Bharatiya Vidya Bhavan's

SARDAR PATEL COLLEGE OF ENGINEERING

(Government Aided Autonomous Institute)

Munshi Nagar, Andheri (W) Mumbai – 400058

End Semester/~~Re-exam~~ – January/~~February~~ 2025

S. Y. Sem III

Program: B.Tech Civil Engineering (Working Professional) Duration: 3 Hours

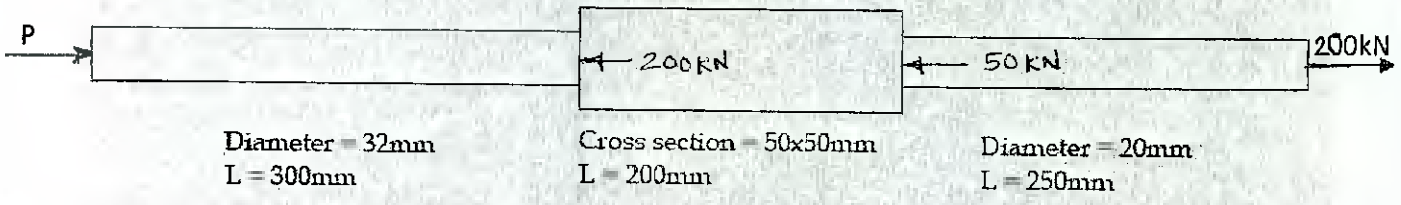
Course Code: PC-BTC301 Maximum Points: 100

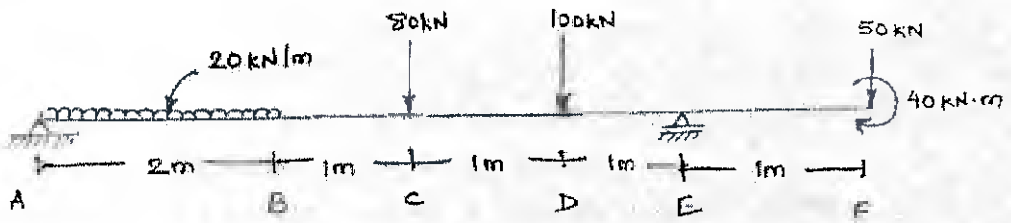
Course Name: Mechanics of materials Semester: III

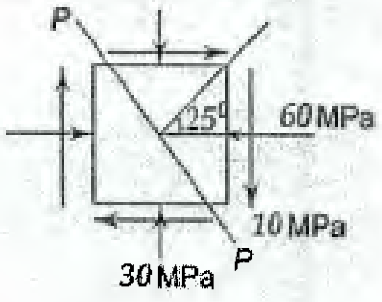
13/1/25

Notes:

- Attempt any 5 main questions
- Draw neat sketches to support your answers
- Assume suitable data if missing and state the same clearly.

Q.No.	Questions	Points	CO	BL	Module
1. a)	Explain and sketch the stress strain curve obtained for ductile materials under tensile test. Mark and define the following points : Elastic limit, Yield stress, Ultimate stress, Modulus of elasticity.	10	02	02	01
1.b)	Analyze the axial stresses in the bar of varying cross section as shown below and obtain the total change in length	10	02	03	01
					
2.a)	A bar with rectangular cross section is subjected to an axial pull of 150kN along its length. If it is originally 2m long, 30mm wide and 20mm thick, evaluate the following values : a) Change in length b) Change in width c) Change in thickness d) Modulus of rigidty and bulk modulus Take E=200GPa and Poisson's ratio = 0.3	10	02	03	01
2.b)	A rod of steel 1m in length at a temperature of 20°C. Find: i)the free expansion/contraction when the	10	02	03	01

	temperature is raised to 110° C; ii)stress in bar if no expansion is allowed and iii)stress when an expansion of 0.5 mm is allowed. Take $\alpha = 12 \times 10^{-6}$/° C, $E = 2 \times 10^5$ N/mm².				
3	Draw the SFD and BMD for the beam shown in fig. below. Also obtain maximum bending moment and its point of action.	20	01	03	02
					
4.a)	A 150 x 400 mm timber beam is strengthened by the addition of 100 x 4 mm steel plates secured at its top and bottom surfaces. The flitched beam is simply supported and carries a uniformly distributed load of 30kN/m over an effective span of 10m. analyse the following: i)Bending stresses in timber beam before strengthening ii)Bending stresses in timber and steel plates after strengthening Take $E_s = 2 \times 10^5$N/mm² and $E_T = 1 \times 10^4$ N/mm².	10	02	03	03
4.b)	A cylindrical vessel, whose ends are closed by means of rigid flange plates, is made up of steel plate 6 mm thick. The length and internal diameter of the vessel are 70 cm and 35 cm respectively. Determine the longitudinal and hoop stresses in the cylindrical shell due to an internal fluid pressure of 1.5MPa. Also calculate the increase in length, diameter and volume of vessel. Take E = 2×105 MPa and μ=0.3	10	03	03	07
5.a)	A plane element is subjected to the stresses as shown in the figure below. Determine **analytically**: i) The principal stresses and their directions ii) The maximum shearing stresses iii) Normal and shearing stresses on the inclined plane P-P	10	02	03	06

					
5.b)	Solve Q 5.a) **graphically** using Mohr's circle	10	02	03	06
6.a)	An I beam having flanges as (250x10)mm and web as (8x350) mm is used as a simply supported beam over 5m span and carries a UDL of 10kN/m. Calculate the shear stresses induced at support section and sketch its variation along the depth.	10	01, 02	03	04
6.b)	Obtain the shear centre for a channel section having flanges = 150x12mm and web = 250x10mm. The section is subjected to a shear force of 30kN. Sketch the variation of shear flow across the section.	10	04	03	04
7.a)	The maximum shear stress developed on the surface of a solid circular shaft subjected to torsion is 150MPa. Analyse the maximum shear stress that will develop if the diameter of shaft is increased by 50%.	05	02	03	05
7.b)	A solid shaft has to carry a torque of 15 kNm. Find a suitable diameter for the shaft if the maximum stress is limited to 100 MPa and the angle of twist should not be more than 20 degrees per metre length. G = 85 GPa. If this solid shaft is to be replaced by a hollow shaft of same material, equal length and same allowable shear stress, having external diameter equal to 1.3 times the internal diameter, find the cross section dimensions of the hollow shaft.	10	02	03	05
7.c)	Define torsion. State the assumptions in theory of torsion. Explain the terms in torsion equation with neat sketch	05	02	02	05

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END-SEM/~~RE-EXAM~~ Examinations, January/~~February~~ 2025

S.Y CCJ Sem III

Total points: 100

Duration: *Total Time allotted will be 3Hr.*

Class: B.TECH (Civil Engineering) [Working Professional]. Semester III

Program: CIVIL

Name of the Course: **Basics of Surveying** Course Code : **PC-BTC303**

Instructions:

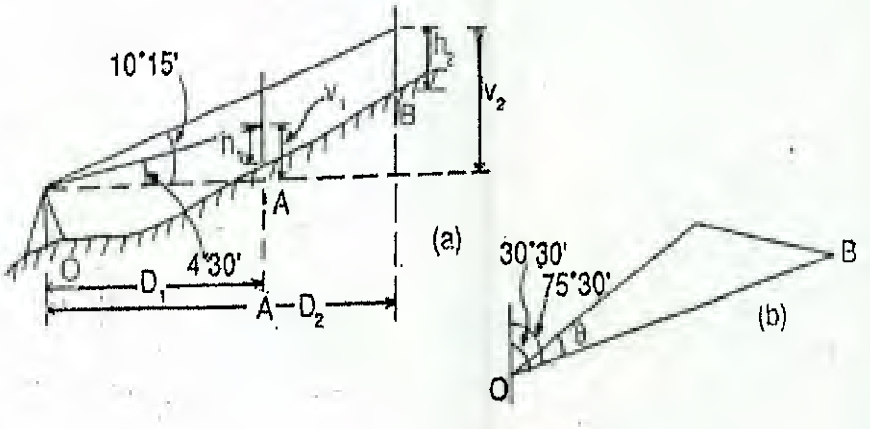
1. **All Questions are compulsory.**
2. Assume suitable data if necessary and state the clearly.

15/11/25

Que. No		Points	CO	BL	Module no
Q1	A. The following observations were made using tachometer fitted with anallatic lens, the multiplying constants being 100.	10	1,2	3	4

Instrument station	HI	Staff station	WCB	Vertical angle	Hair readings	Remarks
O	1.550	A	$30^0 30' 0''$	$4^0 30' 0''$	1.155, 1.755, 2.355	RL of O= 150.000
		B	$75^0 30' 0''$	$10^0 15' 0''$	1.250, 2.000, 2.750	

Calculate the distance AB and RLs of A and B. Find also the gradient of line AB.



	B. Determine the values of stadia constants from the following observations.	10	2	3	4

		Instrument station	Staff reading on	Distance(m)	Stadia readings				
					Lower	Upper			
		O	A	150	1.255	2.750			
			B	200	1.000	3.000			
			C	250	0.750	3.255			
Q 2	A. Describe the process of method of repetition and reiteration. B. What are fundamental lines of theodolite and what should be relation in between them. C. An incomplete traverse table is obtained as follows- Line / Length(m) / Bearing AB / 100 / ?? BC / 80.5 / $140^0 30' 0''$ CD / 60 / $220^0 30' 0''$ DA / ?? / $310^0 15' 0''$ Calculate length of DA and Bearing of AB.						05 05 10	2 1 2,4	2 1 3	3 3 3
Q 3	A. The following offsets were taken from a chain line to an irregular boundary line at an interval of 10 m: 0, 2.50, 3.50, 5.00, 4.60,3.20, 0 m Compute the area between the chain line, the irregular boundary line and the offsets by 1) The mid-ordinate rule 2) The average-ordinate rule 3) The Trapezoidal rule 4) Simpsons rule B. What is Two-point problem? Explain with a neat sketch procedure of solving a two-point problem in plane table surveying. C. What are advantages and disadvantages of plane table surveying?						08 08 04	1,3 2,3 2,4	2 1 1	5 5 5
Q 4	A. Explain the characteristics of contours with diagrams B. Explain the methods of contouring.						10 10	1,2 1,2	1 1	2 2
Q 5	A. The line of sight from two stations A and B just grazes the sea level. If the height of A and B above sea level are 100m and 150m respectively. Find the distance AB (Diameter of earth= 12880km)						05	3	2	2

	 B. The following consecutive readings were taken with a level and a 4-m levelling staff on a continuously sloping ground at a common interval of 30 m: 0.855(on A) , 1.545m 2.355, 3.115, 3.825, 0.455, 1.380, 2.055, 2.855, 3.455, 0.585, 1.015, 1.850, 2.755, 3.84599(on B). The RL of A was 380.500m. Make entries in level book and apply the usual checks. Determine the gradient of AB.	15	1,4	3	2
Q 6	A. The following are the bearings observed in traversing, with a compass, an area where local attraction was suspected. Find the amount of local attraction at a different station, the correct bearings of lines and the included angles. Draw a sketch of the plot assuming AB= 180 m, BC= 120m, CD= 60m and show in it all included angles.	15	1,4	2	1
	B. Explain Dip of magnetic needle and local attraction.	05	1	1	1
Q 7	A. Explain the steps of fieldwork in chain surveying. B. Explain with figure types of offsets.	10 10	1,3 1,2	1 1	1 1

Line	FB	BB
AB	$59^0 00' 0"$	$239^0 00' 0"$
BC	$139^0 30' 0"$	$317^0 00' 0"$
CD	$215^0 15' 0"$	$36^0 30' 0"$
DE	$208^0 0' 0"$	$29^0 00' 0"$
EA	$318^0 30' 0"$	$138^0 45' 0"$

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10/11/25

END SEM/RE-EXAM EXAMINATION JAN 2025

Program: B.Tech. (Civil) ENGINEERING Sem III **Duration: 3 Hours**

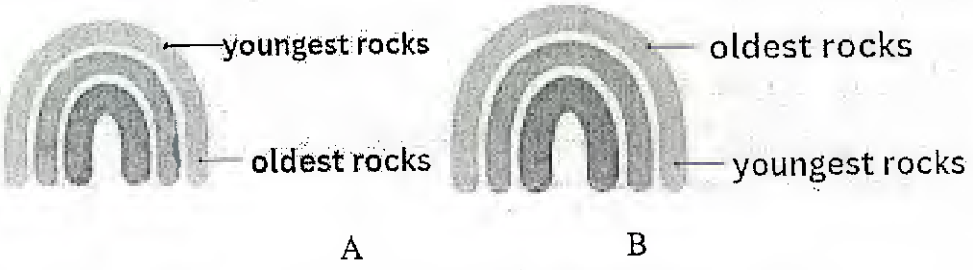
Course Code: BS-BTC 302 **Maximum Points: 100**

Course Name: Engineering Geology **Semester: III**

NOTE: Attempt the question paper in either ascending sequence or descending sequence. Start a new question on a fresh sheet. Use of scientific calculators is permitted. Mention the correct question numbers in the answer sheet. Attempt any 5 questions out of the 7 questions.

