ANJUMAN-I-ISLAM'S

AIKTC KALSEKAR TECHNICAL CAMPUS

INNOVATIVE TEACHING · EXUBERANT LEARNING

Knowledge Resource & Relay Centre (KRRC)

AIKTC/KRRC/SoET/ACKN/QUES/2017-18/   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

Q. P. Code: 36431

[3hours]   Total Marks 80

N.B. (1) Question No 1 is compulsory

(2) Attempt any 3 of the remaining

(3) Use of statistical table is allowed

1. a) A variable X follows a Poisson distribution with variance 3. Find   (5)

   P(x=2) and P(x≥ 2)

   b) Evaluate $\iint_s 9xi + 6yj - 10zk.\overline{ds}$ where s is surface of the sphere with radius 2,

   using Gauss divergence theorem.   (5)

   c) Ten individuals are chosen at random from a population and their heights are
      found to be 63, 63, 64, 65, 66, 69, 69, 70, 70, 71 inches.
      Discuss the suggestion that the mean height of the universe is 65 inches.   (5)

   d) Using Cayley- Hamilton Theorem find $2A^5 - 3A^4 + A^2 - 4I$ where $A = \begin{bmatrix} 3 & 1 \\ -1 & 2 \end{bmatrix}$ (5)

2. a) A continuous random variable X has the probability density function   (6)
      $f(x) = kx^2e^{-x}$, x≥ 0. Find k,mean and variance

   b) Ten school boys were given a test in statistics and their scores were

      recorded. They were given a months special coaching and a second test

      was given to them in the same subject at the end of the coaching period.

      Test if the marks given below give evidence to the fact that the students are

      benefitted by the coaching.

      Marks in Test I   : 70, 68, 56, 75, 80, 90, 68, 75, 56, 58

      Marks in Test II : 68, 70, 52, 73, 75, 78, 80, 92, 54, 55   (6)

   c) Two lines of regression are given by x+6y = 6 ,and 3x+2y =10

      calculate (i) mean values of x and y, (ii) the coefficient of correlation and (8)

      (iii) estimate y when x = 12

3. a) It is known that the probability of an item produced by a certain machine will be
      defective is 0.05. If the produced items are sent to the market in packets of 20,
      find the number of packets containing (i) at least2, (ii) exactly2 and (iii) at most
      2 defective items in a consignment of 1000 packets using Poisson distribution   (6)

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(14)

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b) Use Stoke's theorem to evaluate $\int_c \overline{F}.d\overline{r}$ where $\overline{F} = yzi + zxj + xyk$ and c is the

boundary of the circle $x^2 + y^2 + z^2 = 1$,z =0 (6)

c) Find the eigen values and eigen vectors of the matrix $A = \begin{bmatrix} 8 & -8 & -2 \\ 4 & -3 & -2 \\ 3 & -4 & 1 \end{bmatrix}$

(8)

4. a) Out of 800 people 25% were literate and 300 had travelled beyond the

limits of the district. 40 % of the literates were among those who had not

travelled. Prepare a 2x2 table and test at 5% level of significance whether

there is any relation between travelling and literacy (6)

b) Compute rank correlation coefficient from the following

X : 10, 12, 18, 18, 15, 40

Y : 12, 18, 25, 25, 50, 25 (6)

c) The marks of 1000 students of a university are found to be normally

distributed with mean 70 and standard deviation 5. Estimate the number of

students whose marks will be (i) between 60 and 75 (ii) more than 75

(iii) less than 68 (8)

5.a) A machine is set to produce metal plates of thickness 1.5 cms with standard
deviation of 0.2 cms. A sample of 100 plates produced by the machine gave
an average thickness of 1.52 cms. Is the machine fulfilling the purpose? (6)

b) Using the method of Lagrange's multipliers solve the following N.L.P.P

Optimise $z = 6x_1^2 + 5x_2^2$

Subject to $x_1 + 5x_2 = 7,$

$x_1, x_2 \geq 0$ (6)

c) If the vector field $\overline{F}$ is irrotational find the constants a,b,c where $\overline{F}$ is given by
$\overline{F} = (x + 2y + az)i + (bx - 3y - z)j + (4x + cy + 2z)k$. Find the scalar potential of $\overline{F}$ .Then
find the workdone in moving a particle in this field from (1,2,-4) to (3,3,2)
along the straight line joining these points (8)

