AIKTC/KRRC/SoET/ACKN/QUES/2018-19/ **Date:** _____

School: SoET-CBCS **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	Building Materials & Construction 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**

N.B.:- 1. Question no 1 is compulsory.
2. Attempt any THREE questions out of remaining FIVE questions.

Q.1 a) Write the dual of the given LPP **(5)**
Maximize $Z=4x_1+9x_2+2x_3$
Subject to: $2x_1+3x_2+2x_3\le 7$, $3x_1-2x_2+4x_3=5$, $x_1,x_2,x_3\ge 0$.

b) If X is a Random Variable with probability density function **(5)**

$$f(x)=\begin{cases} kx; 0\le x\le 2 \\ 2k; 2\le x\le 4 \\ 6k-kx; 4\le x\le 6 \end{cases}$$

Find k, expectation and $P(1\le x\le 3)$

c) A tyre company claims that the life of the tyres have mean 42,000 kms with standard deviation of 4,000 kms. A change in the production process is believed to a result in better product.A test sample of 81 new tyres has a mean life 42,500 kms.Test at 5% level of significance that the new product is significantly better than the old one. **(5)**

d) Find the minimal polynomial of $A=\begin{bmatrix} 2 & 2 & 1 \\ 1 & 3 & 1 \\ 1 & 2 & 2 \end{bmatrix}$. Is A derogatory? **(5)**

Q.2 a) Use Big-M method to solve the following LPP **(6)**
Minimize $Z=2x_1+x_2$
subject to $3x_1+x_2=3$,
$4x_1+3x_2\ge 6$,
$x_1+2x_2\le 3$, $x_1,x_2\ge 0$

b) Find e^A and A^{-1} if $A=\begin{bmatrix} 3/2 & 1/2 \\ 1/2 & 3/2 \end{bmatrix}$. **(6)**

c) Verify Green's theorem for $\int_C (3x^2-8y^2)dx+(4y-6xy)dy$ where C is the closed curve given by $y=x^2, y=\sqrt{x}$. **(8)**

Q.3 a) Prove that $\vec{F}=2xyz^2i+(x^2z^2+z\cos yz)j+(2x^2yz+y\cos yz)k$ is a conservative field. Find ϕ such that $\vec{F}=\nabla\phi$. Hence find the work done in moving an object in this field from $(0,0,1)$ to $(1,\frac{\pi}{4},2)$. **(6)**

b) The standard deviations calculated from two random samples of sizes 9 and 13 are 1.99 and 1.9. Can the samples be regard as drawn from the normal populations with same standard Deviations. **(6)**
(Given: $F(0.025)=3.51$ with d. f. 8 & 12 and $F(0.025)=4.20$ with d. f. 12 & 8.)

c) Find the index, rank, signature and class of the Quadratic Form $x_1^2+2x_2^2+3x_3^2+2x_1x_2-2x_1x_3+2x_2x_3$ by reducing it to canonical form using congruent transformation method. **(8)**

Q. 4 a) Evaluate $\iint_S \bar{F}\cdot d\bar{S}$ where $\bar{F}=(2xy+z)i+y^2j-(x+3y)k$ and S is the closed surface bounded by $x=0, y=0, z=0, 2x+2y+z=6$. **(6)**

b) Verify Cayley-Hamilton theorem for $A=\begin{bmatrix}1 & 2\\ 2 & 2\end{bmatrix}$ and hence find $2A^4-5A^3-7A+6I$. **(6)**

c) A sample of 400 students of under-graduate and 400 students of post-graduate classes was taken to know their opinion about autonomous colleges.290 of the under-graduate and 310 of the post-graduate students favoured the autonomous status.Use chi-square test and test that the opinion regarding autonomous status of colleges is independent of the level of classes of students. **(8)**

