Bharatiya Vidya Bhavan's

SARDAR PATEL COLLEGE OF ENGINEERING

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

End Semester EXAMINATION August 2022

Program: **M.Tech Structures** **Duration: 3 hr**

Course Code: PC-MST201 **Maximum Points: 100**

Course Name: Finite Element Analysis **Semester: II**

Notes:

1. Solve any 5 Questions

18/8/22

2. Assume data wherever necessary

Q.No.		Questions	Points	CO	BL
	a	Similarity & differences between the plane stress and plain strain elements.	05	1,2	2
	b	Write short note on Isoparametric Element.	05	1,2	2
	c	Write short note on CST element	05	1,2	2
Q1	d	Derive shape function for 9 noded rectangular element using Lagrangian Formulation.	05	1	2,3
Q2a		Solve the following differential equation using i. Galerkins Method ii. Least Square Method iii. Point Collocation Method $\Phi'' - \Phi = x$ Use Boundary Conditions $\Phi(x=0)=0$ and $\Phi(x=1)=0$	14	1	2
Q2b		Derive shape function for three noded line element.	06	1,2	2,3
Q3a		Write short notes on shape functions and their uses in finite element analysis	05	1,2	2,3
Q3b		Temperature distribution in a steel plate is simulated using the linear type triangular element with the nodal coordinates of (x1=1,y1=1),(x2=8,y2=0.5) and (x3=4,y3=5).The nodal values of temperature at nodes are {25,27,23} respectively. Find the value of temperature at point(3.5,3.5)	08	1,2	2,3

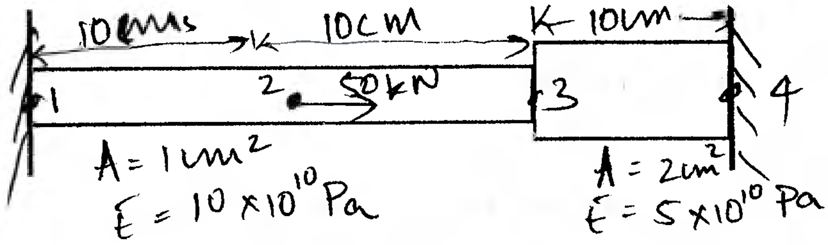
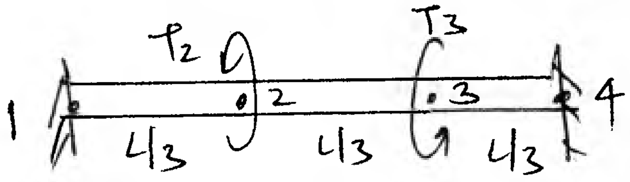
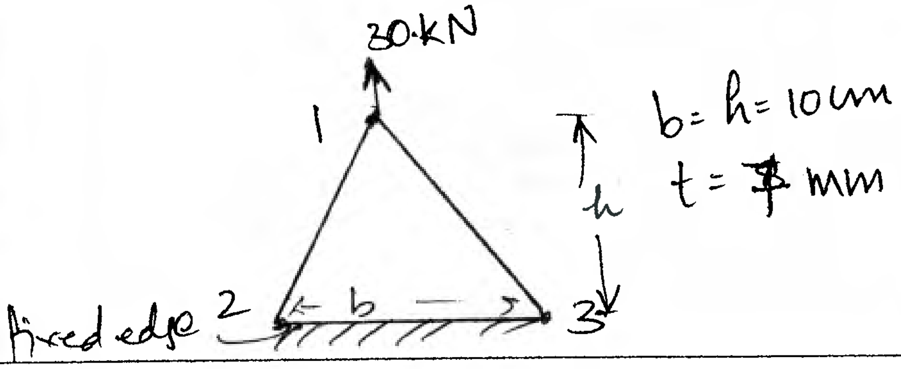
Bharatiya Vidya Bhavan's

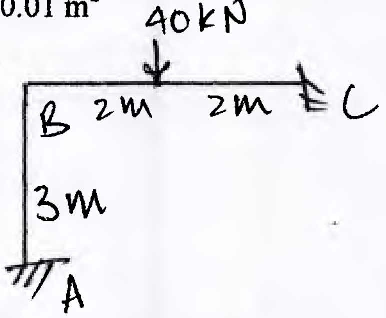
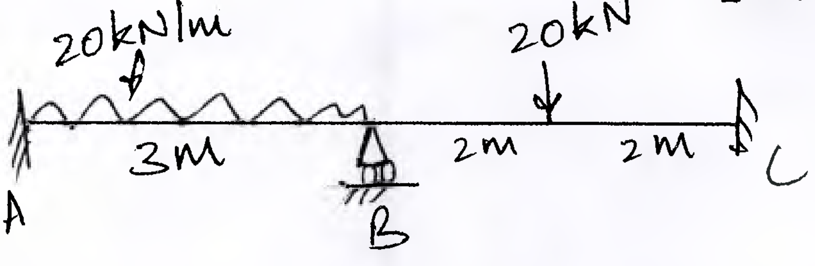
SARDAR PATEL COLLEGE OF ENGINEERING

(Government Aided Autonomous Institute)

Munshi Nagar, Andheri (W) Mumbai – 400058

End Semester EXAMINATION August 2022

Q3c	Calculate the field variable x at a point P(s=L/3) for a line element with cubic interpolation function and also its first derivative at the same point ,given that {x}=[2 ,3 ,5 ,7.5]	07	1,2	2,3
Q4a	For the three-bar assemblage shown in figure determine a) Assembled stiffness matrix b) displacement at point x (5 cm right of node 2) c) Reactions at nodes 1 and 4  	10	1,2	2,3
Q4b	A circular shaft is subjected to torques T2 and T3 as shown in the diagram.By employing one-dimension torsion elements compute angular roatations at nodes 2 and 3 and reactive torque at nodes 1 and 4  	10	1,2	2,3
Q5a	Derive the shape function for a CST element starting from the first principle.	08	1,2	2,3
Q5b	Two –dimensional model of an anchor plate of a communication towers guy cable is shown in the fig. The anchor consists of a triangular steel plate ,which is subjected to a force of 30kN.Analyse the anchor plate. Thickness of plate is 7mm.E= 175GPa and v= 0.3  	12	1,2	2,3

Q6	Analyse the plane frame shown in the fig using FEM. Consider E=200GPa ,I $=10^{-4}$ m^4 and A=0.01 m^2  	20	1,2	2,3
Q7	Analyse beam system shown using FEM $E = 200$ GPa $I = 10^{-4}$ M^4  	20	1,2	2,3