No.	Questions	Points	CO	BL	Module No.
1	Solve the following questions.	4			
1.	What is a thalweg? Explain it using a diagram.	6			1
2.	Where do s-waves disappear in the internal layers of the Earth? What is the reason behind the disappearance?				
1.B	Solve the following questions	5			
1.	List out the common rock forming minerals.	2			2
2.	What is the difference between rocks and minerals?	3			
3.	Which of the following is a foliated metamorphic rock - quartzite, schist, and marble.		1	2	
.2A	Discuss the issues associated with a site which is:	10			
1.	An area with limestone and claystone bedding.				3
2.	An area with basalts which have vesicles and have columnar joints.				
3.	An area with foliated metamorphic rocks such as slates and schists.				
2B	Match the following.	10			1
	1. Focus/Hypocentre — A.The point on the surface that is directly perpendicular to the focus.				
	2. Epicentre — B.Measure the scale of absolute magnitude of an earthquake				
	3. S-waves — C.The point where the energy of an earthquake is released inside the Earth.				
	4. Richter scale — D.Measures the intensity of an earthquake based on based on the amount of destruction caused				
	5. Mercalli scale — E.Second to reach the epicenter		1, 2	1, 2, 3	
. 3A	Match the following features with the associated rocks.	10			
1	Foliated metamorphic rock. A. Phyllite/Schist			1,	
2	Metamorphic composed of CaCO3. B. Gneiss		1	2, 3	3

END SEM/RE-EXAM EXAMINATION JAN 2025

3	Sedimentary rock composed of CaCO3. C. Marble					
4	Preferred orientation of mafic and felsic minerals arranged in separate layers. D. Limestone					
5	Fine grained metamorphic rock with layers and fissility. E. Slate					
Q.3 B	**Solve the following questions.**					
1.	List out the properties of sedimentary rocks with examples.	5				
2.	Claystone, Sandstone, Gneiss, Conglomerate, Limestone. Find the odd one out and justify your answer.	5				
Q. 4	Solve the following questions.					
1.	Draw the diagrams of an antiform and synform. Identify the anticline and syncline from the diagrams below:  A B	5				
2.	What is the geological feature in which blocks of rocks move with respect to one another? Mention its types with a short description.	5				
3.	What are the factors causing landslides?	5				
4.	Comment on the type of dams that can be constructed at a location with:	5				
a.	Narrow valleys, and strong abutments					
b.	Wide valleys.					
c.	Strong foundation, and moderately narrow valleys.					
d.	Seismically active regions.			1,		
e.	Wide valleys with weak or permeable foundations.		1, 2	2, 3	4	
Q.5A	Write a note on (any 5)					
1.	Dip and strike	10			4	
2.	Right hand thumb rule for identifying the dip and strike					
3.	Principle of Original horizontality					
4.	Principle of Uniformitarianism					
5.	Unconformities					
6.	Principle of order of superpositions					
7.	Principle of inclusions					
8.	Principle of crosscutting relationships			1,		
Q. 5B	What is a cone of depression? Which factors influence this cone of depression?	10	1, 2	2, 3	6	

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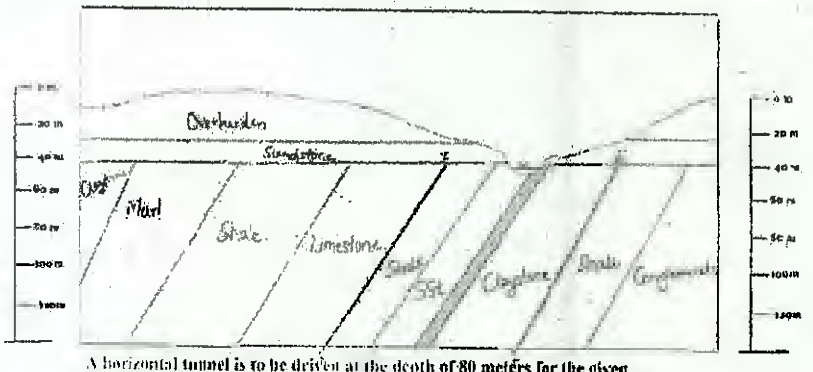
Q.6	Solve the following questions.				
1.	List out the direct methods of geological investigation.	5			
2.	What is sorption? What happens if the value of sorption exceeds 60%?	5			
3.	A rock sample has the following properties: • Volume of voids: 35 cm^3 • Total volume of the sample: 140 cm^3 Calculate the porosity of the sample. Express the answer as a percentage.	5			
4.	Write a note on (any 1)	5			
i.	Seismic method of geophysical investigation				
ii.	Self-potential method of geophysical investigation				
iii.	Gravity method of geophysical investigation.		1, 2	1, 2, 3	5
. 7A	Solve the following questions:				7
1.	Which rocks are suitable for construction of tunnels?	2			
2.	Comment on the issues that will be encountered if a tunnel is to be constructed at the depth of 80m in the diagram below.	8			
	 A horizontal tunnel is to be driven at the depth of 80 meters for the given hypothetical geological section. Comment on the various possible problems that might be encountered during tunneling with an emphasis on the lithological aspect of the area.				
. 7B	Solve the following questions.	10		1, 2,	6
	How is an unconfined aquifer different from confined and perched aquifers?		3	3, 4	

Working Professionals

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End Semester/~~Re-examination~~ 2024-25

Program: S.Y.B.Tech_WP (Civil) Sem III

Duration: 3 Hours

Course Code: BS-BTC301

Maximum Points: 100

Course Name: Laplace Linear Algebra and Complex Analysis

Semester: III

6/11/25

Note:

1. **Attempt Any Five Questions**
2. **Answers to the sub questions should be grouped together**

		Questions	Points	CO	BL	Module
1	a	Test the consistency of the following system of linear equations and if possible, solve $2x+3y-z-2=0$ $x+2y+z+3=0$ $3x+y-2z-1=0$	6	4	BL5	4
	b	Find the sum and product of Eigen values of A^{-1}, where $A=\begin{bmatrix}3&1&6&8\\0&2&5&7\\0&0&5&3\\0&0&0&-1\end{bmatrix}$	6	4	BL5	4
	c	Evaluate $(i)\,L\{e^{-3t}\sin 4t\cdot\cos 3t\}$ $(ii)\,L\{t\cos(at+b)\}$, where a and b are constants.	8	1	BL3	1
2	a	Find Eigen Values and Eigen Vectors of the following matrix $A=\begin{bmatrix}3&4\\4&-3\end{bmatrix}$	6	4	BL5	5
	b	Under the transformation $w=\frac{1}{z}$, find the image of $\lvert z-3\rvert=2$	6	3	BL2	3

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	c	Reduce the following matrix to normal form and hence find its rank. $A=\begin{bmatrix}2 & 1 & 4 & -1\\ 1 & 2 & 1 & 3\\ 4 & 5 & -1 & 2\\ 8 & 7 & 7 & 1\end{bmatrix}$	8	4	BL3	4
3	a	Prove that $v=x^4-6x^2y^2+y^4$ is a harmonic function and find corresponding harmonic conjugate	6	3	BL4	3
	b	Evaluate $L^{-1}\left\{\frac{3s+1}{(s-1)^2(s+2)}\right\}$	6	1	BL5	2
	c	Verify Cayley Hamilton Theorem for the following matrix and find A^{-1}, if it exists $A=\begin{bmatrix}0 & c & -b\\ -c & 0 & a\\ b & -a & 0\end{bmatrix}$	8	4	BL5	5
4	a	Determine constants a,b and c if $A=\frac{1}{3}\begin{bmatrix}1 & 2 & a\\ 2 & 1 & b\\ 2 & -2 & c\end{bmatrix}$ is orthogonal.	6	4	BL5	4
	b	Evaluate $\int_0^\infty te^{-3t}\cos 4t\,dt$	6	2	BL3	1
	c	Using Convolution Theorem, Evaluate $L^{-1}\left\{\frac{1}{(s+3)(s-2)^3}\right\}$	8	1	BL3	2
5	a	Evaluate $L\left\{\frac{e^{-at}-e^{-bt}}{t}\right\}$	6	1	BL4 ,5	2
	b	Find the map of the straight line $3x+2y=1$ by the transformation	6	3	BL4	3

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End Semester/~~Re-examination~~ 2024-25

		$w=\frac{1}{z}$				
	c	Evaluate $(i)\,L\{\sin t\cdot\sin 2t\cdot\sin 3t\}$ $(ii)\,L\{e^{-2t}f(t)\}$ where $L\{f(t)\}=\frac{2s-3}{s^2+s+1}$	8	1	BL2 BL4	1
6	a	Evaluate $L^{-1}\left\{\frac{2s+3}{(s-1)(s-2)(s-3)}\right\}$	6	1	BL5	2
	b	Evaluate $L\left\{\left(t+e^{-t}+\sin t\right)^2\right\}$	6	1	BL3	1
	c	For the following matrix A, find two non-singular matrices P and Q such that PAQ is in the normal form. $A=\begin{bmatrix}1&2&3&4\\2&1&4&3\\3&0&5&-10\end{bmatrix}$	8	4	BL3 BL5	4
7	a	Find the analytic function $f(z)=u+iv$ whose imaginary part is $v=x^2-y^2+\frac{x}{x^2+y^2}$	5	3	BL2 BL3	3
	b	Evaluate $L^{-1}\left\{\log\left(\frac{(s-1)(s-2)}{s^2+4}\right)\right\}$	5	1	BL5	2
	c	Find Eigen Values and Eigen Vectors of the following matrix $A=\begin{bmatrix}2&1&1\\2&3&2\\3&3&4\end{bmatrix}$	10	4	BL1 BL3	5

Formula

1. $\frac{d}{dx}e^{ax} = ae^{ax}$ $\quad \therefore \int e^{ax}dx = \frac{e^{ax}}{a}$
2. $\frac{d}{dx}\sin(ax+b) = a\cos(ax+b)$ $\quad \therefore \int \cos(ax+b)dx = \frac{1}{a}\sin(ax+b)$
3. $\frac{d}{dx}\cos(ax+b) = -a\sin(ax+b)$ $\quad \therefore \int \sin(ax+b)dx = -\frac{1}{a}\cos(ax+b)$
4. $\frac{d}{dx}x^n = nx^{n-1}$ $\quad \therefore \int x^n dx = \frac{x^{n+1}}{n+1}$
5. $\frac{d}{dx}\log(ax+b) = \frac{a}{ax+b}$ $\quad \therefore \int \frac{1}{ax+b}dx = \frac{1}{a}\log(ax+b)$