Q. 5 a) Prove that $\nabla\times\left[\frac{\bar{a}\times\bar{r}}{r^3}\right]=\frac{-\bar{a}}{r^3}+\frac{3(\bar{a}\cdot\bar{r})\bar{r}}{r^5}$ **(6)**

b) Show that the matrix $A=\begin{bmatrix}3 & -1 & 1\\ -1 & 3 & -1\\ 1 & -1 & 3\end{bmatrix}$ is diagonalizable and hence find the transforming matrix and diagonal matrix. **(6)**

c) Ten school boys were given a test in statistics and their scores were recorded. They were given a month special coaching and a second test was given to them in the same subject at the end of the coaching period .Test at 5% level of significance, if the marks given below give evidence to the fact that the students are benefited by coaching **(8)**

Mark in test 1:	70	68	56	75	80	90	68	75	56	58
Mark in test 2:	68	70	52	73	75	78	80	92	54	55

Q. 6 a) In a sample of 1000 cases, the mean of a certain test is 14 and Standard Deviation is 2.5. Assuming the distribution to be normal, find **(6)**
1] how many students score between 12 & 15.
2] how many score above 18.

b) Evaluate by Stoke's theorem $\int_C xy\,dx+xy^2dy$, where C is the square in the xy-plane with vertices (1, 0),(0,1),(-1,0),(0,-1). **(6)**

c) Using duality solve the following L.P.P. **(8)**

Minimise $z=0.7x_1+0.5x_2$

subject to $x_1\geq 4, x_2\geq 6, x_1+2x_2\geq 20, 2x_1+x_2\geq 18,$

$x_1, x_2, x_3\geq 0.$

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13/5/19

B.E- Sem-IV - choice based - Civil

[3 Hours] **Marks: 80**

N.B:
- Question **No.1** is **compulsory.**
- Solve **any three** questions out of the remaining questions.
- Assumptions, if any, should be clearly stated. Draw sketches wherever required.

Q 1 **(Solve Any four sub-questions. Each carries 05 marks)** **(20)**

a) Explain the field procedure to set out a simple circular curve by Rankine's method of deflection angles.

b) Describe the roles and responsibilities of Survey of India department.

c) Write a note on Remote Sensing and its applications in Civil Engineering.

d) Draw the format of a 7/12 Abstract and state the data mentioned in it.

e) Explain the working of a handheld GPS receiver.

Q 2 **(20)**

a) Two tangents intersect at a chainage 1950 m, the deflection angle being 38^0. Calculate all the necessary data for setting out a curve with a radius of 350 m by Rankine's method. Take Peg Interval as 30 m. 12

b) Two straights AB and BC intersect at a chainage of 2520 m.The deflection angle is 52^0.It is proposed to insert a circular curve of radius 340 metres between two transition curves of length 85 metres each. Calculate all the elements required to set out the curves. 08

Q 3 **(20)**

a) A downgrade of 2.5% is followed by an upgrade of 3.5%. The RL of point of intersection is 350 m & its chainage is 1400 m. A vertical curve of 200 m length is to be introduced to connect the two grades. If the peg interval is 20 m, Calculate the elevations of the points on the curve using tangent correction method. Tabulate the results. 12

b) What do you understand by setting out of a work? Explain the procedure for setting out a building. 08

Q 4 **(20)**

a) Explain **Any one** of the following projects in detail : 10
i) Radial contouring. ii) Profile levelling.

b) Explain stepwise procedure of collecting the data of a traverse ABCD using Total station including the initial temporary adjustments. 10

Q 5 **(20)**

a Mention the general and Civil Engineering specific applications of GPS. 10

b The meridian altitude of a star was observed to be $64^0 36' 20''$ on a certain day, the star lying between the zenith and the equator. The declination of the star was $26^0 12' 10''$N. Find the latitude of the place of observation. 05

c State the duties and responsibilities of a Tehsildar. 05

Q 6 (20)

a) Explain spatial and non-spatial data in GIS. Enlist names of few GIS softwares. 08

b) A section line AB appears to be 10.16 cm on a photograph for which the focal length is 16 cm. the corresponding line measures 2.54 cm on a map which is to a scale 1/50,000. The terrain has an average elevation of 200 m above mean sea level. Calculate the flying altitude of the aircraft, above mean sea level, when the photograph was taken. 07

c) Explain the working principle of EDM. 05

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(3 Hours) **Maximum Marks-80**

NB:

1. **Q. No. 1 is compulsory. Attempt any three out of remaining five questions.**
2. **Figures to the right indicate full marks.**
3. **Assume suitable data if necessary but justify the same.**
4. **Draw neat sketches wherever necessary.**

Q.1 Attempt **any four** questions.