Bharatiya Vidya Bhavan's

Sardar Patel College of Engineering

(A Government Aided Autonomous Institute)
Munshi Nagar, Andheri (West), Mumbai – 400058.
End Semester Examination
August ~~November~~ - 2022

Max. Marks: 100
Class: M.Tech. Str. Engg - Semester: II
Name of the Course: Earthquake Engineering

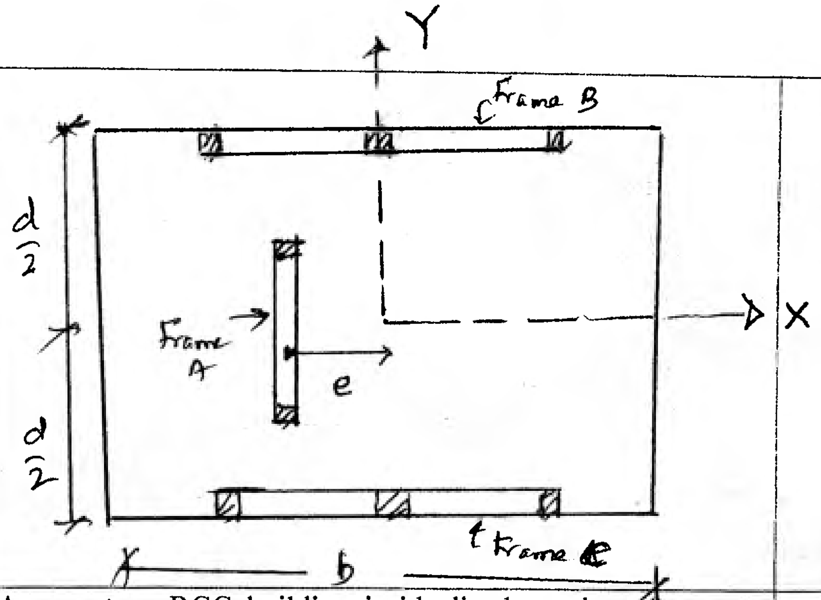
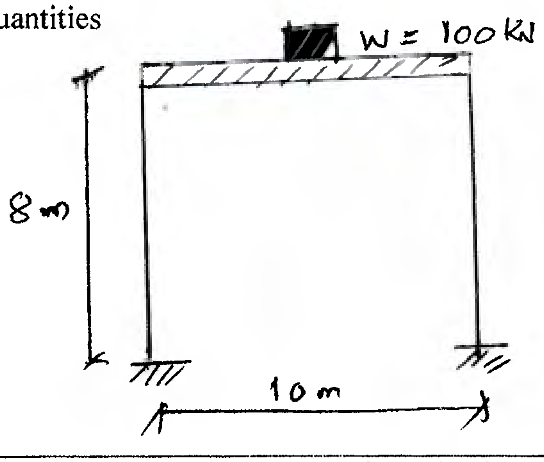
Duration: 3 Hours
Program: Civil Engineering
Course Code : PC-MST 202

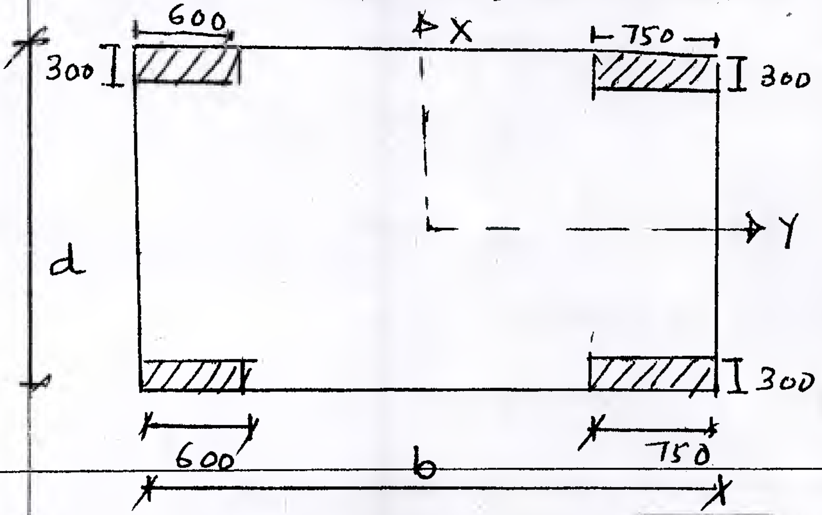
22/8/22

Instructions:

- Attempt any FIVE questions out of SEVEN questions.
- Answers to all sub questions should be grouped together.
- Figures to the right indicate full marks.
- Assume suitable data if necessary and state the same clearly

Question No		**Max. Marks**	**Course outcome**	**Module No.**
Q1 (a)	Answer the followings: (i) What is seismic zone factor? Explain briefly its significance	**2**	**2**	**2**
	(ii) Explain briefly the structure of earth.	**2**	**2**	**2**
	(iii) Briefly explain the Plate Tectonic Theory of an earthquake occurrence	**4**	**2**	**2**
Q1 (b)	The plan of one storey building is as shown in figure. The structure consists of a roof idealized as a rigid diaphragm, supported on three frames A, B, and C as shown. The roof weight is uniformly distributed and has magnitude 200 Kg/m^2. The lateral stiffness are K_y = 20000 KN/m for frame A and K_x =25000 KN/m for frames B and K_x = 30,000 for frame C The plan dimensions are b= 30 m d=25m. The height of building is 8m. (i) In general how many degrees of freedom for this system? Identify those dof.	**1**	**3**	**1**
	(ii) Calculate the stiffness matrix and write the equation of motion if the system is subjected to ground motion u $_{gx}$(t) in x direction only.	**6**	**3**	**1,**
	(iii) If Kx = 25,000KN/m for both frames B & C, and e= 0 and the system is subjected to the ground motion only in X direction, the response spectrum of which is shown in figure1. Determine the design value of lateral deformation, base shear and bending moment for the system.	**5**	**3,4**	**1,4**