Integration by Parts

$$\int uvdx = u\cdot\int vdx - \int\left[\frac{du}{dx}\cdot\int vdx\right]dx$$

Generalized Formula for Integration by Parts
(For Product of Algebraic and Trigonometric functions
or Product of Algebraic and Exponential functions)

$$\int uvdx = u\cdot v_1 - u'\cdot v_2 + u''\cdot v_3 - u'''\cdot v_4 + \cdots$$

where $u' = \frac{du}{dx}$, $u'' = \frac{du'}{dx}$, $u''' = \frac{du''}{dx}$ and $v_1 = \int vdx$, $v_2 = \int v_1 dx$, $v_3 = \int v_2 dx$

u is always Algebraic Function, where as v can be either Trigonometric or Exponential Function

Trigonometric Formulae

1. $\sin A\cdot\cos B = \frac{1}{2}[\sin(A+B)+\sin(A-B)]$
2. $\cos A\cdot\cos B = \frac{1}{2}[\cos(A-B)+\cos(A+B)]$
3. $\sin A\cdot\sin B = \frac{1}{2}[\cos(A-B)-\cos(A+B)]$

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END SEM/~~RE-EXAM~~ EXAMINATION FOR WORKING PROFESSIONAL JAN/FEB 2024-25

8/1/25

S. Y.

Program: B.Tech. Civil Engineering Sem IV

Course Code : **PC-BTC305**

Course Name : **Concrete Technology**

Duration: 3 Hour

Maximum points: 100

Semester: III

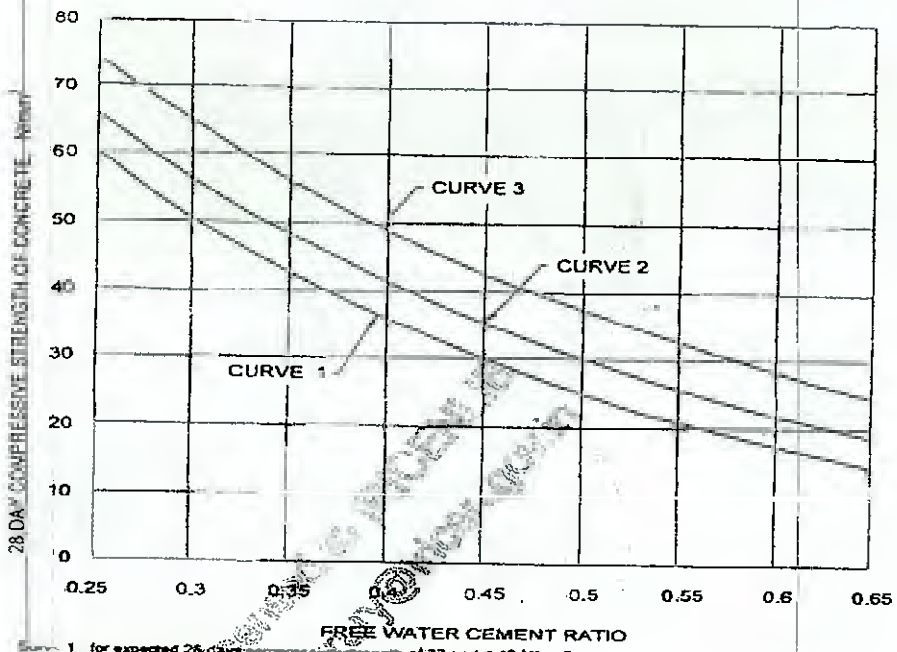
Instructions:

1. Attempt ***any FIVE questions out of SEVEN*** questions
2. Answers to all sub questions should be grouped together
3. Draw neat diagrams wherever required
4. Assume suitable data if necessary and state the clearly.

<table>
<tr><th>Que. No.</th><th>Descriptions</th><th>Points</th><th>CO</th><th>BL</th><th>Module No.</th></tr>
<tr><td rowspan="3">Q1</td><td>(a) "Ready mix Concrete turns out to be a boon for Indian construction industry" justify your answer. Also discuss the various units and their functions you have observed during site visit.</td><td>08</td><td>3</td><td>2</td><td>05</td></tr>
<tr><td>(b) How workability of normal concrete and SCC measured at site to examine the quality of fresh concrete?</td><td>07</td><td>3</td><td>4</td><td>04</td></tr>
<tr><td>(c) Highlight the importance of Alkai-Silica reaction on durability of concrete.</td><td>05</td><td>1</td><td>2</td><td>01</td></tr>
<tr><td rowspan="3">Q2</td><td>a. Differentiate between weigh batching and volume batching of concrete</td><td>5</td><td>1</td><td>3</td><td>03</td></tr>
<tr><td>b. Design concrete for M35 grade using guidelines given in IS 10262:2019 for the following data.</td><td>15</td><td>2</td><td>2</td><td>03</td></tr>
<tr><td colspan="4"><table>
<tr><td>Exposure condition: Severe</td><td>Maximum size of aggregate —20 mm</td><td>Method of placement — crane and bucket</td><td>Specific gravity of 20 mm aggregate (M_2)- 2.80</td></tr>
<tr><td>Strength of cement OPC —43 grade</td><td>Workability — slump, 100 mm</td><td>Type of coarse aggregate — angular coarse aggregate</td><td>Specific gravity of 10 mm aggregate (M_1) — 2.70</td></tr>
<tr><td>Zone of sand — I</td><td>Water absorption- M_2-1.8% & M_1- 1.3% Total moisture content M_2-0.7% & M_1- 0.8%</td><td>Water absorption fine aggregate- 3.1% Total moisture content in fine aggregate – 5.6 %</td><td>Specific gravity of fine aggregate — 2.85</td></tr>
</table></td></tr>
<tr><td rowspan="2">Q3</td><td>(a) Design concrete for M 25 grade using DOE method. Refer the data from Que2 and chart attached at the end of manuscript. Consider maximum permissible ratio of 0.55 and minimum cement content as 325 kg per cum.</td><td>12</td><td>3</td><td>4</td><td>3</td></tr>
<tr><td>(b) Why corrosion of steel reinforcement occurs in concrete? Explain in detail the procedure for conducting Half-cell potentiometric test.</td><td>08</td><td>2</td><td>2</td><td>5</td></tr>
</table>

Q4	**(a) Design concrete for M30 grade using ACI Method; consider the data related to the properties of material as given in Que.No.2.** (b) Discuss problems occurs in cold weather concreting. Suggest suitable measures to improve the performance.	12 8	2 1	3 2	3 4
Q5	(a) It is proposed to **design SCC** of grade M35 for slump flow of 600-800 mm, consider w/c of 0.34, and the percentage of fine aggregate passing from 125 micron as 4.1 %. Assume suitable powder content between 400-600 kg /$m^3$and other data from the que2a. (b) Distinguish between (i) Hydrophobic cement and low heat cement (ii) Hand mixing vs. Machine mixing	**12** **8**	1 2	2 2	3 1,3
Q6	(a) What are the benefits of High Performance concrete (HPC)? Discuss in brief different properties of HPC. (b) Explain the effect of w/c on strength, durability and workability of concrete. (c) How Silica fume act as sustainable material to improve the performance of concrete?	**10** **6** **4**	1 3 2	2 3 3	4 2 1
Q7	Write explanatory notes on the following *(any Four)* i) Materials for HPC ii) Ultrasonic pulse velocity test iii) pH test of concrete iv) Testing of chemical admixture v) Bulking of sand vi) Bogues compound	 **5** **5** **5** **5** **5** **5**	 3 2 3 1 1 3	 2 2 2 2 2 2	 4 5 5 3 1 1

Reference Tables for IS 10262:2019 Method of Concrete mix design



Curve 1 for expected 28-days compressive strength of 33 and < 43 N/mm².
Curve 2 for expected 28 days compressive strength of 43 and < 53 N/mm².
Curve 3 for expected 28-days compressive strength of 53 N/mm² and above.

NOTES

Table 5 Minimum Cement Content, Maximum Water-Cement Ratio and Minimum Grade of Concrete for Different Exposures with Normal Weight Aggregates of 20 mm Nominal Maximum Size

(Clauses 6.1.2, 8.2.4.1 *and* 9.1.2*)*

Sl No.	Exposure	Plain Concrete			Reinforced Concrete		
		Minimum Cement Content kg/m³	Maximum Free Water-Cement Ratio	Minimum Grade of Concrete	Minimum Cement Content kg/m³	Maximum Free Water-Cement Ratio	Minimum Grade of Concrete
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
i)	Mild	220	0.60	-	300	0.55	M 20
ii)	Moderate	240	0.60	M 15	300	0.50	M 25
iii)	Severe	250	0.50	M 20	320	0.45	M 30
iv)	Very severe	260	0.45	M 20	340	0.45	M 35
v)	Extreme	280	0.40	M 25	360	0.40	M 40

NOTES

1 Cement content prescribed in this table is irrespective of the grades of cement and it is inclusive of additions mentioned in 5.2. The additions such as fly ash or ground granulated blast furnace slag may be taken into account in the concrete composition with respect to the cement content and water-cement ratio if the suitability is established and as long as the maximum amounts taken into account do not exceed the limit of pozzolana and slag specified in IS 1489 (Part 1) and IS 455 respectively.

2 Minimum grade for plain concrete under mild exposure condition is not specified.

Table 5 Volume of Coarse Aggregate per Unit Volume of Total Aggregate for Different Zones of Fine Aggregate for Water-Cement/Water-Cementitious Materials Ratio of 0.50

(Clause 5.5*)*

Sl No.	Nominal Maximum Size of Aggregate mm	Volume of Coarse Aggregate per Unit Volume of Total Aggregate for Different Zones of Fine Aggregate			
		Zone IV	Zone III	Zone II	Zone I
(1)	(2)	(3)	(4)	(5)	(6)
i)	10	0.54	0.52	0.50	0.48
ii)	20	0.66	0.64	0.62	0.60
iii)	40	0.73	0.72	0.71	0.69

NOTES

1 Volumes are based on aggregates in saturated surface dry condition.

2 These volumes are for crushed (angular) aggregate and suitable adjustments may be made for other shape of aggregate.

3 Suitable adjustments may also be made for fine aggregate from other than natural sources, normally, crushed sand or mixed sand may need lesser fine aggregate content. In that case, the coarse aggregate volume shall be suitably increased.

4 It is recommended that fine aggregate conforming to Grading Zone IV, as per IS 383 shall not be used in reinforced concrete unless tests have been made to ascertain the suitability of proposed mix proportions.

Table 4 Water Content per Cubic Metre of Concrete For Nominal Maximum Size of Aggregate

(Clause 5.3*)*

Sl No.	Nominal Maximum Size of Aggregate mm	Water Content[1] kg
(1)	(2)	(3)
i)	10	208
ii)	20	186
iii)	40	165

[1] Water content corresponding to saturated surface dry aggregate

Table 3 Approximate Air Content

(Clause 5.2*)*

Sl No.	Nominal Maximum Size of Aggregate mm	Entrapped Air as Percentage of Volume of Concrete
(1)	(2)	(3)
i)	10	1.5
ii)	20	1.0
iii)	40	0.8

5.2.1 The actual values of air content can also be adopted during mix proportioning, if the site data (at least 5 results) for similar mix is available.