(a) Write Moment Area Theorems - I & II, giving neat sketches. 5

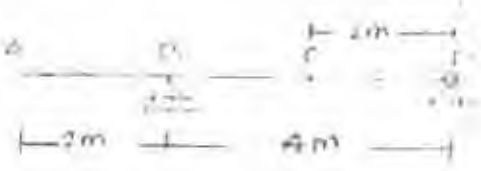
(b) Differentiate between symmetrical & Unsymmetrical bending, giving suitable examples. 5

(c) State and explain-(i) Maxwell's theorem (ii) Betti's theorem 5

(d) Define the term 'Strain Energy' and state its expression for (i) Axial force (ii) Bending moment (iii) Shear force and (iv) Torsion 5

(e) Explain the necessity & function of stiffening girder in a Cable-Suspension bridge. 5

(f) For the beam shown in figure draw the qualitative influence line diagram (ILD) for (i) BM at C (ii) SF at section taken, just to the right of support B. 5



Q.2 (a) A simply supported beam of span PQ = 6 m is subjected two point loads 15 KN and 45 KN applied at mid span point R through two different planes as shown in I-section of the beam. Find- 10

(i) Resultant plane of loading

(ii) Location of neutral axis.

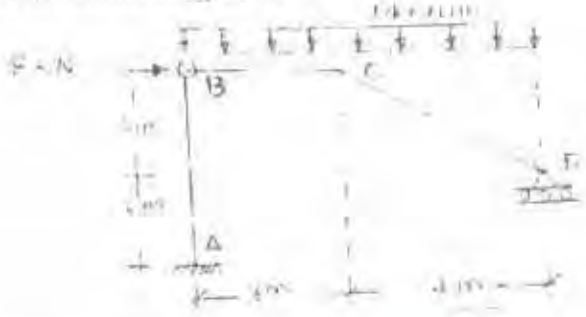
(iii) Nature and magnitude of maximum stress at corner **B**.

Q.2 (b) For the rigid jointed plane frame ABCD loaded as shown in figure- 10

(i) Find support reactions.

(ii) Draw Free body diagram (FBD) of all members.

(iii)AFD, SFD and BMD for the frame indicating salient points.
Note that there is internal hinge at '**B**'



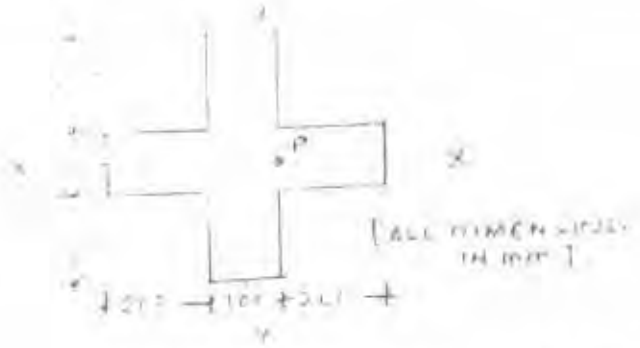
Q.3 (a) A 3-hinged symmetrical **circular arch** of span 30 m and central rise 6 m is subjected UDL of 12 KN/m over the entire span. Determine- **10**

(i) Support reactions.

(ii) BM, NT and RSF at left quarter span point

Also draw BMD for the arch clearly indicating the location & magnitude of maximum bending moment.