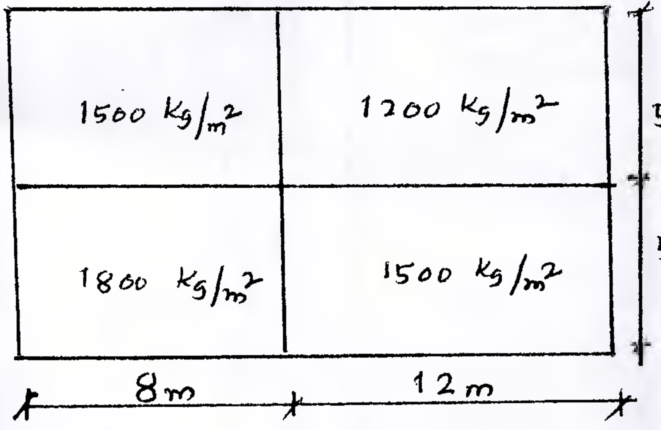
				
Q2 (a)	A one story RCC building is idealized as plane frame as shown in figure. The cross section of columns is 200 mm x 300 mm and E= 30,000 Mpa. If the building is to be designed for ground motion, the response spectrum of which is shown in figure1 but scaled to peak ground acceleration of 0.5g. Determine the design values of lateral deformation and bending moments in the columns for the following two conditions: **(i)** The cross section of beam is much larger than that of columns, so the beam may be assumed as rigid. **(ii)** The beam cross section is much smaller than that of columns, so the beam stiffness can be neglected. Comment on the influence of beam stiffness on deign quantities 	**4** **4**	**3,4** **3,4**	**1,4** **4** **4**
Q2 (b)	A 1000 Kg machine is mounted on four identical springs of total stiffness 1960 KN/m and it has 1% damping. The machine is subjected to the harmonic external force of amplitude 500 N and frequency 180 rpm. Determine the amplitude of motion of machine and force transferred to the foundation.	**5**	**3**	**1**

Q2 (c)	What is response spectrum? Explain the procedure to construct elastic response spectrum for estimated peak ground motion parameters.	**7**	**4**	**3**
Q3	The plan of one story building is as shown in figure. The structure consists of a roof idealized as a rigid diaphragm, supported on four corner columns as shown in figure. The roof weight is uniformly distributed and has magnitude 200 kg/m^2. The plan dimensions are b= 30 m d=20m			
	(i) Derive the stiffness matrix and determine the natural frequencies and modes shapes of vibrations of the structure	**10**	**1**	**1**
	(ii) If the structure is subjected to ground motion only in X direction. write down the equations of motion for the system	**2**	**1,4**	**1,4**
	(iii)As a special case, if all columns are of the same size, 300 mm x 600 mm, and if the system is subjected to the ground motion only in X direction, the response spectrum of which is shown in figure1. Determine the design value of lateral deformation, base shear and bending moment for the system.	**8**	**4**	**4**
		$E= 2\times10^4$ N/mm^2 h = 6m.		
Q4 (a)	For a residential RCC special moment resisting building frame the seismic weights on floors are W_1 =1079.1 KN, W_2= 1863.9 KN and W_3= 294.3 KN. The ground story height is 4.0m and first and second story height is 3.2m. The building is founded on hard soil and situated in zone IV. Determine the distribution of lateral forces and story shear by using equivalent static method. (Fig. No 2)	**12**	**5**	**5**
Q4(b)	A two story frame with free vibration characteristics as given below is subjected to a subjected to ground motion, the response spectrum of which is shown in figure1. Take damping ratio =5%. Calculate the peak story displacements.	**8**	**5**	**4**

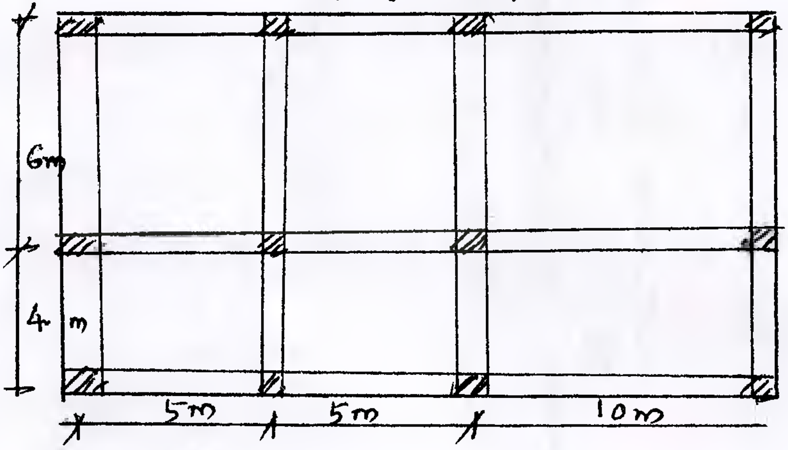
<table>
<tr><td></td><td>
<table>
<tr><td>Floor No.</td><td>Mass (t)</td><td>Mode No.</td><td>ω, rad/sec</td><td colspan="2">Mode shapes</td></tr>
<tr><td></td><td></td><td></td><td></td><td>Φ_{i1}</td><td>Φ_{i2}</td></tr>
<tr><td>1</td><td>85</td><td>1</td><td>9.714</td><td>1.0</td><td>1.235</td></tr>
<tr><td>2</td><td>60</td><td>2</td><td>30.58</td><td>1.0</td><td>-1.149</td></tr>
</table>
</td><td></td><td></td><td></td></tr>
<tr><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>Q5 (a)</td><td>Explain the three requirements of displacement design of structure for earthquake load as per IS 1893-2016.</td><td>4</td><td>5</td><td>5</td></tr>
<tr><td>Q5 (b)</td><td>As per IS 1893-2016, how many mode need to be considered in the earthquake force calculation by Response Spectrum Method</td><td>2</td><td>5</td><td>5</td></tr>
<tr><td>Q5 (c)</td><td>State the limitation of Equivalent static Method. As per IS 1893-2016, under what conditions the Equivalent static Method is permitted to use to calculate the earthquake forces.</td><td>2</td><td>5</td><td>5</td></tr>
<tr><td>Q5 (d)</td><td>Using response spectrum method, calculate the seismic force on each floor of the frame whose pre vibration properties are given below. Use the following additional data: Z=0.36, I =1.0, R=5.0 and ξ = 5%. Assume foundation strata as soft and use response spectrum given in figure 2.
<table>
<tr><td>Story No.</td><td>Mass No.</td><td>Mass (t)</td><td>ω rad/sec</td><td colspan="3">Mode shapes</td></tr>
<tr><td></td><td></td><td></td><td></td><td>Φ_{i1}</td><td>Φ_{i2}</td><td>Φ_{i3}</td></tr>
<tr><td>1</td><td>1</td><td>160</td><td>7.12</td><td>1.0</td><td>1.260</td><td>4.0</td></tr>
<tr><td>2</td><td>2</td><td>80</td><td>15.55</td><td>1.0</td><td>0.0</td><td>-1.0</td></tr>
<tr><td>3</td><td>3</td><td>40</td><td>20.81</td><td>1.0</td><td>-1.264</td><td>4.0</td></tr>
</table>
</td><td>12</td><td>5</td><td>5</td></tr>
<tr><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>Q 6(a)</td><td>Explain the following with reference to SDOF systems:
(i) Allowable Ductility (ii) Ductility Demand</td><td>4</td><td>5</td><td>6</td></tr>
<tr><td>Q 6(b)</td><td>Briefly explain the following:
(i) When the structure is subjected to torsion ? Briefly explain the IS 1893-2016 provisions for design for torsion.
(ii) Briefly explain the plan irregularities as per IS 1893-2016</td><td>6</td><td>5</td><td>5</td></tr>
<tr><td>Q 6(c)</td><td>(i) A building having a non-uniform distribution of mass is shown in figure. Locate its center of mass. (Fig. No 3)
(ii) The plan of a simple one-storied building shown in figure. All columns have the same dimensions. Obtain the center of stiffness. (Centre of Rigidity). (Fig. No 4)</td><td>4</td><td>5</td><td>5</td></tr>
<tr><td>Q 6(d)</td><td>The first floor plan of a building with shear walls is as shown in figure. The plinth level plan is also same.</td><td>4</td><td>5</td><td>5</td></tr>
</table>