6.a) Using Green's theorem evaluate $\int_c (xy + y^2)dx + x^2 dy$ where c is the closed curve

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of the region bounded by $y = x, y = x^2$ (6)

b) Show that $A = \begin{bmatrix} 6 & -2 & 2 \\ -2 & 3 & -1 \\ 2 & -1 & 3 \end{bmatrix}$ is derogatory and find its minimal polynomial (6)

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

Maximise $z = -x_1^2 - x_2^2 - x_3^2 + 4x_1 + 6x_2$

Subject to $x_1 + x_2 \le 2$, $2x_1 + 3x_2 \le 12$

$x_1 . x_2 , x_3 \ge 0$

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Paper / Subject Code: 38802 / SURVEYING-II

Q.P.Code: 21775

(3 hours) [Total Marks-80]

Question No.1 is compulsory. Attempt any three out of remaining questions.

Assume any suitable data if required, state the same clearly.

Figures to the right indicate full marks.

Attempt sub questions in order.

1.   Attempt any four from following:

    a.   Explain field procedure of determination of tacheometer constants.   (05)

    b.   Write detailed note on Beaman's Stadia arc.   (05)

    c.   What is vertical curve? Sketch various types of vertical curves stating their application.   (05)

    d.   Calculate the ordinate at 10m intervals for a circular curve if the length of long chord is   (05)
        80m and radius of curve is 200m

    e   Write detailed note on application of GIS and remote sensing in the field of civil   (05)
        engineering.

2   a.   List various methods of setting out of horizontal curves. Explain setting out of curve by   (06)
        two theodolite method.

    b   Explain procedure for calculating data and setting out of vertical curve by chord gradient   (08)
        method.

    c.   A 20m chain is used to set out a simple circular curve. Two tangents intersect at   (06)
        chainage 1192m, the deflection angle being 50°. Calculate the necessary data for setting
        out of a curve of radius 280m using linear method of offsets from chords produced.
        Take peg interval as 20m.

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

Staff Station	Staff intercept	Vertical Angle	Axial hair Readings	Remarks
P	2.350	+8° 36' 0"	2.105	R L of P
Q	2.055	+6° 6' 0"	1.895	is 321.50m

    Find length PQ and RL of Q.

    b.   Explain how to calculate the R L of top of tower whose base is inaccessible, with one   (05)
        plane method.

    c.   Derive an expression for calculating horizontal and vertical distance for line of sight   (05)
        inclined and staff held vertical.

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4   a.   Calculate the data required for setting out composite curve. It is proposed to insert a   (10)
         right hand 50m radius circular curve with a cubic parabola of 20m length at each end.
         The chainage of intersection point is 80m, the deflection angle being 50°. The peg
         interval for circular curve & transition curve is 5m. Tabulate the required data if LC of
         instrument used is 20".

    b.   Define reverse curve, its necessity and disadvantages of providing reverse curve.   (05)

    c.   Write detailed note on errors in stadia surveying   (05)

5   a.   A 8m wide road is to deflect through an angle of 60° with the centre line radius 300m,   (12)
         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.

    b.   Explain how surface survey is connected to underground survey and transfer of levels   (08)
         while setting out a tunnel.

6   a.   A 0.6% rising gradient meets - 0.7% down gradient. The chainage of and RL of   (08)
         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 0.1%
         per peg. The peg interval is 20m. Tabulate the results.

    b.   Explain in detail how to carry out a route survey for a road connecting two states?   (08)

    c.   Write short note on EDM, its principle and working.   (04)

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Paper / Subject Code: 38803 / STRUCTURAL ANALYSIS - I