(b) Figure shows the **plus** cross section (symmetrical) of a column which is 8 m long with both ends hinged. This column is subjected to a load of P = 600 KN applied at an eccentricity of 50 mm from the axis of column. Determine the extreme fibre stresses if E = 150 GPa for column material. Also sketch the stress distribution diagram. **10**



Q.4 (a) A non-prismatic cantilever beam ABC fixed at 'A' with AB = BC = 3 m is having flexural rigidity 2EI & EI respectively. It is subjected to UVL having zero intensity at B and maximum 12 KN/m at C. Using **Moment Area Method or Conjugate Beam Method**, determine slope at 'B' and deflection at free end 'C' in terms of EI **10**

Q.4 (b) A pin-jointed frame loaded and supported as shown in figure. Determine horizontal deflection of joint 'E'. Take AE = constant for all the members. **Use unit load method or any other suitable method.** **10**

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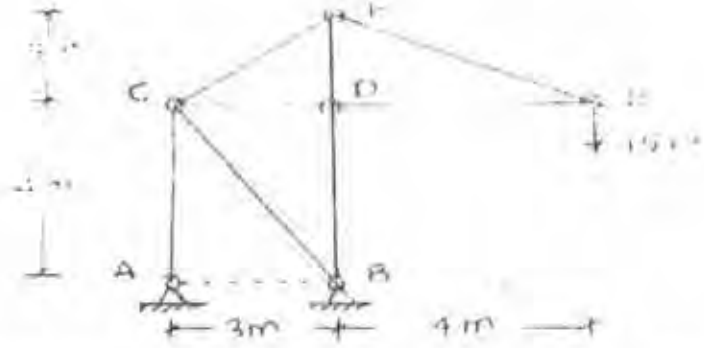
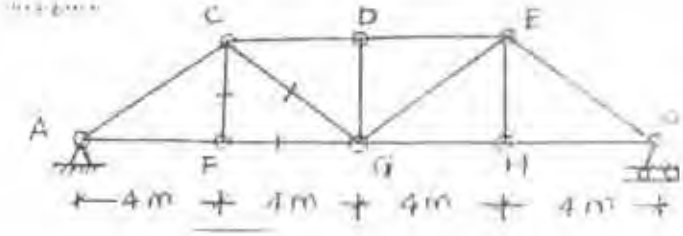
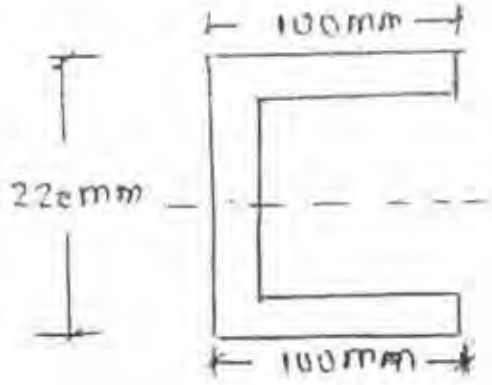


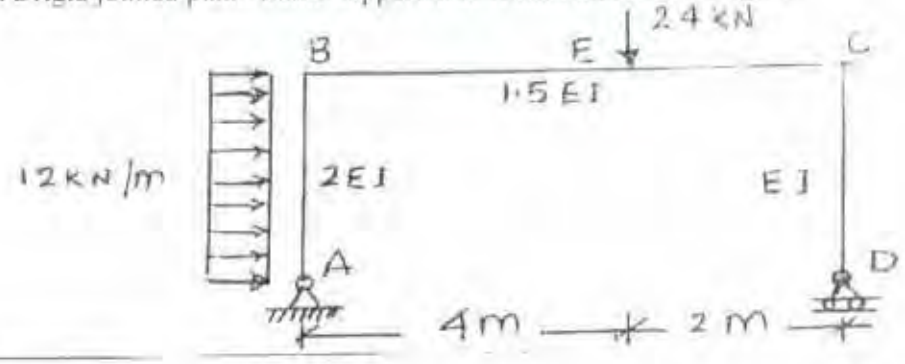
Q.5 (a) Draw ILDs for axial force in member CG, FG and CF of a through type bridge truss shown in figure. 6