	Calculate the fundamental period of the building as per the provision of 7.6.2, of IS 1893-2016 both in X and Y direction. The total height of building is 24 m. (Fig. No 5)			
Q 6(e)	For the SMRFs idealized as shear building with rigid girders, investigate whether the building structure has soft story. The height of first story is 4.5 m and that of remaining is 3.0 m. (Fig. No 6)	2	5	5
Q 7(a)	What is ductility of a structure? Explain the importance of ductility in seismic resistant structures.	3	5	6
Q 7(b)	What is shear Wall? Explain the advantages of shear walls for earthquake resistant structure.	3	5	7
Q 7(c)	Explain the provisions of IS 13920 for (i)Beams: General provisions, longitudinal reinforcement and web reinforcement. (ii)Shear walls: General requirements, , design for shear force and design for axial force & bending moment.	12	5	6,7
Q 7(d)	Briefly explain the different types of structural systems used in a building structure to resist lateral loads due earthquake	2	5	7

(Fig No 3)



(Fig No 4)



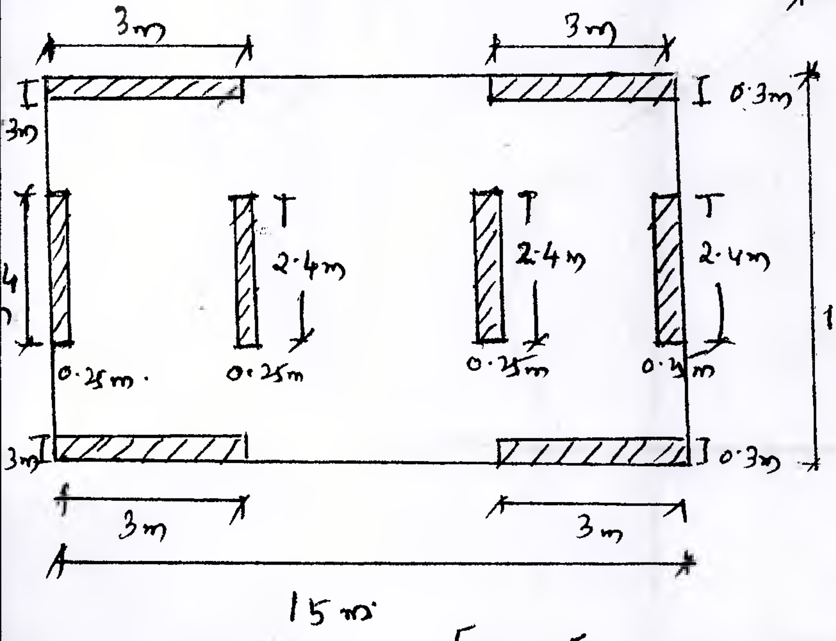


Fig. No 5

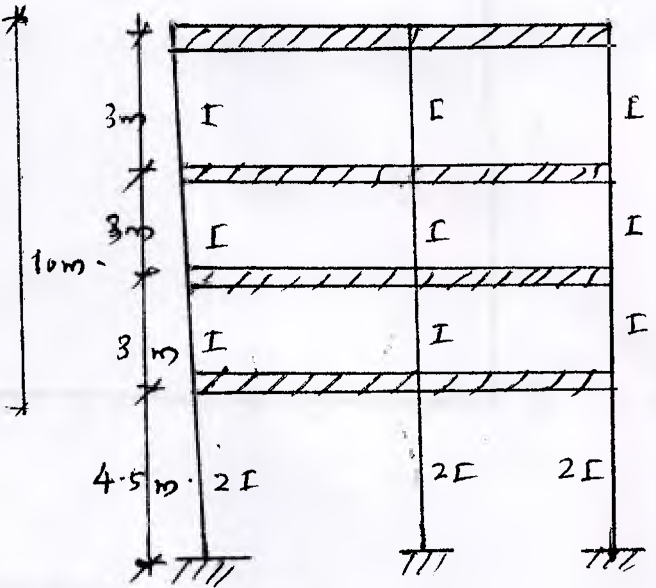


Fig. No 6

DISPLACEMENT RESPONSE SPECTRA
FOR EL-CENTRO EARTHQUAKE FOR 5% DAMPING PGA = 0.32g

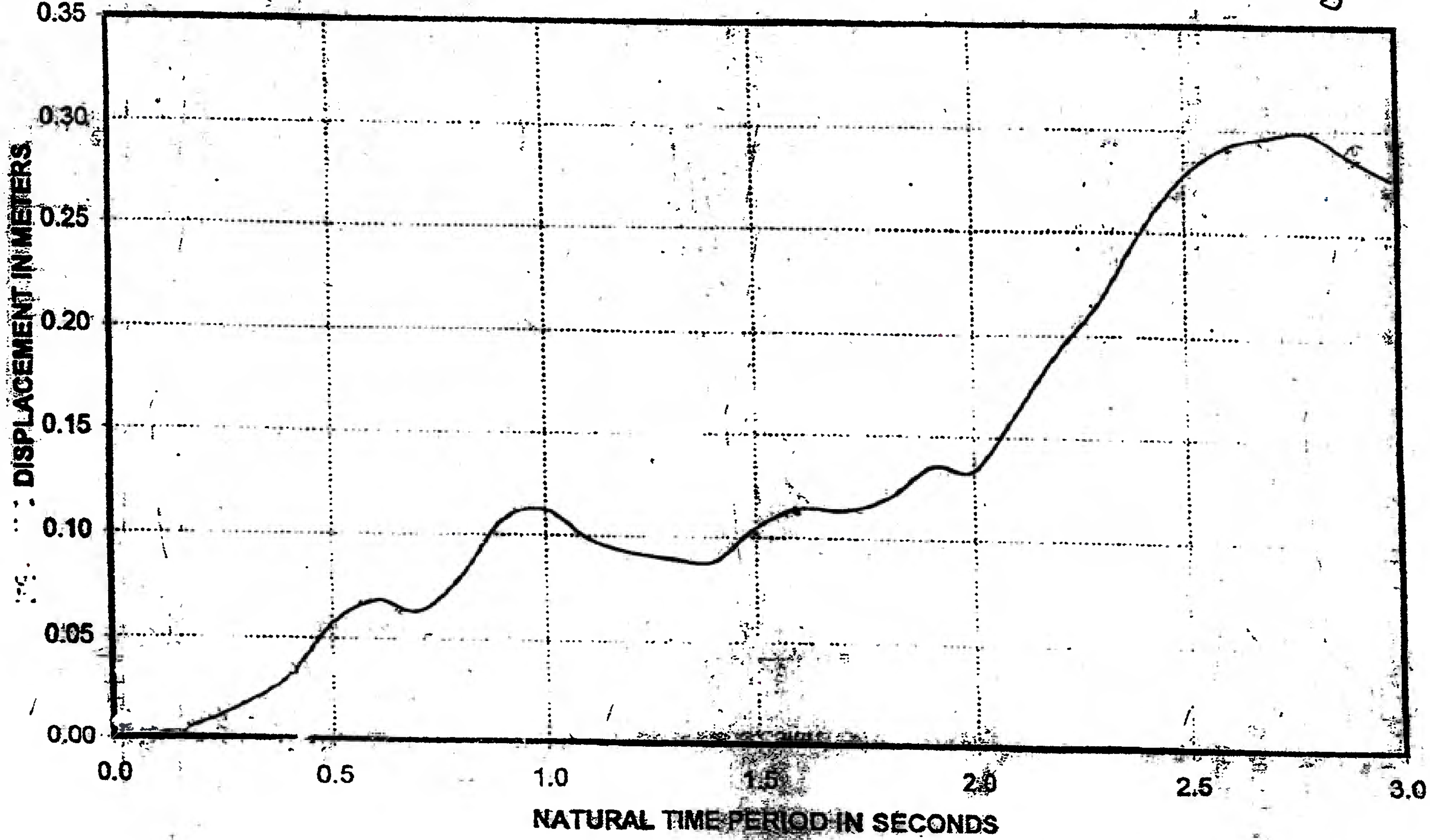
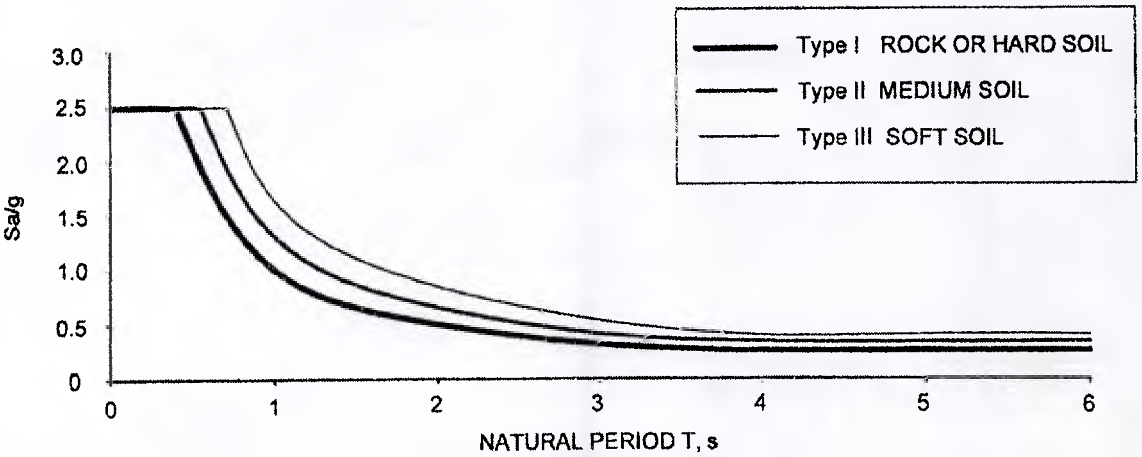
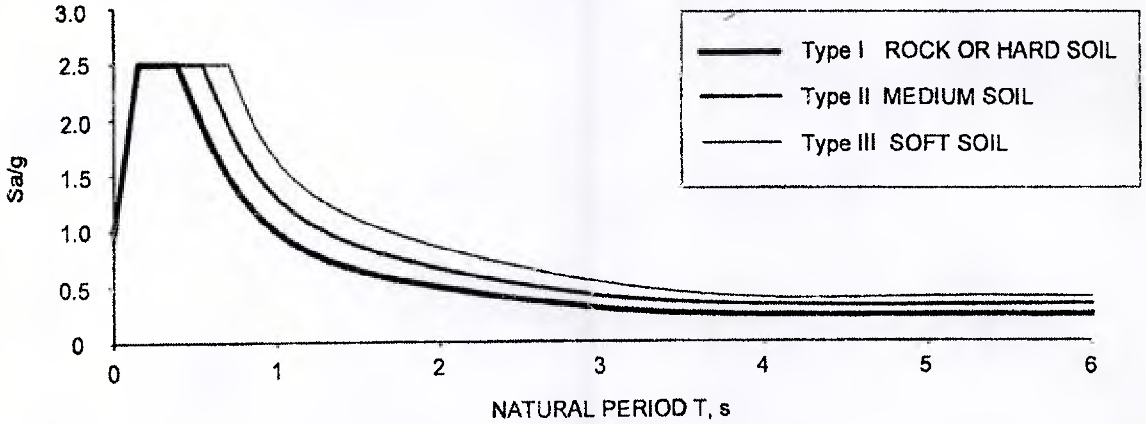


