - Calculate the ordinate at 10m intervals for a circular curve if the length of long chord is 80m and radius of curve is 200m (05)
 - Write detailed note on applications of remote sensing in civil engineering. (05)
2. a. Define vertical curve. Sketch the types of vertical curves stating application of each. (06)
 b. List various methods of setting out of horizontal curves. Explain setting out of curve by two theodolite method. (08)
 c. A 20m chain is used to set out a simple circular curve. Two tangents intersect at chainage 1090m, the deflection angle being 60°. Calculate the necessary data for setting out of a curve of radius 250m using linear method of offsets from chords produced. Take peg interval as 20m. (06)

3. a. A tachometer fitted with annallactic lens is set up at an intermediate point on a traverse course PQ & following observations are made on a vertically held staff: (10)

Instrument station	Staff Station	Staff intercept	WCB	Vertical Angle	Axial hair Readings
O	P	1.2	20°	+4° 12'	1.15
O	Q	1.7	320°	+5° 42'	2.705

RL of instrument axis is 125m. Calculate gradient between staff stations.

- Explain how to calculate the R L of top of tower whose base is inaccessible, with two plane method. (05)
 - Derive an expression for calculating horizontal and vertical distance for line of sight inclined and staff held vertical. (05)
4. a. A road 8m wide is to deflect through an angle of 60° with the centre line radius 300m. The chainage of intersection point being 3605m. A transition curve is to be inserted at each end of circular curve of such a length that the rate of gain of radial acceleration is 0.5m/s³. The speed limit is 50kmph. Calculate length of transition curve; superelevation; chainage of all junction points. Offsets at L/4; L/2; 3L/4 and L. (12)
 b. What do you mean by setting out of works? Explain setting out of residential building with theodolite. The building is 6m wide and 12m long. The columns are spaced at 3m centre to centre along the length of building. (08)

5. a. A 0.6% rising gradient meets - 0.7% down gradient. The chainage of and RL of intersection points are 550m and 375m respectively. Calculate the RLs of the points on the vertical curve using tangent correction method. The rate of change of grade is 1% per peg. The peg interval is 20m. Tabulate the results. (10)
- b. Explain how surface survey is connected to underground survey and transfer of levels while setting out a tunnel. (10)
6. a. Describe in detail applications of GIS in civil engineering. (05)
- b. Define remote sensing and write classification of sensors. (05)
- c. What is GPS receiver? Write classification of GPS receivers. (05)
- d. Write short note on EDM, its principle and working. (05)

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17/5/19

(3 Hours)

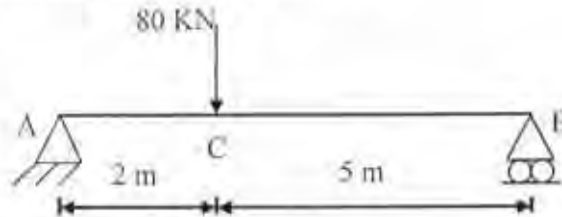
(Maximum Marks 80)

N.B.

- (1) Question No.1 is compulsory.
- (2) Attempt any three questions out of remaining questions.
- (3) Assume suitable data if required but justify the same.

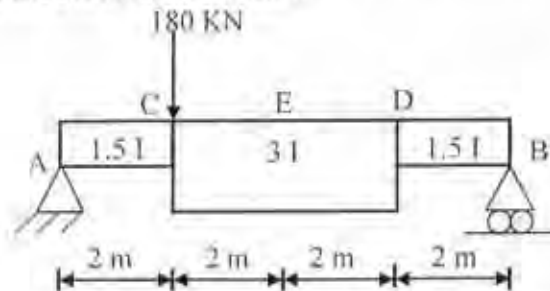
Q.1 Attempt any four from following-

- a. A circular section having of 300 mm external diameter and 20 mm thickness is used as a column of 4.2 m length. Both ends of the column are fixed. It carries a load of 180 KN at an eccentricity of 30 mm from the axis of the column. Find the maximum bending moment. Take $E = 94,000$ MPa. 5
- b. Define influence lines and explain its importance Draw typical ILD for R_A and M_A for a cantilever beam AB, where A is fixed and B is free. 5
- c. State and explain the two Mohr's theorems of Moment Area Method. 5
- d. Using strain energy method, determine the deflection at free end of a cantilever having length L and carrying a point load of P at free end. 5
- e. A cable carrying a load of 20 KN/m run of horizontal span is suspended between two supports 120 m apart. The supports are at the same level and the central cable dip is 6 m. Find maximum and minimum tensions in the cable. 5
- f. Find slope at A using Macaulay's Method. 5