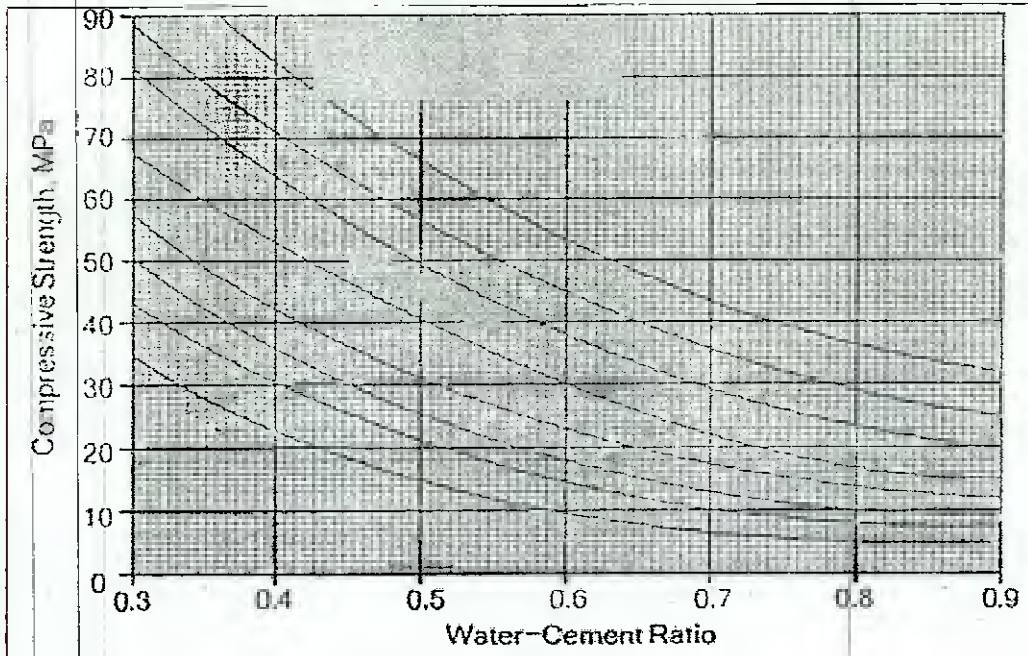
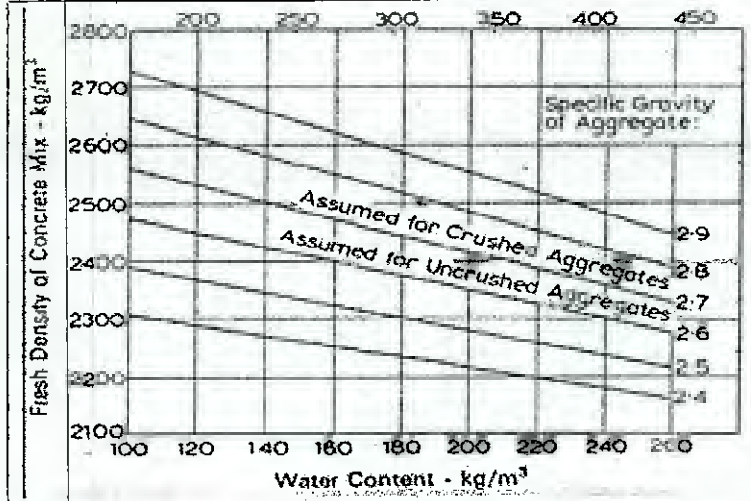


Table 20.47. App. Free water content required for various workability according to 1988 British Method

Aggregate		Water content kg/m³ for slump			
Max. size mm	Type	0 — 10 mm	10 — 30 mm	30 — 60 mm	60 — 180 mm
		Vee Bee seconds > 12	6 — 12	3 — 6	0 — 3
10	Un crushed	150	180	205	225
	crushed	180	205	230	250
20	Un crushed	135	160	180	195
	crushed	170	190	210	225
30	Un crushed	115	140	160	175
	crushed	155	175	190	205

Table 20.48. Reduction in water content of table 21.47 when fly ash used.

% of fly ash in cementitious material	Slump in mm Vee Bee seconds	Reduction in water content kg/m³			
		0 — 10 > 12	10 — 30 6 — 12	30 — 60 3 — 6	60 — 180 0 — 3
10		5	5	5	10
20		10	10	10	15
30		15	15	20	20
40		20	20	25	25
50		25	25	30	30



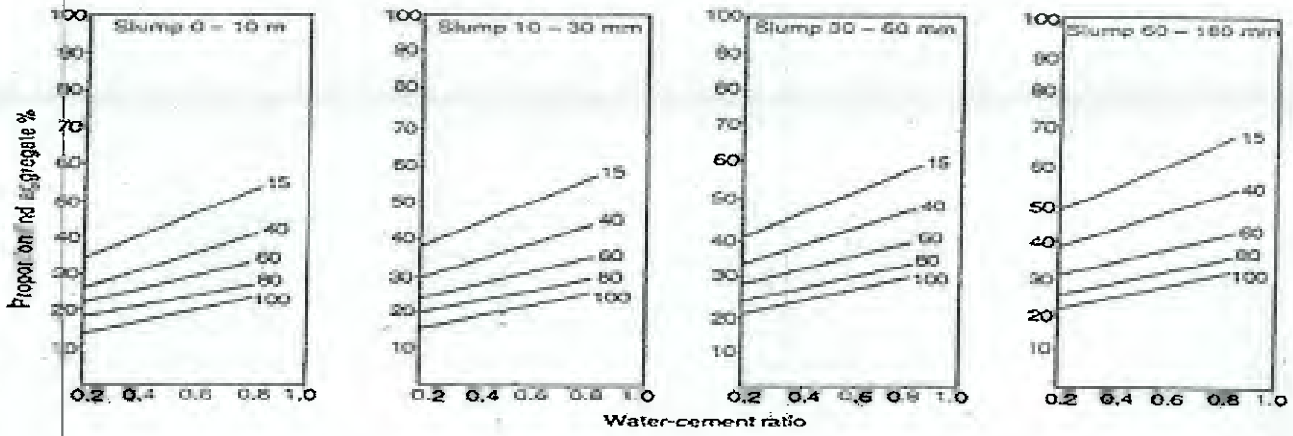


Fig 20.12. (b)

Table 20.46 App Compressive strength of concrete in Mpa with w/c of 0.5 as per DOE for OPC (Type I) and SRC (Type v) at diff time period

Type of cement		3 days	7 days	28 days	91 days
OPC	Uncrushed	18-22	27-30	40-42	48-49
SRC	Crushed	23-27	33-36	47-49	55-56

Table 1,2 and 3 for ACI Method Concrete Mix Design

(1) Dry Bulk Volume of coarse aggregate/ unit volume of concrete as per ACI 211.1-91

Maximum size of aggregate	Bulk volume of dry rodded CA /unit volume of concrete for fineness modulus of sand of			
FM	2.4	2.6	2.8	3.00
10	0.5	0.48	0.46	0.44
12.5	0.59	0.57	0.55	0.53
20 (25,40,50,70)	0.66	0.64	0.62	0.60
150	.87	0.85	0.83	0.81

(2) Relation between water/cement ratio & average compressive strength of concrete, as per ACI211.1-91

Average compressive strength at 28 days	Effective water/cement ratio (by mass)	
MPa	Non air entrained concrete	Air entrained concrete
45	0.38	-
40	0.43	-
35 (30,25,20)	0.48	0.4
15	0.8	0.71

(3) Requirements of ACI-318-89 for w/c ratio & strength for special exposure conditions

Exposure condition	Maximum w/c ratio, normal density aggregate concrete	Minimum design strength, low density aggregate concrete MPa
Concrete intended to be watertight		
(a) Exposed to fresh water	0.5	25
(b) Exposed to sea water	0.45	30
Concrete exposed to freezing in a moist condition	0.45	30
For corrosion protection of reinforced concrete exposed to de icing salts, sea water	0.4	33

Table 4,5 and 6 for ACI Method Concrete Mix Design

(4) Recommended value of slump for various types of construction as per ACI 211.1-91

Type of construction	Range of slump (mm)
Reinforces foundation walls & footings	20-80
Plain footings,substructure wall	20-80
Beams & reinforced walls	20-100
Building columns	20-100
Pavements & slabs	20-80
Mass concrete	20-80

(5) Approximate requirements for mixing water & air content for different workabilities & nominal maximum size of aggregates as per ACI211.1-91

	Non air entrained concrete			
Workability or air content (Slump)	Water content, kg/m3 of concrete for indicted maximum aggregate size			
	10 mm (25, 40,50,70)	12.5 mm	20 mm	150 mm
30 -50 mm	205	200	185	125
80-100 mm	225	215	200	140
150-180 mm	240	230	210	-
Approx entrapped air (%)	3	2.5	2	0.2

(6) First estimate of density of fresh concrete as pe ACI 211.1-91

Maximum size of aggregate (mm)	First estimate of density of fresh concrete	
	Non air entrained kg/m³	Air entrained kg/m³
10	2285	2190
12.5 (20,25,40,50)	2315	2235
20	2355	2280
150	2505	2435

As per ACI in absence of record; required increase in mean strength for specified design strength

Specified design Strength (Mpa)	Less than 21	21-35	35 or more
Required Increase in mean strength (Mpa)	7	8.5	10

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Sardar Patel College of Engineering

(A Government Aided Autonomous Institute)
Munshi Nagar, Andheri (West), Mumbai – 400058

End Sem/~~Re-Examinations~~ Working Professional- January 2025

Program: J.Y. Civil Engineering Sem III **Duration: 3hr**

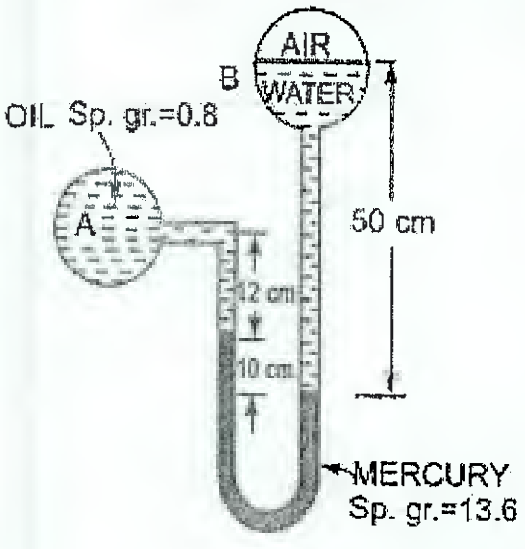
Course Code: PC-BTC306 **Maximum Points: 100**

Course Name: Fluid Mechanics **Semester: III**

Instructions

1. **Attempt any 5 Questions.**
2. Neat diagrams must be drawn wherever necessary.
3. Assume Suitable data if necessary and state it clearly.