Figure 1



2A SPECTRA FOR EQUIVALENT STATIC METHOD



2B SPECTRA FOR RESPONSE SPECTRUM METHOD

FIG. 2 DESIGN ACCELERATION COEFFICIENT (S_a/g) (CORRESPONDING TO 5 PERCENT DAMPING)

Figure 2

Bharatiya Vidya Bhavan's

SARDAR PATEL COLLEGE OF ENGINEERING

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

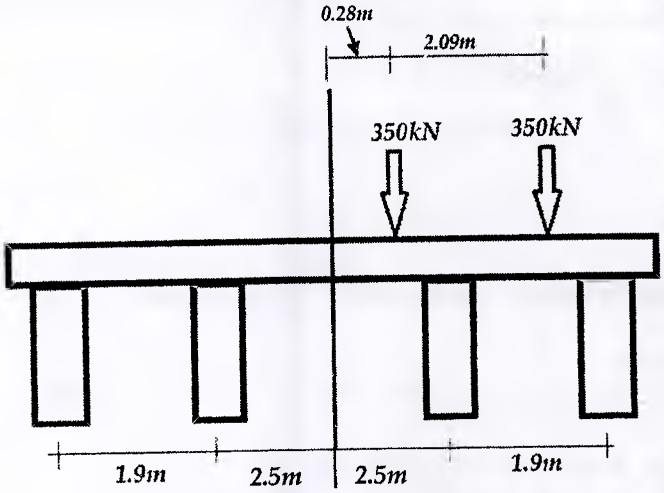
End Sem- Aug 2022 Examinations

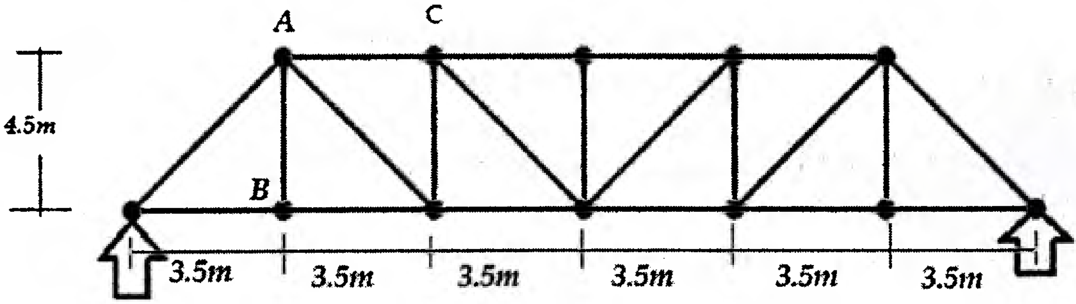
Program: M.Tech Civil Engg. (Structure)
Course Code: EC-MST203
Course Name: Bridge Engineering

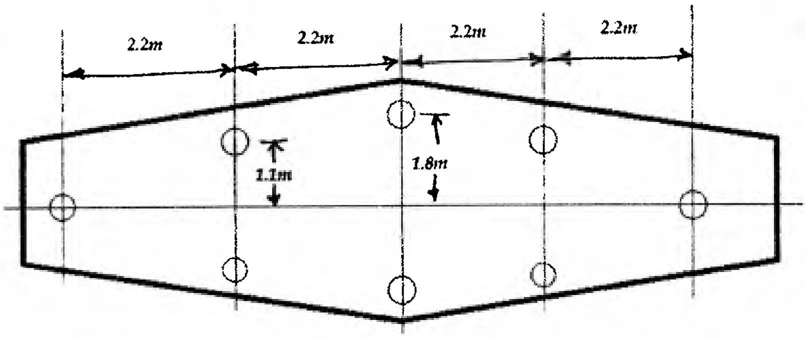
Duration: 3Hours
Maximum Points: 100
Semester: II

24/8/22

Notes: 1) Attempt any 5 main questions
2) Assume suitable data if missing and mention the same clearly
3) Draw neat sketches wherever possible

Q.No.	Questions	Points	CO	BL	PI
1.a)	Enlist the different methods for bridge construction. Explain the incremental launching method of construction of bridges with neat sketches	10	3	2	2.1.3
1.b)	Explain classification of bridges based on : i) structural form ii) inter-span connection iii) based on fixity/mobility	10	3	2	1.4.1
2.a)	Design an RC slab culvert for a clear span of 6m and a carriageway of 8m. Wearing coat is of 75mm thickness. Consider single train of IRC Class 70R tracked vehicle loading. SIDL = 3.5kN/m^2. Use M30 and Fe500	14	4	4	3.1.4, 3.2.1
2.b)	Using Courbon's method, obtain the forces transferred to each girder as shown below  	06	1	2	2.3.2
3	**For the steel truss shown below :** The total dead load per nodal point = 200kN Deck width = 7.5m Design the members AB and AC as marked when a single IRC class 70R tracked vehicle is passing on the bridge	20	4	4	3.1.4, 3.2.1



4.a)	Calculate the loads on piles as shown below using rivet theory if the axial compression load is 3000kN and Moment about X axis is 2500kNm.  	06	4	4	2.4.2
4b)	Shown below is a simply supported span of 20m. It is supported on a single fixed (FX) and free bearing (FR) at each end. The width of carriageway is 7.5m. Calculate the braking forces for Class 70R wheeled vehicle plying on the span. If the reaction from dead load on each bearing is 1200kN, what are the longitudinal forces on the bearings? ***(Assume that the supports are unyielding, μ=0.05)***  	07	3	2	2.2.2
4.c)	Write a short note on bridge aesthetics	07	3	2	2.1.3
5.a)	Write any 2 advantages and 2 disadvantages of using PSC box girder as bridge superstructure	04	3	2	2.2.2
5.b)	Explain the structural behavior of box girder under transverse loads with neat sketches	06	3	2	2.2.2
5.c)	Evaluate the axial load and moment carrying capacity for a pier having following data : Size : 1300mm x 1300mm Reinforcement on each face = 7nos-25mm dia(each face) Effective cover = 60mm Assume N.A = 450mm from extreme compression fibre Concrete grade is M40 and steel grade is Fe500.	10	4	4	2.4.2
6.a)	Obtain the maximum bending moment and maximum shear force for a girder of span 15m subjected to a single class 70R wheeled vehicle and having a courbon factor of 0.45	07	1	4	2.4.1
6.b)	Design an RCC girder of span 15m as per IRC 112 with following specifications: UDL on girder due to footpath and crash barrier = 8kN/m UDL on girder due to wearing course = 2.5kN/m Live load as per Q.7(a)	13	4	4	3.1.4, 3.2.1