Q.2

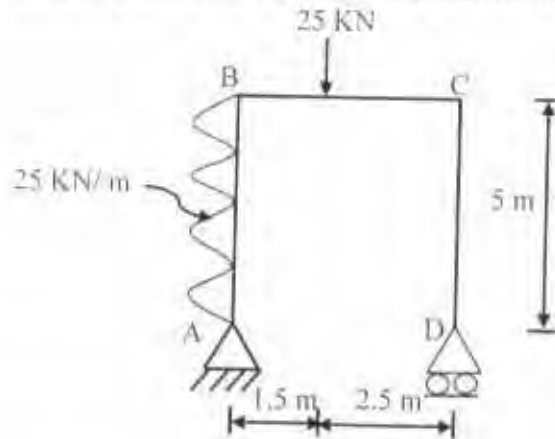
- a. Find rotation at A, B and deflection at E (mid-span) for the beam shown in figure using Conjugate Beam method. $EI = \text{Constant}$. 8



- b. A three hinged symmetrical parabolic arch ADCEB having central rise 6 m has a span of 40 m. It is hinged at A, B and at crown C. Point D and E are 10 m away from left and right support respectively. The arch carries an UDL of 20 KN/m over the portion DE. Find, 12
 - i) Support Reactions. ii) BM, Normal Thrust at D
 - iii) BM and Radial Shear force at E.

Q.3

- a. A cantilever beam of 6 m span carries a UDL of 24 kN/m over half span starting from fixed end. Find slope and deflection at free end by Moment Area Method, $EI = \text{Constant}$. 8
- b. Draw AFD SFD and BMD for each member shown in following figure. 12

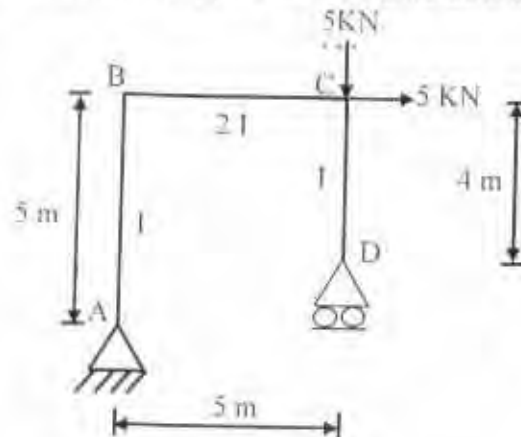


Q.4

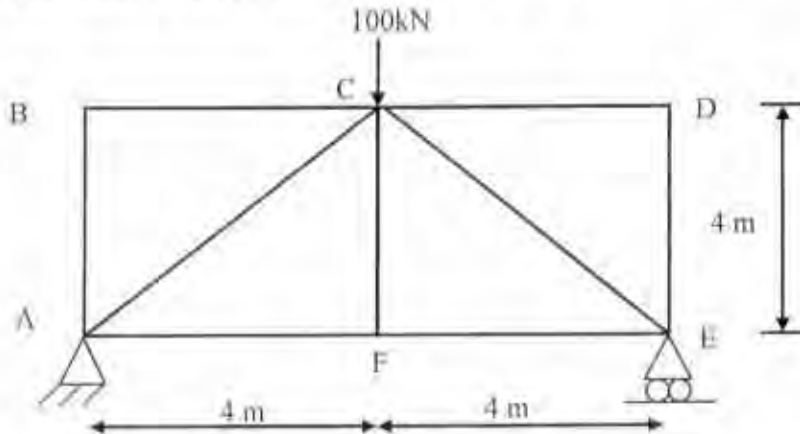
- a. A cable of 150 m span has a central dip of 15 m. It carries a load of 5 kN/m over entire span. Calculate the maximum and minimum tension in the cable. Also find horizontal and vertical force in the pier if the cable passes over a frictionless roller at the top of pier. 8
- b. Four point loads having magnitude of 10 kN, 18 kN, 18 kN and 12 kN are spaced at 2 m centre to centre spacing from each other with 12 kN load leading. They traverse a girder of 30 m span from left to right. Calculate the maximum bending moment and maximum shear force at 8 m from left support. 12

Q.5

- a. Find horizontal deflection at roller support for the frame as shown in figure using Unit Load Method. 10