(b) Define the term 'Shear Centre' and its importance in structural analysis. Also locate clearly the shear centre for a thin walled channel section shown in figure. Take uniform wall thickness as 8 mm. 5



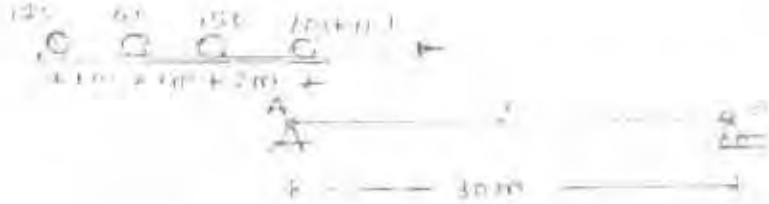
(c) Using **Virtual Work Method**, determine the horizontal deflection of joint **B** in a rigid jointed plane frame supported & loaded as shown in figure. 9



Q.6 (a) A simply supported girder of span 30 m is traversed by a system of wheel loads 120 KN, 60 KN, 150 KN & 70 KN spaced at 1 m, 1 m & 2 m respectively, moving from left to right with 70 KN leading load as shown in figure. Determine- 12

(i) Maximum positive & negative SF at mid span section.

(ii) Maximum BM at mid span.



(b) A suspension cable of span 120 m & central dip 12 m carries UDL of 10 KN/m over the entire span. Find the forces transmitted to the supporting pier- 8

(i) If the cable passes over a smooth pulley fixed on the top of pier

(ii) If the cable is clamped to a saddle with smooth rollers mounted on the top of pier.

For each of the above cases the anchor cable is inclined at 30^0 angle with horizontal.

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Correction in *T00524 - S E (CIVIL)(Sem IV)(Choice Based) / 40403 - STRUCTURAL ANALYSIS I QP Code : 71004

In Q. 5(C). - Height of Frame shall be taken as 4 m

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[illegible]

Mon-Fri 10am - 5pm

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B-30 Yahya Khan [signature]

(1'30 SE-sem-IV-Civil Board - 4/1 23/5/19

Paper / Subject Code: 40404 / Building Design & Drawing

(4 Hours) **[Total Marks: 80]**

N. B. : (1) Question No. **1** is **compulsory**.
(2) Answer any **three** questions from remaining **five** questions.
(3) Assume suitable data if required and state it clearly.

1. It is proposed to construct a **Boys Hostel** building as (G+1) RCC framed structure with the following requirements.

1) 2 Seated Rooms	10 nos	-each 15 m^2
2) 3 Seated Rooms	10 nos	-each 25 m^2
3) Guest Room		- 20 m^2
4) Entrance and Reception		- 20 m^2
5) Hostel Warden Room		- 15 m^2
6) Indoor Games		- 35 m^2
7) TV/Audio Room		- 40 m^2
8) Newspapers & Magazines		- 30 m^2
9) Kitchen		- 40 m^2
10) Dining Area		- 120 m^2

Provide passage, toilet, Dog legged staircase, etc as per the bye-laws. Assume floor to floor height as 4 m .
Draw with suitable scale
i) Draw the ground floor plan **15**
ii) Draw the line plan of first floor. **5**

2. It is proposed to construct a Residential Bungalow as **(G+1) R.C.C** framed structure with the following requirements.

a) Living Room	-24 m^2
b) Master Bedroom with A.T	- 20 m^2
c) Bed Room	- 18 m^2
d) Kitchen	- 12 m^2
e) Dinning Area	- 14m^2
f) Guest Room	- 15 m^2

Provide entrance porch for vehicle parking, verandah, staircase, passage and sanitary units as per byelaws.
Assume floor to floor height **-3.3 m**.
i) Draw the **Ground Floor plan**. **15**
ii) Draw the **line plan** of first floor. **05**