	Effective slab width as beam flange = 2.4m Depth of slab = 0.25m Use M35 and Fe500				
7	Design a shallow foundation as per IRC 112 for a pier of size 1.1m x 1.1m. The design axial load = 3600kN and design moment along transverse axis = 2200kNm. SBC of soil = 185kN/m^2. Use M40 and Fe500. Provide checks for : a) Flexure b) One way shear c) Punching shear at distance 2 x depth of footing from face of pier and at face of pier	20	4	4	3.1.4, 3.2.1

Bharatiya Vidya Bhavan's

SARDAR PATEL COLLEGE OF ENGINEERING

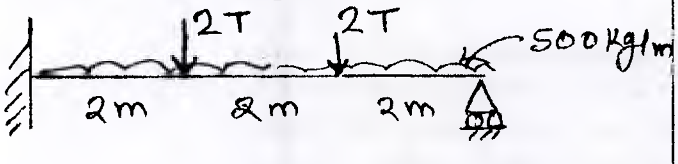
(Government Aided Autonomous Institute)
Munshi Nagar, Andheri (W) Mumbai – 400058

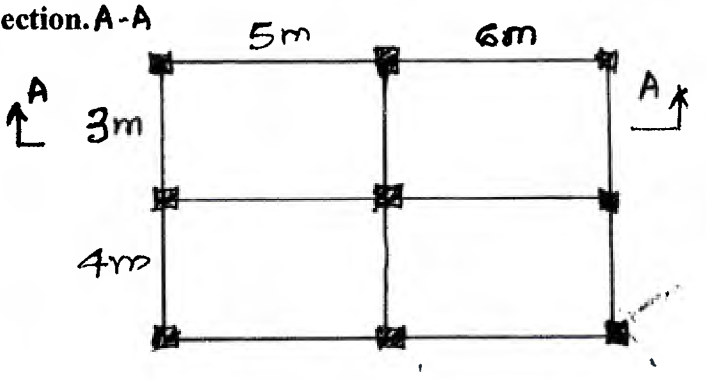
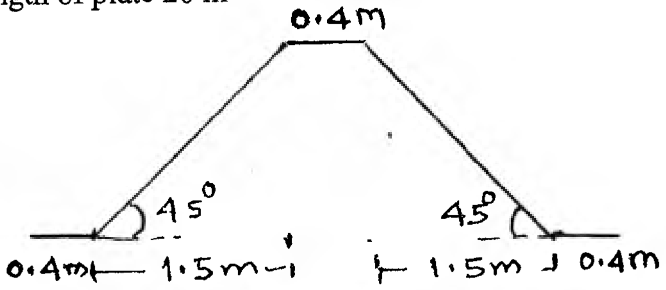
TERM END EXAMINATION AUGUST 2022

Program: M. tech Civil (Structural engineering)
Course Code: EC MST214
Course Name: Advanced design of concrete Structures

Duration: 3 Hr
Maximum Points: 100
Semester: II
No. of Pages - 4
26/8/22

Notes: 1) Each question carries 20 marks
2) Solve any five questions out of seven questions

Q.No.	Questions	Points	CO	BL	PI
Q. 1(a)	Design a reinforced concrete beam of overall size 25 cm x 50 cm for ultimate moment of 4,000,000 kg cm Assume that the depth to compression steel is 5 cm and to the tension steel 45cm. Assume σsy= 2800 kg/cm2, σcu= 300 kg/cm2 . **Use Ultimate Load method**	12	CO1	L6	
Q.1(b)	Explain how limit state of serviceability for deflection and cracking is taken care by various IS 456 clauses	08	CO1	L2	
Q. 2(a)	Explain the concept of tensile hinge and compression hinge used in Baker's method of analysis	10	CO1	L2	
Q.2(b)	Determine the necessary ultimate moment for the beam shown, if the negative plastic moment (at support) is equal to positive plastic moment (at span). Use load factors 1.8 for dead load and 2.2 for working load. Load shown on beams are working load. 	10	CO1	L4	
Q. 3(a)	Using the Virtual Work Method, analyze a 250 mm thick reinforced concrete slab spanning 9.0 x 7.5 m. The slab occupies a corner bay of a floor, which has columns at each corner connected by stiff beams in each direction. The slab can be regarded as being continuous over two adjacent sides and simply supported on the other two.	12	CO1	L5	

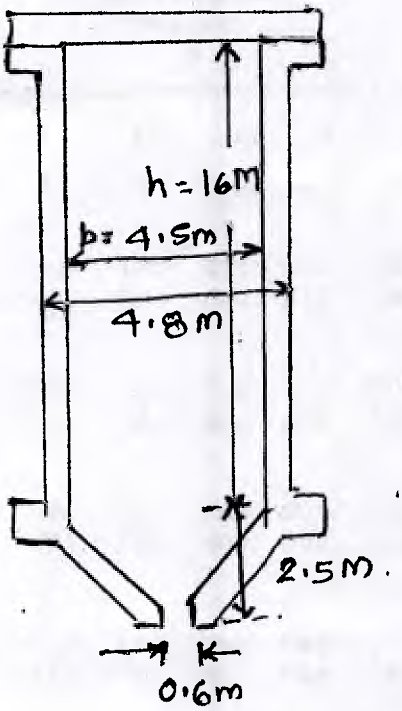
	Assume isotropic reinforcement with equal 'm' in each direction. Calculate value of m (assume yield lines formation at an angle of 45 degrees.)				
Q.3(b)	Why check on rotational capacity is important? Explain steps for rotation checks in terms of rotation required and rotation capacity available	08	CO1	L3	
Q.4	For the slab beam arrangement shown calculate design bending moments for slab after redistribution of moments. Design the slab reinforcement. The slabs are subjected to live load of 3.0 Kn/m2 in addition to floor load 1 Kn/m2 and self-weight. **Draw reinforcement in section.A-A** 	20	CO1	L6	
Q. 5	Analyze intermediate panel and Calculate design bending moments for flat slab of size 6.0 m x 6.0 m. The slab is supported by columns of size 450 mm x 450 mm **Use direct design method** **Draw reinforcement in plan**	20	CO2	L6	
Q.6	Perform **preliminary analysis upto stress distribution for compatibility** only for the folded plate shown . Thickness of plate 110 mm. Loading on inclined plate 250 kg/m2 and loading on horizontal plate 300 kg/m2. Length of plate 20 m 	20	CO2	L5	