Q. P. Code :25896

**(3 Hours)**   **(Max. Marks-80)**

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) State and explain-   5
    i.   Betti's theorem
    ii.   Castigliano's theorem.
  (b) Write Prof.Perry's formula, explaining the terms involved. Also state the   5
  importance of this formula over Secant formula.
  (c) A 3-hinged symmetrical parabolic arch is subjected to UDL over the entire span,   5
  Using the concept of ILD for bending moment (BM); prove that the BM at every
  section of the arch is zero.
  (d) Explain with neat sketches the terms-(i) Unsymmetrical bending (ii) Shear centre. 5
  Also state their significance in structural analysis.
  (e) Write the BM equation needed as per Macaulay's method for the beam loaded as   5
  shown-
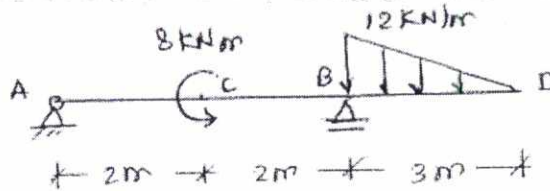
  (f) State & explain Moment Area Theorem-II. Also draw the conjugate beams for   5
 following real beams shown below-

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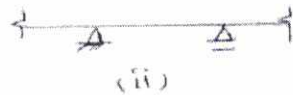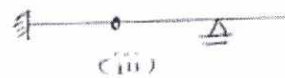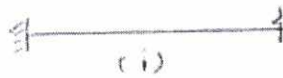
Q.2 (a) For a rigid jointed plane frame shown in figure, find support reactions and draw   10
FBD for all four members. Also draw AFD, SFD and BMD for the frame, indicating
important points. Note that there is internal hinge at 'B'.
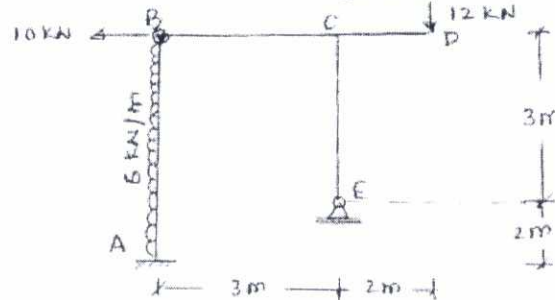
(b) An unsymmetrical 3-hinged parabolic arch is loaded as shown in figure.   10
Find-
  i.   The position of third hinge at 'C' above the left support.
  ii.   Support reactions. .
  iii.   The position & magnitude of max +ve and max -ve BM in the arch.
          Also draw BMD for the arch.
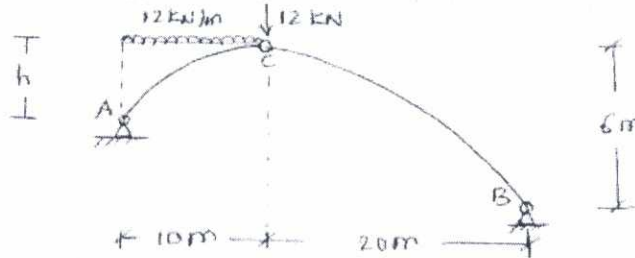
Q.3 (a) A pin jointed truss is loaded and supported as shown in figure. Determine the   10
horizontal deflection of joint 'C' using Unit Load Method.
Take axial rigidity AE = 30,000 KN for all members.
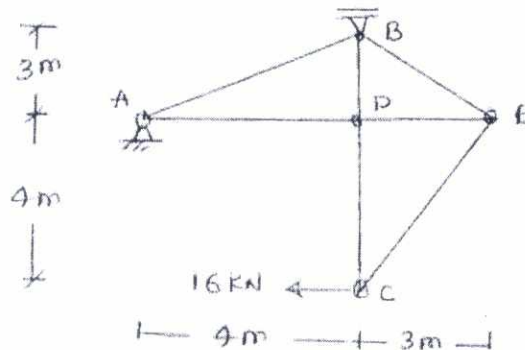
Q.3 (b) Using Moment Area Method **OR** Conjugate beam method, determine the location   10
and magnitude of maximum deflection in a non-prismatic simply supported beam
loaded as shown.
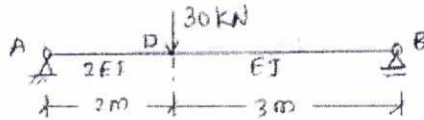
Q.4 a) A 3-hinged stiffening girder of a suspension bridge of span 120 m is subjected to   12
two point loads of 180 KN and 240 KN at distances 30 m and 80 m respectively from
left support. The supporting cable has a central dip of 12 m. Draw SFD & BMD for
the girder, indicating important points. Also find maximum & minimum cable tension.

(b) A simply supported girder of span 24 m is traversed by a series of five wheel loads   8
10 KN,20 KN, 20 KN, 25 KN and 18 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 18 KN as leading
load, find the location & magnitude of absolute maximum BM in the girder.