Q. No.	Questions	Points	CO	BL	Mod
1a	Determine the viscosity of a liquid having a kinematic viscosity 6 stokes and specific gravity 2.0	4	CO1	BL2	1
1b	Find the capillary rise of water in a tube 0.03 cm diameter. The surface tension of water is 0.0735N/m	4			1
1c	State and Prove Pascal's law	8	CO1	BL2	2
1d	An oil of specific gravity of 0.8 is under a pressure of 137.2kN/m^2	4	CO1		2
	i) What is the pressure head expressed in meter of water? ii) What is the pressure head expressed in meter of oil?				
2a	Discuss the classification of fluids.	8	CO2	BL2	1
2b	A rectangular plane 3.0m wide and 4.0 m deep is immersed in water in such a way that its plane makes an angle of 30 degrees with the free surface. Determine the total pressure on one face of the plate and position of the center of pressure when its upper edge is 2m below the free surface.	8	CO1	BL3	3
2c	Brief about the classification of pressure measuring devices.	4	CO1	BL1	2
3a	A differential manometer is connected to two pipes A and B as shown in the figure. At B air pressure is 7.848N/cm^2. Find absolute pressure at A.	6	CO1	BL2	2



3b	Derive continuity equation for 3 dimensional flow.	8	C 2	BL2	4
3c	A body of dimensions width 2m, depth 1.5m and length 4m floats horizontally in water. Find the volume of water displaced and position of center of buoyancy. G for wooden block is 0.7.	6	CO1	BL3	3
4a	Describe Reynolds experiment, along with the characteristics of laminar and Turbulent flow.	8	CO3	BL2	5
4b	Discuss classification notches and orifices.	4	CO2	BL1	4
4c	Water flows through a pipe AB 1.2m dia at 3m/s and then passes through a pipe BC 1.5m dia. At C the pipe branches.	8	CO1	BL3	4
	Branch CD is 0.8 m in diameter and carries one third of flow in AB. The flow velocity in branch CE2.5 m/s. Find the volume rate of flow in AB, the velocity in BC, the velocity in CD and diameter of CE				
5a	Prove that equipotential lines are orthogonal to streamlines at all points of intersections.	6	CO2	BL2	4
5b	Explain in detail stream line, pathline and streak line.	6	CO2	BL2	4
5c	Discuss the development of boundary layer along the flat plate and any 2 method to control the separation of boundary layer.	8	CO3	BL2	6
6a	State Bernoulli's theorem. Explain in depth the applications of the same.	8	CO3	BL2	
6b	In a fluid, the velocity field is given by	8	CO1	BL3	4
	$V=(3x+2y)i+(2z+3x^2)j+(2t-3z)k$ Determine a) The velocity components u, v and w at any point in the flow field. b) The speed at point(3,2,3) c) The speed at t=4sec at point (0,0,4) d) Also classify the velocity field as steady, or unsteady, uniform or non-uniform and 1D, 2D and 3D flow.				
6c	Differentiate Newtonian and non-Newtonian fluids.	4	CO1	BL1	4
7a	A 25 cm diameter pipe carries oil of specific gravity 0.9 at a velocity of 3m/sec. at another section the diameter is 20cm. Find the velocity at this section and also mass rate of flow of oil.	8	CO3	BL2	4
7b	Discuss the conditions of a equilibrium of a submerged bodies.	6	CO1	BL2	3
7c	An open tank contains water upto a depth of 2m and above it an oil of specific gravity 0.9 for a depth of 1m. Find the pressure intensity a) At the interface of the two liquids b) At the bottom of the tank.	6	CO1	BL3	

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SARDAR PATEL COLLEGE OF ENGINEERING

(Government Aided Autonomous Institute)
Munshi Nagar, Andheri (W) Mumbai – 400058

END SEM/RE-EXAM EXAMINATION JAN/FEB 2024-25 (WPS)

S.Y. **SET: I**

Program: Civil Engineering Sem III

Course Code: PC-BTC-303

Course Name: Building Drawing with CAD

Duration: 3.00 hrs.

Maximum Points: 100

Semester: III

Notes: 1. Q.1 is compulsory & attempts any four out of remaining six.

2. Illustrate answer with neat sketches wherever required.

3.Make suitable assumptions where necessary and state them clearly.

Q.No	Questions	Points	BL	CO	Module No
1.	A) Draw to a suitable scale developed plan for ground floor of G+1 story bungalow for an Artist on a site of the data given below. 1. Plot size: 14 M x 16 M. (FSI: 1.0) 2. Road is on south side parallel to 14 M direction 3. Wind direction is E-SW-W & climatic zone is cold. 4. Requirements of Engineer a. Office room b. Master bed room c. Living room d. Children bed room e. Kitchen cum dining room f. Guest bed room g. Staircase/bath/WC/store/verandah are to be provided B) Draw terrace plan for above question.	15+05	L4	1-5	1-5
2	A. Draw to a suitable scale line plan of first floor for Q.1A. B. State: Built up area, Rera carpet area, carpet area, super built up area, FAR for Q.1A.	15+05	L2	1-5	1/5
3	A. Draw to a suitable scale, line plan of primary healthcare center building opening on a plot size 30 M x 45 M. Show all units with dimension and position of door, & windows.	20	L3	2-5	1,2
4	A. Discuss the need, objectives and five pillars of Real Estate Regulation Act, 2016 (RERA). B. Explain following principles of planning in detail, 1. Aspect 2. Circulation	10+10	L2	2	1

5	A. Discuss the necessities of building byelaws. Also explain building bylaws related to height of building and frontage of building. B. Discuss the site selection criteria's for residential building in detail.	10+10	L2/3	2-5	1/3/5
6	A. Draw to a suitable scale Foundation plan for Q.1A. B. Draw to a suitable scale site plan for Q.1A.	10+10	L3	1-3	1/3/5
7	A. Define: Perspective Drawing. Discuss the necessity of perspective drawing. Explain the detail procedure for two point perspective drawing. B. Discuss the types of residential building along with advantages and disadvantages.	10+10	L3	1-3	1/3/5

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Munshi Nagar, Andheri (W) Mumbai – 400058

END SEM/RE-EXAM EXAMINATION FOR WORKING PROFESSIONAL

JAN/FEB 2024-25

14/2/25

Program: B.Tech. Civil Engineering S.Y. Sem III

Duration: 3 Hour

Course Code: PC-BTC 305

Maximum Points: 100

Course Name: Concrete Technology

Semester: III

Notes:

1. Attempt ***any FIVE questions out of SEVEN*** questions
2. Answers to all sub questions should be grouped together
3. Draw neat diagrams wherever required
4. Assume suitable data if necessary and state the clearly.

Q.No.	Questions	Points	CO	BL	Module No.
1	a) Explain in detail the procedure for conducting Carbonation test of concrete.	06	2	2	05
	b) Give in details the classification of aggregates used in concrete.	06	3	1	01
	c. Explain the components and working of RMC plant observed during site visit.	08	3	3	01
2	a). Design a concrete mix of M45 grade using IS 10262:2019; for pile foundation with severe exposure condition. Take a standard deviation of 5 MPa. Use, OPC 53 grade cement, the specific gravities of cement-3.15; Fly ash-2.4, GGBS-2.8; plasticizer-1.1; specific gravities of Coarse Aggregate (10 mm-2.65, 20 mm-2.68) and specific gravity of Fine Aggregate are 2.87. Fineness Modulus of Fine Aggregate is 3.00 (Zone-I). A **slump of 175** mm is necessary. The water absorption of coarse aggregate is 1.4% and free moisture aggregate is 0.8%. The water absorption of fine aggregate is 2.2% and free moisture aggregate is 3.5%. ***Assume any missing data suitably and state them.***	15	02	3	02
	b). Highlight the importance of core test of concrete from structural stability perspective.	05	02	1	05
3	a. Design concrete for M 35 grade using DOE method. Refer the data from Que2a and chart attached at the end of manuscript(max. w/c - 0.55 & min. cement - 325 kg/m³)	12	02	3	02
	b. Discuss in detail the problems due to hot weather concreting. Suggest suitable measures to improve the performance.	08	03	2	04
4	a. Design concrete for specified design strength of 25 N/mm2 using ACI Method; consider the data related to the properties of material as given in Que.No.2a.	13	2	3	02

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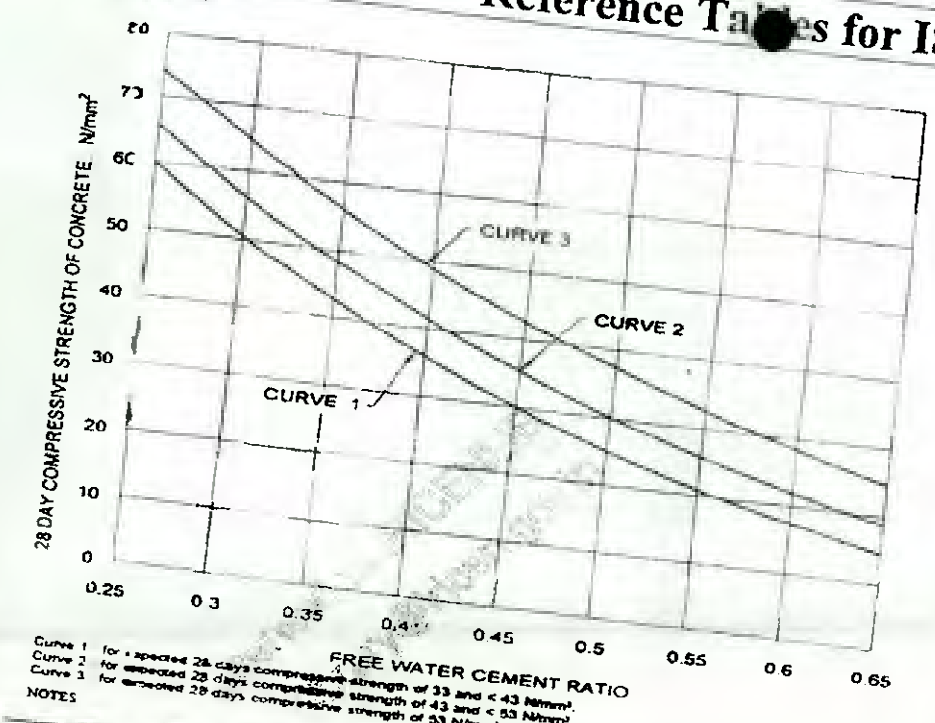
END SEM/RE-EXAM EXAMINATION FOR WORKING PROFESSIONAL

JAN/FEB 2024-25

	b. Explain in details procedure for ultrasonic pulse velocity test used to measure quality of concrete.	07	1	2	05
5.	a. It is proposed to design SCC of grade M45 for slump flow of 600-800 mm, consider w/c of 0.32, and the percentage of fine aggregate passing from 125 micron as 3.8 %. Assume suitable powder content between 400-600 kg /m^3 and other data from the que2a.	12	2	3	2
	b. Explain in detail various aspects considered to improve the quality of high performance concrete.	08	3	2	3
6	a) State the advantages and disadvantages of self-compacting concrete.	06	3	1	3
	b). Explain the salient Features of high performance concrete.	06	3	2	3
	c. Discuss various methods of concrete transportation with their suitability.	08	2	1	4
7	Write short notes on (any four)	20			
	i. Types of Retarders	5	1	2	1
	ii. Rice husk ash	5	1	1	1
	iii. Hydrophobic cement	5	3	2	3
	iv. Silica fume	5	2	1	1
	v. types of Plasticizers	5	1	2	1
	vi. Hydration products	5	3	3	1

Reference Tables for IS 10262:2019 Method of Concrete mix design



Curve 1 for a specified 28 days compressive strength of 33 and < 43 N/mm².
Curve 2 for attended 28 days compressive strength of 43 and < 53 N/mm².
Curve 3 for attended 28 days compressive strength of 53 N/mm² and above.

NOTES

Table 5 Minimum Cement Content, Maximum Water-Cement Ratio and Minimum Grade of Concret for Different Exposures with Normal Weight Aggregates of 20 mm Nominal Maximum Size

(Clauses 6.1.2, 8.2.4.1 and 9.1.2)

Sl No.	Exposure	Plain Concrete			Reinforced Concrete		
		Minimum Cement Content kg/m³	Maximum Free Water-Cement Ratio	Minimum Grade of Concrete	Minimum Cement Content kg/m³	Maximum Free Water-Cement Ratio	Minimum Grade of Concrete
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
i)	Mild	220	0.60	-	300	0.55	M 20
ii)	Moderate	240	0.60	M 15	300	0.50	M 25
iii)	Severe	250	0.50	M 20	320	0.45	M 30
iv)	Very severe	260	0.45	M 20	340	0.45	M 35
v)	Extreme	280	0.40	M 25	360	0.40	M 40

NOTES

1 Cement content prescribed in this table is irrespective of the grades of cement and it is inclusive of additions mentioned in 5.2. The additions such as fly ash or ground granulated blast furnace slag may be taken into account in the concrete composition with respect to the cement content and water-cement ratio if the suitability is established and as long as the maximum amounts taken into account do not exceed the limit of pozzolona and slag specified in IS 1489 (Part 1) and IS 455 respectively.