3 Draw the Sectional Elevation for the Boys Hostel you have planned in Q.no1. **20**

4 (a) Explain all types of pitched roof in detail, with proper diagrams **10**
(b) Write principles of planning for Residential Building. **10**

5. Draw Two -point perspective for the Boys Hostel you have planned in Q.no.1 **20**

6. (a) Explain various types of Staircases with proper sketches. **10**
(b) Explain Sun path diagram & Wind rose diagram with sketches. **10**

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SE-Sem-IV - Choice Based - Civil 29/5/19

Paper / Subject Code: 40405 / Building Materials & Construction Technology

(03 HOURS) **TOTAL MARKS: 80**

Instructions : (1). Question No .1 is compulsory
(2) Answer any **three questions** from the remaining questions.
(3) Each full question carries **20** marks.
(4) Assume suitable data, if needed and state it clearly.

Q.1 Attempt any four

a Enlist in detail classifications of engineering materials. (05M)

b What is the effect of 'Bulking of sand & Water absorption of CA on the concrete mix proportioning. (05M)

c State the elastic properties of hardened concrete and explain any one of them in brief. (05M)

d Explain defects in timber due to seasoning with neat sketch. (05M)

e Draw Queen closer & King closer sketches with dimensions in case of standard brick. (05M)

f Which field tests are conduct in the field on cement? (05M)

Q.2 a) Which IS code is required to perform compressive strength test on burnt clay brick? Explain step by step procedure to determine compressive strength of brick in the lab as per IS code. (10M)

b) Which IS code is required to perform compaction factor test? Calculate how much quantities of ingredients of concrete in 'Kg.' are required to perform this test in the lab? If the nominal mix proportions for M20 grade of concrete by ratio are 0.6 : 1 : 1.67 : 3.33. Take internal dimensions of the upper hopper as . top diameter = 254 mm, bottom diameter = 127 mm & height = 279 mm and also take density of concrete = 2350 Kg/m^3. (10M)

Q.3 a) State the physical properties of OPC as per IS code? Explain in brief Standard Consistency of cement and give applications of it. (06M)

b) What are the various applications of cement mortar? (04M)

c) Explain in-detail, how will you decide dosage of chemical WRA's to enhance the properties of concrete by reducing W/C ratio of the mix. Plot graph of it. (10M)

Q.4 a) Describe English bond in case of single brick wall in brief with labeled sketches. (10M)

b) Enlist the various types of pointing of masonry work and explain any one of them with sketch. (06M)

c) Define cladding. Explain 'Attached system' of installation method of cladding. (04M)

Q.5 a) Design M25 grade of concrete for flexure in accordance with IS 10262, for the following data: (12M)

Design Parameters :
f_{ck} = 25 MPa
MSA = 20 mm
Shape of CA : Angular
Degree of Workability : 0.78 of CF.
Degree of Quality Control : Very good
Degree of Exposure : Moderate.

Data On Material :
Cement used : OPC.
Specific Gravity of Cement : 3.15
Specific Gravity of FA : 2.65
Specific Gravity of CA : 2.71
CA :20 mm & 10 mm size in 60:40 ratio.
FA (Sand) : Confirming to zone-I (08M)

b) Explain the Wedging method of quarrying of stone with neat labeled sketch. (10M)

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(05M)

Q.6 a) Explain with neat labeled sketch "Couple roof". (05M)

b) Explain "Marble Flooring".

c) Draw a neat labeled sketch of D.P.C. treatment for ground flooring.