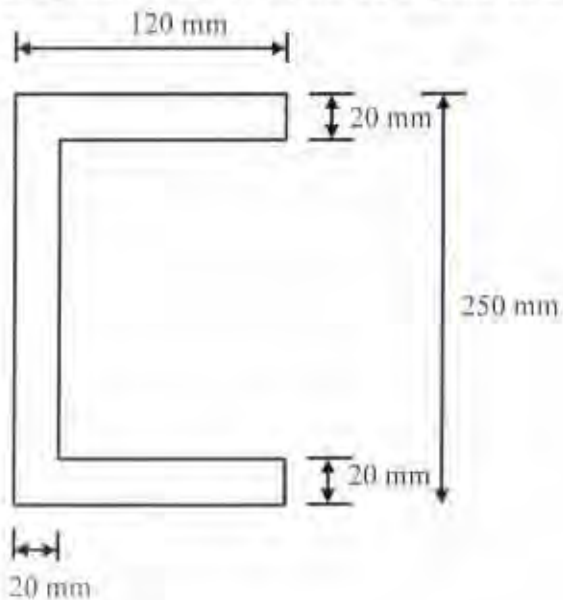


- b. Find vertical deflection of the joint B in the truss loaded as shown in following figure. 10
 Area of each section is 5000 mm^2 . $E = 2 \times 10^5 \text{ MPa}$.



Q.6

- a. Define principal moment of inertia and explain unsymmetrical bending with neat sketch. 6
- b. State the internal forces developed in the following members with neat free body diagram. 6
- i) Arch.
 - ii) Cable.
 - iii) Beam.
 - iv) Pin Jointed Frame.
 - v) Rigid Jointed Frame.
- c. Locate shear centre for a thin walled channel section shown in figure. 8



2

SE-sem-IV-CBS 95-Uni

23/5/19

Paper / Subject Code: 38804 / BUILDING DESIGN & DRAWING-I

(4 Hours)

(Max. Marks:80)

1. Q. No. 1 is compulsory
 2. Attempt any **three questions** from remaining questions.
 3. Assume any data suitably if not given and state it clearly.
1. It is proposed to allot a residential bungalow as (G+1) R.C.C. framed structure. Following are the various units of the bungalow, according to their function in two floors. **The plot area measuring 30 m x 35 m.**
- | | |
|-----------------------------|--------------------|
| (a) Living Room | : 24 sq. mt. |
| (b) Master Bedroom with A.T | : 24 sq. mt. |
| (c) Bedrooms (2 Nos.) | : 15 sq. mt., each |
| (d) Dining Room | : 16 sq. mt. |
| (e) Guest Room | : 20 sq. mt. |
| (f) Study Room | : 14 sq. mt. |
| (g) Kitchen | : 12 sq. mt. |
| (h) Store | : 12 sq. mt. |

Provide passages, staircase, open space etc. as per byelaws.

- | | |
|--|------|
| (a) Draw Ground floor plan. | (15) |
| (b) Draw First Floor Line Plan | (05) |
| 2. (a) What are the Building Bye-Laws & Zoning Regulations. Explain properly. | (10) |
| (b) Explain in detail about PRINCIPLES OF PLANNING for RESIDENTIAL BUILDINGS | (10) |
| 3. Draw the detailed sectional elevation passing through staircase and other important units of building given in Q.No.1. | (20) |
| 4. (a) Draw the Foundation plan of the building & section of one Footing, which you have Planned for Q.No.1. | (14) |
| (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. | (06) |
| 5. (a) Draw the plan and section of King-Post Roof Truss | (10) |
| (b) Draw the front elevation of the building given in Q.No.1 | (10) |
| 6. (a) Draw roof/ terrace plan of the building given in Q.No.1 | (08) |
| (b) Draw the plan and section of Dog-Legged staircase for a Residential I building as (G+1) storied, having floor to floor height 3.9 mts. Also show design calculations. | (12) |

5

SE - sem-IV - CBSGS - Civi

29/5/19

Paper / Subject Code: 38805 / CONCRETE TECHNOLOGY

Q. P. Code: 27139

(3 Hours)

[Total Marks : 80]

NOTE:-

- Question No. 1 is compulsory.
- Attempt any Three out of the remaining five questions.
- Figure to the right indicates full marks.
- Draw neat sketches wherever necessary.
- Assume suitable data wherever required.

- Q.1 (a) What are Bogue's compounds? State the effects of Bogue's compounds on properties of cement. 05
- (b) Define bulking of sand and fineness modulus of sand. State their effect on the strength of concrete. 05
- (c) Define workability. What is the significance of workability in concrete? 05
- (d) What are the benefits of using fibers in concrete? 05
- Q.2 (a) What are the functions of aggregate in concrete? Classify the aggregates based on their properties. 10
- (b) Define hot weather concreting. What are the effects of hot weather on concrete? What are the precautions to be taken during hot weather concreting? 10
- Q.3 (a) Define concrete mix design. Explain step by step procedure of concrete mix design by IS code method. 10
- (b) Define High strength concrete. What are the constituents of high strength concrete? Explain the method of making high strength concrete. 10
- Q.4 (a) Differentiate between the destructive, nondestructive tests on concrete with examples. Explain in detail ultrasonic pulse velocity method. 10
- (b) What do you understand by soundness of cement? Explain the procedure to determine the soundness of cement. 10
- Q.5 (a) Describe in brief various types of admixtures used in concrete. 10
- (b) Define w/c ratio in concrete? Explain the effect of w/c ratio on the strength and durability of concrete. 10
- Q.6 Write short notes on the following (any four) 20
- i Light weight concrete
 - ii Routing and sealing method of repairs
 - iii Load test
 - iv HPC
 - v Compression test on concrete

3

Please check whether you have got the right question paper.