2 Minimum grade for plain concrete under mild exposure condition is not specified.

Table 5 Volume of Coarse Aggregate per Unit Volume of Total Aggregate for Different Zones of Fine Aggregate for Water-Cement/Water-Cementitious Materials Ratio of 0.50

(Clause 5.5)

Sl No.	Nominal Maximum Size of Aggregate mm	Volume of Coarse Aggregate per Unit Volume of Total Aggregate for Different Zones of Fine Aggregate			
		Zone IV	Zone III	Zone II	Zone I
(1)	(2)	(3)	(4)	(5)	(6)
i)	10	0.54	0.52	0.50	0.48
ii)	20	0.66	0.64	0.62	0.60
iii)	40	0.73	0.72	0.71	0.69

NOTES

1 Volumes are based on aggregates in saturated surface dry condition.

2 These volumes are for crushed (angular) aggregate and suitable adjustments may be made for other shape of aggregate need lesser fine aggregate content. In these case, the coarse aggregate volume shall be suitably increased.

3 Suitable adjustments may also be made for fine aggregate from other than natural sources, normally, crushed sand or mixed sand may

4 It is recommended that fine aggregate conforming to Grading Zone IV, as per IS 383 shall not be used in reinforced concrete unless tests have been made to ascertain the suitability of proposed mix proportions

Table 4 Water Content per Cubic Metre of Concrete For Nominal Maximum Size of Aggregate

(Clause 5.3)

Sl No.	Nominal Maximum Size of Aggregate mm	Water Content[1] kg
(1)	(2)	(3)
i)	10	208
ii)	20	186
iii)	40	165

[1] Water content corresponding to saturated surface dry aggregate.

Table 3 Approximate Air Content

(Clause 5.2)

Sl No.	Nominal Maximum Size of Aggregate mm	Entrapped Air, as Percentage of Volume of Concre
(1)	(2)	(3)
i)	10	1.5
ii)	20	1.0
iii)	40	0.8

5.2.1 The actual values of air content can also adopted during mix proportioning, if the site data least 5 results) for similar mix is available.

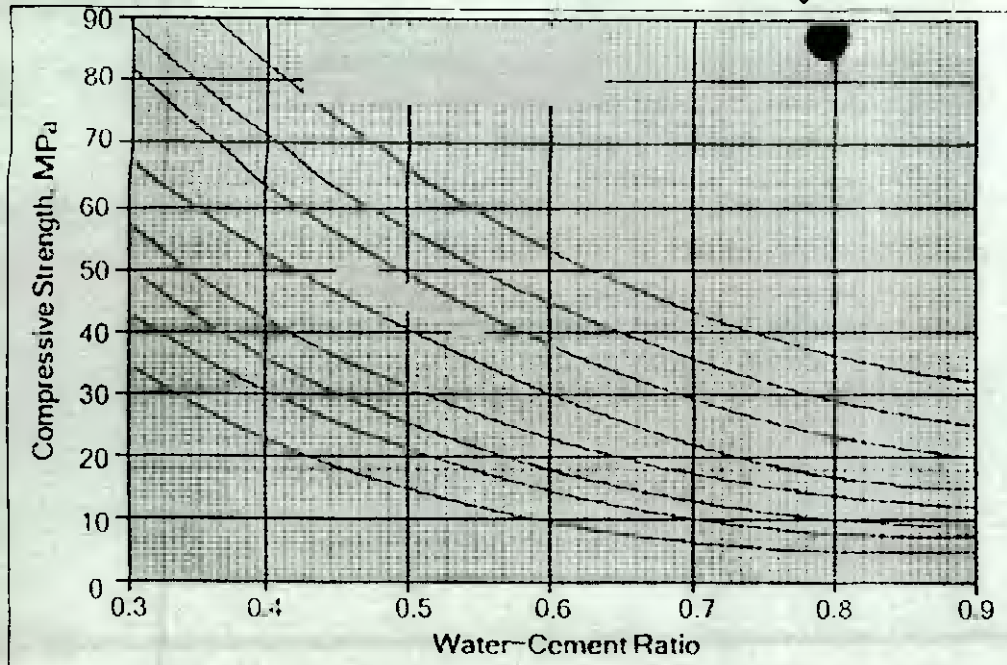


Table 20.47. App. Free water content required for various workability according to 1988 British Method

Aggregate		Water content kg/m³ for slump			
Max. size mm	Type	0 — 10 mm	10 — 30 mm	30 — 60 mm	60 — 180 mm
		Vee Bee secons > 12	6 — 12	3 — 6	0 — 3
10	Un crushed	150	180	205	225
	crushed	180	205	230	250
20	Un crushed	135	160	180	195
	crushed	170	190	210	225
30	Un crushed	115	140	160	175
	crushed	155	175	190	205

Table 20.48. Reduction in water content of table 21.47 when fly ash used.

% of fly ash in cementitious material	Slump in mm Vee Bee seconds	Reduction in water content kg/m³			
		0 — 10 > 12	10 — 30 6 — 12	30 — 60 3 — 6	60 — 180 0 — 3
10		5	5	5	10
20		10	10	10	15
30		15	15	20	20
40		20	20	25	25
50		25	25	30	30

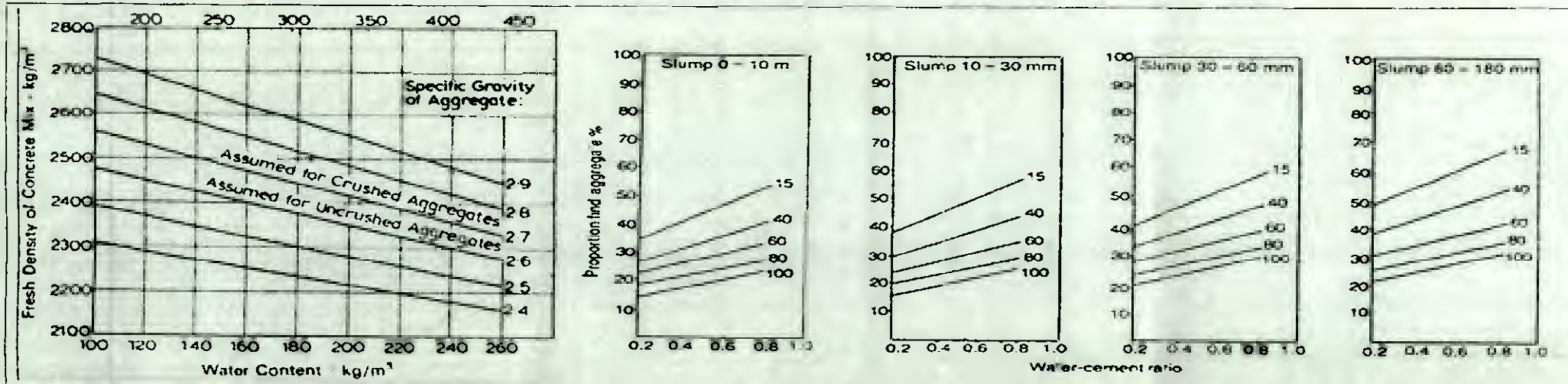


Fig 20.12. (b)

Table 20.46 App Compressive strength of concrete in Mpa with w/c of 0.5 as per DOE for OPC (Type I) and SRC (Type v) at diff time period

Type of cement		3 days	7 days	28 days	91 days
OPC	Uncrushed	18-22	27-30	40-42	48-49
SRC	Crushed	23-27	33-36	47-49	55-56

Table 1,2 and 3 for ACI Method Concrete Mix Design

(1) Dry Bulk Volume of coarse aggregate/ unit volume of concrete as per ACI 211.1-91

Maximum size of aggregate	Bulk volume of dry rodded CA /unit volume of concrete for fineness modulus of sand of			
FM	2.4	2.6	2.8	3.00
10	0.5	0.48	0.46	0.44
12.5	0.59	0.57	0.55	0.53
20 (25,40,50,70)	0.66	0.64	0.62	0.60
150	.87	0.85	0.83	0.81

(2) Relation between water/cement ratio & average compressive strength of concrete, as per ACI 211.1-91

Average compressive strength at 28 days	Effective water/cement ratio (by mass)	
MPa	Non air entrained concrete	Air entrained concrete
45	0.38	-
40	0.43	-
35 (30,25,20)	0.48	0.4
15	0.8	0.71

(3) Requirements of ACI-318-89 for w/c ratio & strength for special exposure conditions

Exposure condition	Maximum w/c ratio, normal density aggregate concrete	Minimum design strength, low density aggregate concrete MPa
Concrete intended to be watertight		
(a) Exposed to fresh water	0.5	25
(b) Exposed to sea water	0.45	30
Concrete exposed to freezing in a moist condition	0.45	30
For corrosion protection of reinforced concrete exposed to de icing salts, sea water	0.4	33

Table 4,5 and 6 for ACI Method Concrete Mix Design

(4) Recommended value of slump for various types of construction as per ACI 211.1-91

Type of construction	Range of slump (mm)
Reinforces foundation walls & footings	20-80
Plain footings substructure wall	20-80
Beams & reinforced walls	20-100
Building columns	20-100
Pavements & slabs	20-80
Mass concrete	20-80

(5) Approximate requirements for mixing water & air content for different workabilities & nominal maximum size of aggregates as per ACI211.1-91

Non air entrained concrete				
Workability or air content (Slump)	Water content kg/m3 of concrete for indicted maximum aggregate size			
	10 mm (25, 40,50,70)	12.5 mm	20 mm	150 mm
30-50 mm	205	200	185	125
80-100 mm	225	215	200	140
150-180 mm	240	230	210	-
Approx entrapped air (%)	3	2.5	2	0.2

(6) First estimate of density of fresh concrete as pe ACI 211.1-91

Maximum size of aggregate (mm)	First estimate of density of fresh concrete	
	Non air entrained kg/m3	Air entrained kg/m3
10	2285	2190
12.5 (20,25.40.50)	2315	2235
20	2355	2280
150	2505	2435

As per ACI in absence of record; required increase in mean strength for specified design strength

Specified design Strength (Mpa)	Less than 21	21-35	35 or more
Required Increase in mean strength (Mpa)	7	8.5	10

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[redacted]/Re-Examinations Working Professional ~~January~~ February 2025

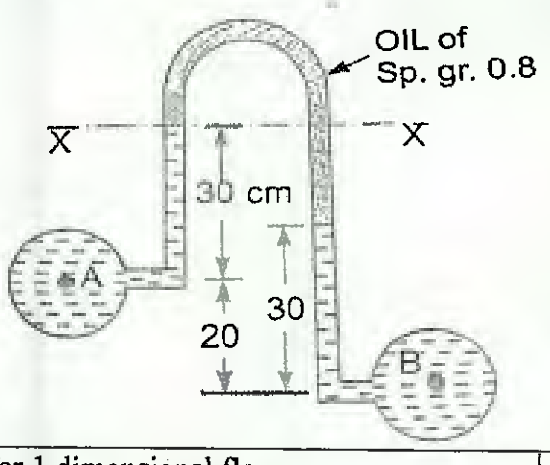
Program: Civil Engineering S.Y. (C) Sem III **Duration: 3hr**

Course Code: PC-BTC304 **Maximum Points: 100**

Course Name: Fluid Mechanics **Semester: III** 13/2/25

Instructions

1. **Attempt any 5 Questions.**
2. Neat diagrams must be drawn wherever necessary.
3. Assume Suitable data if necessary and state it clearly.