Data For Q. 5 a)

Data for Concrete Mix Design from Indian Standard Codes

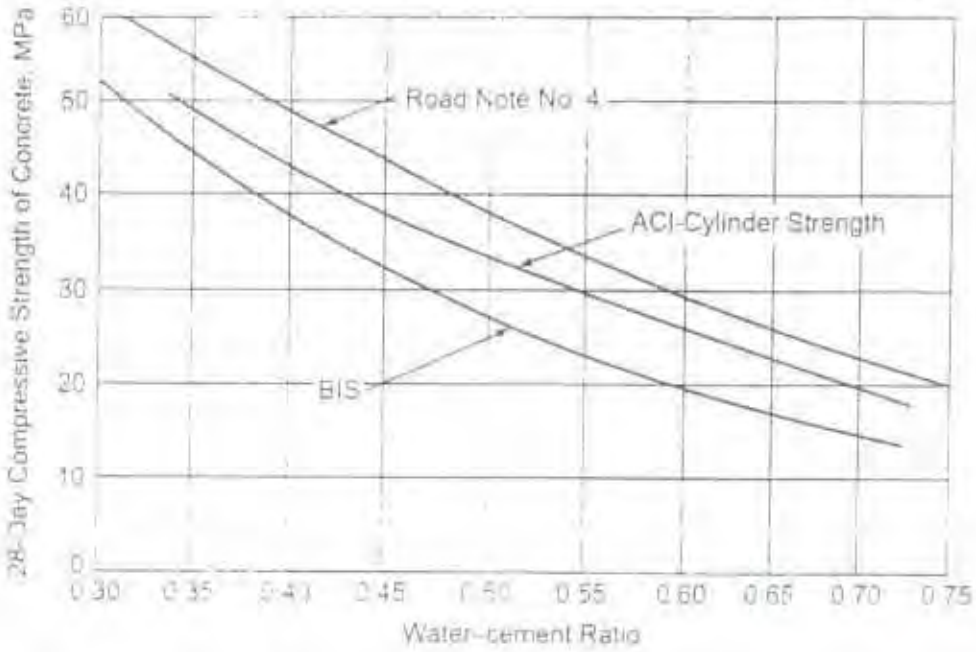

Table 1: Values of 'k' OR 't'

Percentage of results below the characteristics strength	Values of 'k' OR 't'
50	0
16	1.00
10	1.28
5	1.65
2.5	1.96
1	2.33
0.5	2.58
0.0	Infinity

Table 2 : Suggested Values of Standard Deviation

Grade of Concrete	Standard deviation for different degree of control in N/mm^2		
	Very good	Good	Fair
M10	2.0	2.3	3.3
M15	2.5	3.5	4.5
M20	3.6	4.6	5.6
M25	4.3	5.3	6.3
M30	5.0	6.0	7.0
M35	5.3	6.3	7.3
M40	5.6	6.6	7.6
M45	6.0	7.0	8.0
M50	6.4	7.4	8.4
M55	6.7	7.7	8.7
M60	6.8	7.8	8.8

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Table 3 : Approximate Air Content

Maximum size of aggregate (mm)	Percentage of Entrapped air (%)
10	3.0
20	2.0
40	1.0

Table 4: Minimum cement content, maximum water-cement ratio & minimum concrete grade (20 mm nominal max. size of aggregates)

Exposure	Reinforced Concrete		
	Min. cement content (kg/m^3)	Max. free water-cement ratio	Min. concrete grade
Mild	300	0.55	M20
Moderate	300	0.50	M25
Severe	320	0.45	M30
Very Severe	340	0.45	M35
Extreme	360	0.40	M40

Table 5: Approximate sand & water content per m^3 of concrete*

Grade	Nominal size of	Water content	Sand as % of	Remarks
Up to M35	10	208	40	Sand zone II, water-cement ratio = 0.6, Compaction Factor = 0.8
	20	186	35	
	40	163	30	
Beyond M35	10	200	28	
	20	180	25	

* These values apply to the conditions given in the **remarks** column. For other conditions, corrections are to be applied as per **Table 6**.

Table 6: Corrections to the values given in Table 5, to be applied for conditions other than those given in the remarks column of Table 5.