Q.5 (a)) A hollow circular column of length 6 m, external diameter 200 mm and internal   10
diameter 150 mm is fixed at both ends. If the column carries a load of 200 KN applied
at distance 40 mm from column axis, determine extreme fibre stresses. Also sketch
the stress distribution diagram. Take E for column material as 96 GPa.

(b) The cross section of a 5 m long simply supported beam is a T-section having   10
flange & web dimensions 120 mm x 20 mm and 20 mm x 180 mm respectively. The
beam carries a central point load of 36 KN inclined at angle 30^0 (anti clockwise) with
vertical axis of cross section. Find maximum compressive and maximum tensile at the
critical section. Also draw the stress distribution diagram.

Q.6 (a) Draw ILD for axial force in top member DE of a warren truss shown in figure.   4
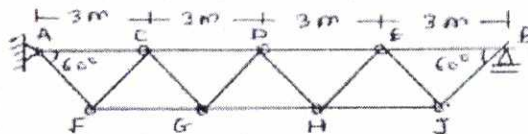
(b) A rod AB of uniform cross section is fixed at 'A' and is bent in vertical plane to   6
give the shape of quadrant of a circle of radius 'R'. At free end B a horizontal load 'P'
(rightwards) is applied. Determine-
  i.   Strain energy stored in the rod due to bending moment
  ii. Horizontal deflection at B. Assume EI=Constant.

(c) Determine horizontal deflection at joint 'B' in a rigid jointed plane frame loaded as   10
shown in figure. Take EI = 40,000 KNm². Use Virtual work method.

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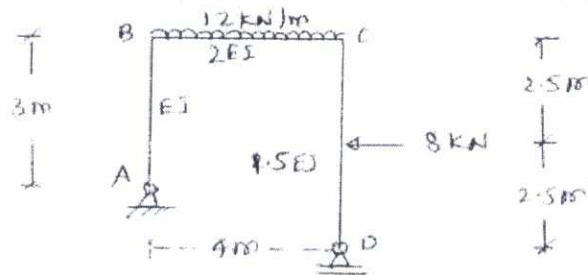
Q.P. Code : 18498

(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 APARTMENT (STILT+3)** in Thane City . The building is, R.C.C. framed structure, The plot size is 28 m x 30 m.
   There are two flats on each floor, **Type 1: 1 BHK (Approx. Area 55 sq. mt.)** and
   Type 2 : 2BHK (Approx. 70 sq.mt.)

   Provide passages, staircase , parking area etc. as per byelaws.

   (a) Draw Typical floor plan.   (15)
   (b) Draw Stilt Level 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)

Paper / Subject Code: 38805 / CONCRETE TECHNOLOGY

QP Code : 39576

(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)	Explain workability of concrete.	05
	(b)	Explain in brief shotcreteing.	05
	(c)	Write a note on grading of aggregate.	05
	(d)	Write a note on permeability of concrete.	05

Q.2 (a) What do you understand by High strength concrete. What are the constituents 10
of high strength concrete? How is high strength concrete produced?
(b) What is roller compacted concrete? Explain the properties of it. 10

Q.3 (a) Differentiate between nominal mix and design mix. Explain the step by step 10
procedure of concrete mix design? What are the factors to be considered for
proportioning of concrete?
(b) Explain alkali- aggregate reaction in detail. 10

Q.4 (a) Enlist the crack repair techniques. Explain any one in detail. 10
(b) What do you understand by soundness of cement? Explain the procedure to 10
determine the soundness of cement.

Q.5 (a) What is High Range Water Reducer (HRWR)? Explain the effects, advantages 10
and disadvantages of HRWR.
(b) Explain the test of flexural strength of concrete. 10

Q.6 Write short notes on the following (any four) 20
   i   Mineral admixture
   ii Distress in concrete
   iii Field test on cement
   iv Ferrocement
   v laitance in concrete

Paper / Subject Code: 38806 / FLUID MECHANICS -II

(3 Hours)   [Total Marks: 80]

Question **No.1** is **compulsory.**
Attempt **any three** from remaining.
Assume any suitable data if required, state the same clearly.
Figures to the right indicate full marks.
Attempt sub questions in order.