Q. No.	Questions	Points	CO	BL	Mod
1a	1 litre of crude oil weighs 9.6N. Calculate specific weight, density and specific gravity.	6	CO1	BL2	1
1b	State hydrostatic law and derive the expression for the same.	8	CO1	BL2	2
1c	Determine the total pressure and center of pressure on an isosceles triangular plate of base 4m and altitude 4m when it is immersed vertically in an oil of sp. Gravity 0.9. The base of the plate coincides with the free surface of oil.	6	CO1		3
2a	Discuss the types of fluid flows along with mathematical expressions and their example.	8	CO2	BL2	4
2b	A circular plate 3.0m dia is immersed in water in such a way that its greatest and least depth below free surface are 4m and 1.5m respectively. Determine the total pressure on one face of the plate and position of the center of pressure.	8	CO1	BL3	3
2c	Brief about different types of fluid motions.	4	CO1	BL1	4
3a	An inverted differential manometer is connected to two pipes A and B which convey water. Manometric fluid is oil of specific gravity(G)	6	CO1	BL2	2
	G=0.8 Find the pressure difference between A and B 				
3b	Derive continuity equation for 1 dimensional flow.	8	CO2	BL2	4
3c	A body of dimensions 1.5m x 1.0m x 2m, weighs 1962 N in water, find its weight in air. What will be its specific gravity?	6	CO1	BL3	3

4a	Describe Reynolds experiment along with the characteristics of laminar and Turbulent flow.	8	CO3	BL2	5
4b	Discuss the classification of fluids.	6	CO1	BL2	1
4c	A pipe 1 of diameter 450mm branches into two pipes 2 and 3 of diameter 300mm and 200mm respectively. The average velocity in 450mm diameter pipe is 3m/s. find a) Discharge through 450mm diameter pipe; b) Velocity in 200mm diameter pipe, if the average velocity in 300 mm pipe is 2.5 m/sec	6	CO1	BL3	4
5a	Discuss classification notches and orifices.	4	CO2	BL1	4
5b	Explain in detail stream tube, stream line, pathline and streak line.	8	CO2	BL2	4
5c	For a laminar steady flow, prove that the pressure gradient in a direction of motion is equal to the shear gradient normal to the direction of flow.	8	CO3	BL2	5
6a	Discuss the development of boundary layer along the flat plate	8	CO3	BL2	6
6b	In a fluid, the velocity field is given by	8	CO1	BL3	4
	$V=(3x+2y)i + (2z+3x^2)j+(2t-3z)k$ Determine a) The velocity components u, v and w at any point in the flow field. b) The speed at point(1,2,3) c) The speed at t=3sec at point (0,0,2) d) Also classify the velocity field as steady, or unsteady, uniform or non-uniform and 1D, 2D and 3D flow.				
6c	Differentiate veturimeter and orifice meter.	4	CO1	BL2	4
7a	Explain with sketches 3 methods of control of boundary layer separation.	6	CO3	BL2	6
7b	Derive Euler's equation of motion along streamline	8	CO1	BL2	4
7c	State Bernoulli's theorem along with assumptions made in it. Also discuss the applications of the same.	6	CO1	BL2	4

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~~End Semester~~/Re-exam – ~~January~~/February 2025

S.Y.

Program: B.Tech Civil Engineering (Working Professional) Duration: 3 Hours

Course Code: PC-BTC301 Sem III Maximum Points: 100

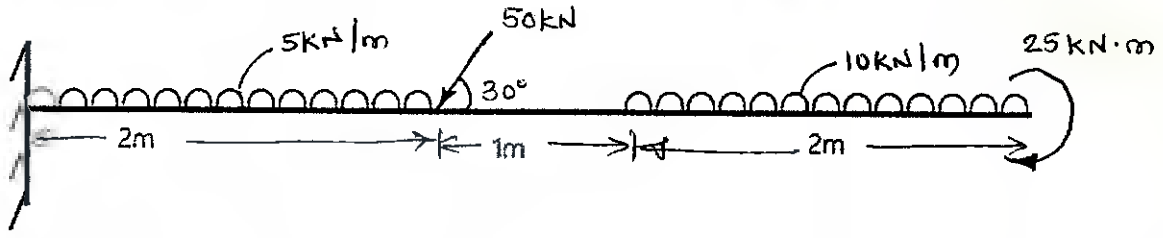
Course Name: Mechanics of materials Semester: III

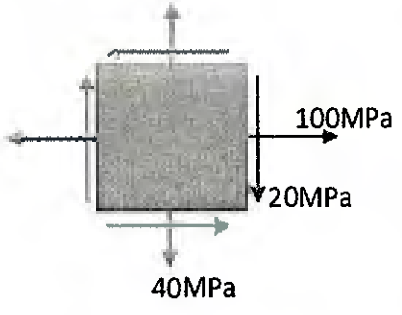
12/2/25

Notes:

- Attempt any 5 main questions
- Draw neat sketches to support your answers
- Assume suitable data if missing and state the same clearly.

Q.No.	Questions	Points	CO	BL	Module
1. a)	Define shear stress and explain single shear and double shear with examples	05	02	02	01
1.b)	State the assumptions in theory of simple bending.	05	02	02	03
1.c)	A steel rod of 16mm diameter passes through a copper tube of 32mm external diameter and 20mm internal diameter. The rod is rigidly attached to tube at both the ends. If a tensile force of 100kN is applied to the assembly, evaluate the stresses in each material and the change in length.	10	02	03	01
2.a)	An axial load of 60kN is applied to a bar of 32mm diameter and 1m length. The extension of bar was measured to be 0.3mm and the reduction in diameter was 0.003mm. Evaluate the Poisson's ratio and the values of three moduli.	10	02	03	01
2.b)	The length of a rail is 32m at 27^0C. Determine : i) The stresses in rail at 80^0C,when there is no allowance for expansion ii) The stresses in rail at 80^0C,when there is 8mm allowance for expansion iii)The expansion allowance for no stress in rail at 80^0C iv)Maximum temperature for no stress in rails when expansion allowance is 8mm $\alpha = 11x10^{-6}/^0$C and E = 205GPa	10	02	03	01
3	Draw the SFD, BMD and AFD for the beam shown in fig. below.	20	01	03	02



4.a)	A 200 x 500 mm timber beam is strengthened by the addition of 3x500 mm steel plates secured on its sides. The flitched beam is simply supported and carries a uniformly distributed load of 30kN/m over an effective span of 10m. Analyse the following: i)Bending stresses in timber beam before strengthening ii)Bending stresses in timber and steel plates after strengthening Take Es = 2 x 10^5N/mm^2 and E_T = 1 x10^4 N/mm^2.	10	02	03	03
4.b)	A cylindrical vessel, whose ends are closed by means of rigid flange plates, is made up of steel plate 6 mm thick. The length and internal diameter of the vessel are 0.8m and 300mm respectively. Determine the longitudinal and hoop stresses in the cylindrical shell due to an internal fluid pressure of 2.5MPa. Also calculate the increase in length, diameter and volume of vessel. Take E = 2×10^5 MPa and μ=0.28	10	03	03	07
5.a)	A plane element is subjected to the stresses as shown in the figure below. Determine **analytically**: i) The principal stresses and their directions ii) The maximum shearing stresses iii) Normal and shearing stresses on a plane inclined at 20° to the horizontal (anticlockwise)  	10	02	03	06
5.b)	Solve Q 5.a) **graphically** using Mohr's circle	10	02	03	06
6.a)	A T beam having flange as (250x10)mm and web as (8x300)	10	02	03	04

	mm is used as a simply supported beam over 3m span and carries a UDL of 8kN/m. Calculate the shear stresses induced at support section and sketch its variation along the depth.				
6.b)	Obtain the shear centre for a channel section having flanges = 100x12mm and web = 200x10mm. The section is subjected to a shear force of 70kN. Sketch the variation of shear flow across the section.	10	04	03	04
7.a)	A solid shaft has to carry a torque of 20 kNm. Find a suitable diameter for the shaft if the maximum stress is limited to 120 MPa and the angle of twist should not be more than 25 degrees per metre length. G = 80 GPa. If this solid shaft is to be replaced by a hollow shaft of same material, equal length and same allowable shear stress, having external diameter equal to 1.25 times the internal diameter, find the cross section dimensions of the hollow shaft. Sketch the shear stress variation for both shafts	10	02	03	06
7.b)	In a torsion test, the specimen is a hollow shaft with 50 mm external and 30 mm internal diameter. An applied torque of 1.6 kN-m is found to produce an angular twist of 0.4° measured on a length of 0.2 m of the shaft. What will be the change in length if a similar specimen is subjected only to a tensile load of 100kN? The Poisson's ratio for this material is 0.3.	10	02	03	01,06

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SET-II END-SEM/RE-EXAM Examinations, January/February 2025

11/2/25

Total points: 100

Duration: *Total Time allotted will be 3Hr.*

Class: B.TECH(Civil Engineering) [Working Professional]. Semester: II

Program: CIVIL

Name of the Course: **Basics of Surveying** Course Code : **PC-BTC303**

Instructions:

1. **All Questions are compulsory.**
2. Assume suitable data if necessary and state the clearly.

<table>
<tr><th>Que. No</th><th></th><th>Points</th><th>CO</th><th>BL</th><th>Module no</th></tr>
<tr><td>Q1</td><td>A. The following records are obtained in a traverse survey where the length and bearing of the last line were not recorded. Compute the length and bearing of line DA.
<table>
<tr><th>Line</th><th>Length(m)</th><th>Bearing</th></tr>
<tr><td>AB</td><td>75.50</td><td>30°24′0″</td></tr>
<tr><td>BC</td><td>180.50</td><td>110°36′0″</td></tr>
<tr><td>CD</td><td>60.25</td><td>210°30′0″</td></tr>
<tr><td>DA</td><td>?</td><td>?</td></tr>
</table>
B. Derive the equation for vertical distance between instrument access and central hair(V) as well as horizontal distance between instrument and staff(D) in case of angle of elevation.</td><td>10

10</td><td>1,2

1,2</td><td>2

2</td><td>3

4</td></tr>
<tr><td>Q 2</td><td>A. Explain different types of levelling.

B. Explain following-
1. Curvature correction
2. Refraction correction
3. Combined Correction</td><td>10

10</td><td>1,3

1,3</td><td>1

1</td><td>2

2</td></tr>
<tr><td>Q 3</td><td>A. The following offsets were taken from a survey line to a curved boundary line:
<table>
<tr><td>Distance(m)</td><td>0</td><td>5</td><td>10</td><td>15</td><td>20</td><td>30</td><td>40</td><td>60</td><td>80</td></tr>
<tr><td>Offset(m)</td><td>2.50</td><td>3.80</td><td>4.60</td><td>5.20</td><td>6.10</td><td>4.70</td><td>5.80</td><td>3.90</td><td>2.20</td></tr>
</table>
Find the area between the survey line, the curved boundary line and the</td><td>08</td><td>2,3</td><td>2</td><td>5</td></tr>
</table>

	first and last offset set by- 1) The Trapezoidal rule 2) Simpsons rule				
	B. Explain methods of orientation in case of plane table surveying.	08	2,4	2	5
	C. Enlist of accessories of plane table surveying.	04	2,4	1	5
Q 4	A. Define the terms contour line, contour interval and horizontal equivalent.	06	1,4	1	2
	B. State the uses of contour map.	04	1,4	1	2
	C. Describe the methods of interpolation of contours.	10	1,4	2	2
Q 5	A. Explain closing error and its limitations in case of theodolite traversing.	05	2,3	2	3
	B. The following observations were taken with a tachometer fitted with analytical lens, the staff being held vertically. The constant of the tachometer is 100. Calculate the reduced level of B and the distance between A and B.	15	2,3	3	2
Q 6	A. The following are the bearings observed in traversing, with a compass, an area where local attraction was suspected. Find the amount of local attraction at a different station, the correct bearings of a lines and the included angles. Draw a sketch of the plot assuming AB= 90 m, BC= 90m, CD= 60m and show in it all included angles.	15	1,3,4	3	1
	B. Explain difference between triangulation and traversing.	05	1,3,4	1	1

Inst St	HI	Staff st	Vertical angle	Staff readings	Remark
P	1.255	BM	$4^0 20' 0''$	1.325, 1.825, 2.325	RL of BM= 255.750 m
P	1.255	A	$6^0 30' 0''$	0.850,1.600,2.350	
B	1.450	A	$-7^0 24' 0''$	1.715, 2.315, 2.915	