Change in conditions other than those given in Table 5	Correction for water content	Correction for sand content in total aggregates
Sand conforming to zone I, III or IV	0	+1.5 for zone I, - 1.5 for zone III, - 3.0 for zone IV
Increase or decrease in compacting factor value by 0.1 (for workability)	±3%	0
Each 0.05 increase or decrease in water-cement ratio	0	±1%
For rounded aggregates (gravel)	- 15 kg/m^3	- 7%

(140)

SE-Sem-IV – Choice Based – Unl

4/6/19

Paper / Subject Code: 40406 / Fluid Mechanics -II

(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 clearly**.

4) Draw **neat figures** as **required**.

1. Answer **any 4** of the following. **20**

a. Derive Dupit's Equation.

b. Explain different steps in solving distribution network by Hardy Cross method.

c. Explain boundary layer separation and its control measures.

d. Explain propagation of pressure waves in a compressible fluid.

e. Explain kinetic correction factor and momentum correction factor.

f. Explain Prandlt's mixing length theory.

2. a. In a pipe of 300 mm diameter, the centre line velocity and velocity at a point 2.3 m/s and 2 m/s resp. Assuming the flow in pipe to be turbulent find discharge through the pipe, co-efficient of friction, height of roughness projections. **10**

b. An aeroplane is flying at 1000 km/hr through still air having a pressure of 78.5 kN/m^2 (abs) and temp. - 8 °C. Calculate on stagnation point on the nose of plane 1) Stagnation Pressure 2) Stagnation Temp. 3) Stagnation Density. Take R = 287 J/kg K and k = 1.4. **10**

3 a. Two sharp ended pipes of diameter 50 mm and 100 mm resp. each of length 100m resp. is connected in parallel between two reservoirs which have a difference of level of 10m. If friction factor for each pipe is 0.32 ,calculate :- **10**

1) Rate of flow for each pipe

2) The diameter of single pipe 100 m long which would give the same discharge, if it were substituted for the original two pipes.

b. Derive Prandlt's universal velocity distribution for turbulent flow in pipes. **10**

4 a. A siphon of diameter 200 mm connects two reservoirs having a difference in elevation of 12m. The total length of siphon is 600 m and the summit is 4m above the water level in the upper reservoir. If the separation takes place at 2.8 m of water absolute, find the maximum length of siphon from upper reservoir to the summit. Take f=0.004 and atmospheric pressure=10.3 m of water. **10**

b. Water is flowing in a pipe of 140mm diameter with a velocity of 2.5 m/s.When it is suddenly brought to rest by closing the valve. Find the pressure rise assuming pipe is elastic. E=206 GN/m^2. Poisson's ratio= 0.25, **04**

K for water = 2.06 GN/m^2 Pipe wall is 5mm thick.

c Explain Hydraulic Gradient Line and Total Energy Line. **06**

5 a. A lubricating oil of viscosity 1 poise and sp.gr.0.9 is pumped through 30 mm diameter pipe. If the pressure drops per meter length of pipe is 20 kN/m^2. **10**

Determine 1) the mass flow rate in kg/min 2) the shear stress at the pipe wall 3) Reynolds number of flow 4) The power required per 50 m length of the pipe to maintain the flow.

b. The velocity distribution in boundary layer is given by **10**

$$\frac{u}{U} = 2\left(\frac{y}{\delta}\right) - \left(\frac{y}{\delta}\right)^2$$

δ =boundary layer thickness

Calculate the displacement thickness, momentum thickness and energy thickness.

6 a. Experiments were conducted in a wind tunnel with a wind speed of 60 km/hr on a flat plate of size 2m long and 1 m wide. The density of air is 1.15kg/m^3.The coefficient of lift and drag 0.75 and 0.15 resp. Determine :- **10**

1) Lift Force 2) Drag force 3) Resultant force 4) Direction of resultant force

5) Power exerted by air on plate.

b. In a rough pipe of diameter 0.5 m and length 4400 m water is flowing at the rate of 0.5 m^3/s. If the average height of roughness is 0.48 mm, find power required to maintain this flow. **6**

c Explain Hydraudynamically smooth and rough boundaries. **4**