1. **Attempt any five**   (20)
   a. Compare Pipes in series and pipes in parallel.
   b. Compare Laminar flow and Turbulent flow.
   c. Compare Hydro dynamically smooth and rough boundaries.
   d. What is siphon? Explain its working.
   e. Write short note on Mach cone & Mach line.
   f. Explain HGL and TEL

2 a. Describe Kinetic energy correction factor & momentum correction factor.   (06)
   b. Write detailed note on Dash pot mechanism and its application.   (05)
   c. An oil of viscosity 1.5 poise and relative density 0.9 is flowing through circular pipe of diameter
      30mm and length 3m at one tenth of the critical velocity for which Reynolds number is 2450.
      Find (1) the velocity of flow through the pipe.(2) the pressure head of oil to maintain the flow in
      the pipe. (3) the power required to overcome viscous resistance to flow of oil.   (09)

3 a. The speed of supersonic aircraft flying at an altitude of 1100m corresponds to Mach number 2.5.
      Find the time elapsed between the instant the aircraft was directly over head of an observer &
      the instant observer feels the disturbance due to aircraft. Consider following three cases: when
      (a) observer is stationary (b) observer is moving in the direction of aircraft at M=0.5. (c)
      observer is moving in opposite direction of aircraft with M=0.5. Take γ = 1.4, R = 287 J/kg K &
      temperature at given height is 280 °K.   (10)

   b. Laminar flow takes place in circular tube. At what distance from the boundary the local velocity
      is equal to the mean velocity.   (04)
   c. A compound pipe system consists of 1800 m of 50cm diameter, 1200m of 40cm diameter, 600m
      of 30cm diameter connected in series. (i) What is equivalent length of 40cm diameter pipe of
      same material? (ii) If three pipes are connected in parallel, what would be the equivalent length
      of 50cm diameter pipe?   (06)

4 a. An equilateral triangle is divided into two parts by a vertical from the vertex to the horizontal
      base. The value of K for vertical bisector, two base pipes and other two sides of triangle are 4,
      2 and 3 respectively. Take n =2, find the flow distribution in not more than two trials for an
      input of 100 units at vertex & output of 30 units each from left and right junction and 40 units
      from the mid point of junction.   (08)

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b. Two reservoirs with a difference in elevation of 15m are connected by three pipes in series. The pipes are 300m long of diameter 30cm ;150m long of diameter 20cm and 200m long of diameter 25cm. The friction factor for three pipes are 0.018; 0.020 and 0.019 respectively. The contraction and expansion are sudden. Determine the flow rate in *lps*. Plot HGL and TEL

(12)

5. **a.** Derive Hagen Poiseuille Formula for laminar flow through circular pipes. (10)

b. Show that the diameter of the nozzle for maximum transmission of power is given by

$$d = \left[\frac{D^5}{8fL}\right]^{1/4}$$ where D is diameter of pipe and L is length of pipe. (05)

c. A pipe line carrying water has surface protrusions of average height 0.1mm. if the shear stress developed is 8Pa; determine whether the pipe surface acts as a smooth; rough or transition. Take density of water as 1000kg/m^3 and kinematic viscosity 0.0093 stokes. (05)

6. **a.** A smooth pipe of 80mm diameter and 1000m long is carrying water at the rate of 8 lit/sec. if the kinematic viscosity 0.015 stoke; calculate (1) loss of head (2)wall shear stress (3)centre line velocity(4) velocity and shear stress at 20mm from the pipe wall (5) thickness of laminar sub layer.

(10)

b. Write short note on Prandtl Mixing length theory. (06)

c. Rewrite following with correct choice: (04)

(i) The most essential feature of turbulent flow is

(a) high velocity   (b) velocity and pressure exhibit irregular fluctuations of high frequency
(c) large discharge   (d) none of above

(ii) In case of viscous flow through a circular pipe the average velocity of fluid is

(a) Twice the maximum velocity   (b) half the maximum velocity
(c) 1.5 times the maximum velocity   (d) none of above

(iii) The energy loss in a pipeline is due to

(a) surface roughness only   (b) viscous action only
(c) friction of pipe wall and viscous function   (d) none of above

(iv) The region outside the mach cone is called

(a) zone of action   (b) zone of silence   (c) control volume   (d) none of above

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