1. Question no.1 is compulsory
2. Solve any 3 questions out of remaining.
3. Assume data wherever necessary and clearly mention the assumptions made.
4. Attempt sub questions in order.

- | | | |
|----|---|----|
| 1. | Attempt any four | 20 |
| a. | What is equivalent pipe? Derive an equation for equivalent size of pipe for pipes connected in parallel. | |
| b. | Explain with sketch assumptions made in Hardy cross method of pipe network. | |
| c. | Derive an expression for velocity of sound wave in compressible fluid. | |
| d. | What size should be installed to carry a discharge of 5.5/ps of oil having viscosity 6×10^{-2} stokes under laminar flow conditions? | |
| e. | Prove that the head loss due to friction is equal to one-third of the total head at inlet for maximum power transmission through pipes or nozzles. | |
| f. | For turbulent flow in pipes, calculate the distance from pipe wall at which velocity is equal to the average velocity of flow. | |
| 2. | a. Establish the following relation for a one dimensional compressible flow through duct of varying area: $(dA/A) = (dp/\rho V^2)(1-M^2)$ | 05 |
| | b. Write detailed note on shockwaves and its types. | 05 |
| | c. Thermodynamic state of an air is given by pressure $p = 2.3\text{bar}$, temperature $T=300^\circ\text{K}$ and velocity of flow = 250m/s. Calculate the stagnation pressure if (i) compressibility is neglected and (ii) Compressibility is accounted for. Comment on results. | 10 |
| 3. | a. Compare pipes in series and pipes in parallel. | 04 |
| | b. Compare hydraulically smooth and rough boundaries | 04 |
| | c. Compare HGL and TEL. | 04 |
| | d. Describe characteristics of Laminar flow. | 04 |
| | e. Describe Reynolds experiment | 04 |
| 4. | a. A pipe of 5cm diameter is 5m long and carries a discharge of $0.005\text{m}^3/\text{s}$. Find the head loss due to friction. The central 2m length of the pipe next is replaced by a pipe 7.5cm diameter, the changes of section being sudden. Determine the head loss and corresponding power due to adoption of this alternative. Take friction coefficient $af=0.01$ for the pipes of both the diameters and contraction loss coefficient = 0.5. | 10 |
| | b. A pipe line 50cm diameter and 4500m long, connects two reservoirs whose constant difference of water level is 12m. A branch pipe, 1250m long and taken from a point at a distant 1500m from the reservoir A, leads to reservoir C whose water level is 15m below that of reservoir A. find the diameter of the branch pipe so that the flow in both the reservoirs is same. Take friction coefficient $af=0.03$ for all the pipes. | 10 |

- 5 a. A steel penstock 60cm in diameter has a shell thickness of 1.2cm. The modulus of elasticity of the shell material is $2.1 \times 10^5 \text{N/mm}^2$ and the bulk modulus of water is $2.1 \times 10^3 \text{N/mm}^2$. The pipe is designed to discharge water at a mean velocity of 2.1m/s. Determine the water hammer pressure rise caused by sudden closure of valve at downstream end (i) by neglecting elasticity of the pipe material and also (ii) by considering the elasticity of pipe material. 10
- b. Laminar flow takes place through circular pipe. At what distance from the boundary does the local velocity equal to the average velocity? 05
- c. Oil of viscosity 0.97 poise and relative density 0.9 is flowing through horizontal circular pipe of 100mm diameter and of length 10m. If 100kg oil is collected at the outlet in 30 seconds, calculate the difference in pressure at the two ends of the pipe. Also verify that the flow is laminar. 05
- 6 a. For uniform laminar flow between two stationary parallel plates separated by distance B, show that $h_f = (12\mu VL) / (\gamma B^2)$ 05
- b. A 30cm diameter pipe conveying water in turbulent regime. Calculate the discharge in the pipe if the centre line velocity is 3.75m/s. Take $f=0.02$. 05
- c. A smooth pipe 200mm diameter carries crude oil of relative density 0.9 at a velocity of 2.5m/s. Estimate the type of flow, head loss in 100m and the power required to maintain the flow. Assume kinematic viscosity as 0.4 stokes. 10
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