Line	FB	BB
AB	$140^0 45' 0''$	$318^0 15' 0''$
BC	$216^0 30' 0''$	$38^0 00' 0''$
CD	$209^0 15' 0''$	$30^0 15' 0''$
DE	$319^0 45' 0''$	$139^0 45' 0''$
DA	$60^0 15' 0''$	$240^0 15' 0''$

Q 7	A. Explain the direct ranging and indirect ranging with suitable diagrams.	10	1,2	1	1
	B. What is substance bar in movable hair method of tachometry?	05	1,4	1	4
	C. Explain characteristics of tachometer.	05	1,4	2	4

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End Semester/Re-examination 2024-25

10/2/25

Program: S.Y.B.Tech_WP (Civil) Sem III **Duration: 3 Hours**

Course Code: BS-BTC301 **Maximum Points: 100**

Course Name: Laplace Linear Algebra and Complex Analysis

Semester: III

Note:

1. **Attempt Any Five Questions**
2. **Answers to the sub questions should be grouped together**

		Questions	Points	CO	BL	Module
1	a	Test the consistency of the following system of linear equations and if possible, solve $2x+y-z=0$ $2x+5y+7z=52$ $x+y+z=9$	6	4	BL5	4
	b	Find the sum and product of Eigen values of A^{-1}, where $A=\begin{bmatrix}2 & 1 & -3 & 8\\ 0 & 4 & -5 & 7\\ 0 & 0 & 1 & 0\\ 0 & 0 & 0 & -3\end{bmatrix}$	6	4	BL5	4
	c	Evaluate $(i)\,L\{e^{-t}\cos 4t\cdot\cos 2t\}$ $(ii)\,L\{t\sin(at+b)\}$, where a and b are constants.	8	1	BL3	1
2	a	Find Eigen Values and Eigen Vectors of the following matrix $A=\begin{bmatrix}1 & 2\\ 4 & 3\end{bmatrix}$	6	4	BL5	5
	b	Under the transformation $w=\frac{1}{z}$, find the image of $\lvert z-3\rvert=2$	6	3	BL2	3

End Semester/Re-examination 2024-25

	c	Reduce the following matrix to normal form and hence find its rank. $A=\begin{bmatrix}4 & 2 & 8 & 1\\ 5 & 1 & 7 & 2\\ -1 & 4 & 7 & 4\\ 2 & 8 & 3 & 8\end{bmatrix}$	8	4	BL3	4
3	a	Prove that $u=x^4-6x^2y^2+y^4$ is a harmonic function and find corresponding harmonic conjugate	6	3	BL4	3
	b	Evaluate $L^{-1}\left\{\frac{2s-3}{(s+1)^2(s+3)}\right\}$	6	1	BL5	2
	c	Verify Cayley Hamilton Theorem for the following matrix and find A^{-1}, if it exists $A=\begin{bmatrix}0 & c & -b\\ -c & 0 & a\\ b & -a & 0\end{bmatrix}$	8	4	BL5	5
4	a	Determine constants a, b and c if $A=\frac{1}{3}\begin{bmatrix}1 & 2 & a\\ 2 & 1 & b\\ 2 & -2 & c\end{bmatrix}$ is orthogonal.	6	4	BL5	4
	b	Evaluate $\int_0^\infty te^{-2t}\cos 3t\,dt$	6	2	BL3	1
	c	Using Convolution Theorem, Evaluate $L^{-1}\left\{\frac{1}{(s+2)(s-1)^3}\right\}$	8	1	BL3	2
5	a	Evaluate $L\left\{\frac{\cos at-\cos bt}{t}\right\}$	6	1	BL4 ,5	2
	b	Find the map of the straight line $2x+3y=1$ by the transformation	6	3	BL4	3

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		$w=\frac{1}{z}$				
	c	Evaluate $(i)L\{\sin t\cdot\sin 2t\cdot\sin 3t\}$ $(ii)L\{e^{-2t}f(t)\}$ where $L\{f(t)\}=\frac{2s-3}{s^2+s+1}$	8	1	BL2 BL4	1
6	a	Evaluate $L^{-1}\left\{\frac{2s+3}{(s-1)(s-2)(s-3)}\right\}$	6	1	BL5	2
	b	Evaluate $L\left\{\left(t+e^{-t}+\sin t\right)^2\right\}$	6	1	BL3	1
	c	For the following matrix A, find two non-singular matrices P and Q such that PAQ is in the normal form. $A=\begin{bmatrix}2&1&4&3\\4&8&0&12\\5&4&9&9\end{bmatrix}$	8	4	BL3 BL5	4
7	a	Find the analytic function $f(z)=u+iv$ whose imaginary part is $v=x^2-y^2+\frac{x}{x^2+y^2}$	5	3	BL2 BL3	3
	b	Evaluate $L^{-1}\left\{\log\left(\frac{(s+1)(s+2)}{s^2+9}\right)\right\}$	5	1	BL5	2
	c	Find Eigen Values and Eigen Vectors of the following matrix $A=\begin{bmatrix}2&1&1\\2&3&2\\3&3&4\end{bmatrix}$	10	4	BL1 BL3	5

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END SEM/RE-EXAM EXAMINATION JAN 2025

Program: B.Tech. (Civil) ENGINEERING **Duration: 3 Hours**
Course Code: BS-BTC 302 **Maximum Points: 100**
Course Name: Engineering Geology **Semester: III**

NOTE: Attempt the question paper in either ascending sequence or descending sequence. Start a new question on a fresh sheet. Use of scientific calculators is permitted. Solve any 5 questions out of the 7 questions.

No.	Questions	Points	CO	BL	Module No.
1	**Solve the following questions.**				
1.	What are ox-bow lakes? Write a note on the formation of ox-bow lakes.	4			
2.	Which agent is involved in the formation of ox-bow lakes? Write a note of the erosional and depositional landforms created by this landform	6	1	2	1
3.	What are the suitable conditions of construction of (any 2):	5			
	Gravity dam | Rockfill dam | Earthfill dam | Arch dam		3	1, 3	3
4.	What are the factors that influence the selection of a dam type?	5			
2A	**Solve the following questions.**				2
1.	Define minerals.	2			
2.	Samples of white coloured calcite and quartz are to be differentiated. How would you differentiate them? You are provided with a hardness box and streak plate.	4			
3.	What are the properties of minerals that you will test in a hand sample? Explain it with an example.	4			
2 B	**Match the following features with the associated rocks.**	10			3
1	Phaneritic, plutonic igneous rock **A. Basalt**				
2	Aphanitic, volcanic igneous rock **B. Granite**				
3	Very fine-grained sedimentary rock. **C. Conglomerate**				
4	Large clasts embedded in a fine-grained matrix. **D. Claystone/siltstone**				
5	Non-Foliated metamorphic rock. **E. Quartzite**		1	1, 2, 3	
3 A	**Solve the following questions.**				
1.	Explain the classification of igneous rocks based on the depth of formation. How does the grain size vary with respect to depth?	5			3
2.	What are the key challenges associated with construction activities in sedimentary terrain? Provide a detailed explanation of at least two significant issues.	5			
3.	Draw an anticline and syncline with proper labels.	5		1,	
4.	Define faults. Identify the types of faults in the figure below:	5	1	2, 3	4

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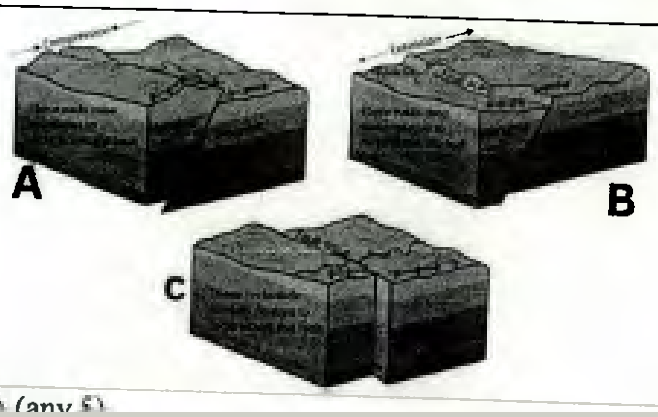
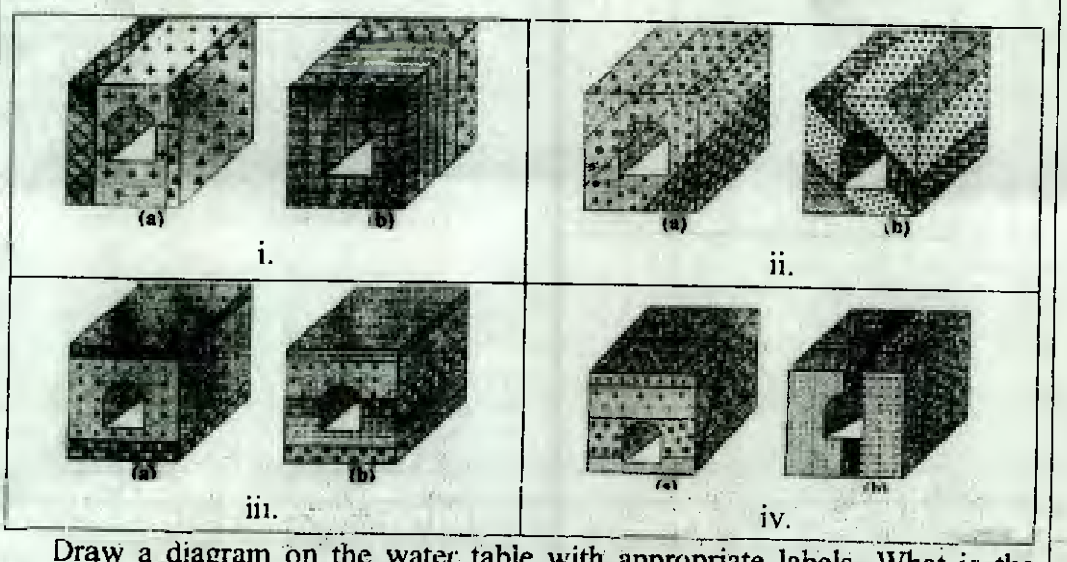
END SEM/RE-EXAM EXAMINATION JAN 2025



Q.4	Write a note on (any 5)				
1.	Principle of fossil succession.				
2.	Principle of Catastrophism				
3.	Principle of Original horizontality				
4.	Principle of Uniformitarianism				
5.	Unconformities				
6.	Principle of lateral continuity				
7.	Principle of inclusions				
8.	Principle of crosscutting relationships				
Q.4B	Identify the confined, unconfined, and perched aquifers in the diagram. Write a note on the same.	10			
		10			
Q.5	Solve the following questions.		1, 2	1, 2, 3	
a.	List out the geophysical methods of geological investigation.	5			
b.	What is porosity? Explain the factors affecting the porosity of rocks.	5			
c.	A core run of 2 meters produces the following core piece lengths (in cm): 15, 8, 12, 20, 5, 25, and 18. Calculate the RQD. Mention the quality of the rock sample.	5			
d.	What are the engineering properties of rocks that must be tested for using rocks	5	1, 2	1, 2, 3	5

	as- construction material, foundation, and aggregates.				
6	Solve the following questions.				7
1.	Which rocks are suitable for tunnel construction?	2			
2.	Comment on the stability of tunnels constructed in the conditions/attitudes of rocks given below (any 2):	8			
	 i. ii. iii. iv.				
3.	Draw a diagram on the water table with appropriate labels. What is the difference between aquifer, aquifuge, aquitard and aquiclude.	10	3	1, 2, 3, 4	6
Q.7	Solve the following questions.				
1.	Which type of rock is commonly seen in terrains with karst landforms? What happens when this rock comes in contact with acidic water?	4	1		1
2.	What are the different types of weathering? List them down and give a short explanation.	6			
3.	List down the 5 anionic groups of mineral classification and the minerals/mineral groups associated with them.	10	1	1,2, 3	2