Bharatiya Vidya Bhavan's

SARDAR PATEL COLLEGE OF ENGINEERING

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

TERM END EXAMINATION AUGUST 2022

Q. 7	Design Silo to store Rice. The dimensions of silo as shown in the figure. Use Airy's theory Assume unit weight of rice as 6500N/m3. Use M20 grade of concrete and mild steel reinforcement Fe 250. Perform calculations at h =4 m, 8m, 12m, 16m Use μ = 0.46 and μ'=0.44  	20	CO2	L6	

Notes

Ⓐ Height upto which is shallow bin behaviour.

$$h = b\left[\mu + \sqrt{\frac{\mu(1+\mu^2)}{\mu+\mu'}}\right]$$

Horizontal Pr. upto ht h $P_h = wh\left[\frac{1}{\sqrt{1+\mu^2+\sqrt{\mu(\mu+\mu'}}}\right]$

Ⓑ Horizontal pr. in deep portion

$$P_h = \frac{wb}{(\mu+\mu')}\left[1 - \frac{\sqrt{1+\mu^2}}{\sqrt{\frac{2h}{b}(\mu+\mu')+(1-\mu\mu')}}\right.$$

Horizontal force

$$P_H = \frac{wb^2}{2(\mu+\mu')^2}\left[\sqrt{\frac{2h}{b}(\mu+\mu')+(1-\mu\mu')} - \sqrt{1+\mu^2}\right]^2$$

[3]

Bharatiya Vidya Bhavan's

SARDAR PATEL COLLEGE OF ENGINEERING

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

TERM END EXAMINATION AUGUST 2022

Table for slab moment coefficients.

(*Clauses* D-1.1 *and* 24.4.1)

Case No.	Type of Panel and Moments Considered	Short Span Coefficients α_x (Values of l_y/l_x)								Long Span Coefficients α_y for All Values of
		1.0	1.1	1.2	1.3	1.4	1.5	1.75	2.0	l_y/l_x
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
1	*Interior Panels:*									
	Negative moment at continuous edge	0.032	0.037	0.043	0.047	0.051	0.053	0.060	0.065	0.032
	Positive moment at mid-span	0.024	0.028	0.032	0.036	0.039	0.041	0.045	0.049	0.024
2	*One Short Edge Continuous:*									
	Negative moment at continuous edge	0.037	0.043	0.048	0.051	0.055	0.057	0.064	0.068	0.037
	Positive moment at mid-span	0.028	0.032	0.036	0.039	0.041	0.044	0.048	0.052	0.028
3	*One Long Edge Discontinuous:*									
	Negative moment at continuous edge	0.037	0.044	0.052	0.057	0.063	0.067	0.077	0.085	0.037
	Positive moment at mid-span	0.028	0.033	0.039	0.044	0.047	0.051	0.059	0.065	0.028
4	*Two Adjacent Edges Discontinuous:*									
	Negative moment at continuous edge	0.047	0.053	0.060	0.065	0.071	0.075	0.084	0.091	0.047
	Positive moment at mid-span	0.035	0.040	0.045	0.049	0.053	0.056	0.063	0.069	0.035

Bharatiya Vidya Bhavan's

Sardar Patel College of Engineering

(A Government Aided Autonomous Institute)

Munshi Nagar, Andheri (West), Mumbai – 400058.

ENDSEM Examinations, AUGUST 2022

Total points:100

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

Class: M. TECH(CM) & MTECH(STR) & MTECH(PEPS) Semester: II Program: Civil

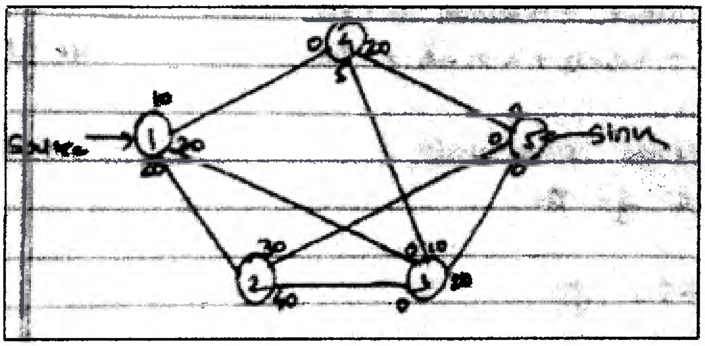
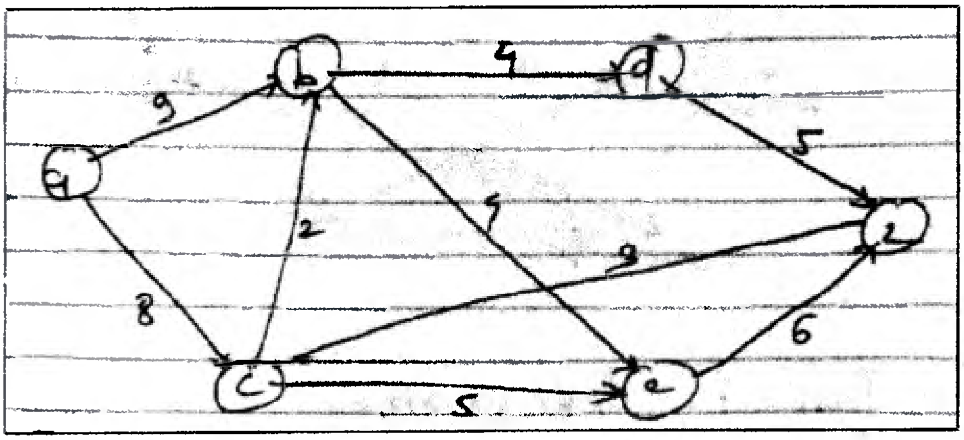
Name of the Course-Operational Research **Course** Code : OE-PG03 PC-MTCM-202

29/8/22

Instructions:

1. **Solve Q2 OR Q5 compulsory**
2. Draw neat diagrams
3. Assume suitable data if necessary and state the clearly.

<table>
<tr><th></th><th></th><th>Points</th><th>CO</th><th>BL</th><th>PI</th></tr>
<tr><td>Q1(A)</td><td>Solve Following LPP by using Kuhn-Tuckers conditions
Max Z = $-X_1^2 - X_2^2 - X_3^2 + 4X_1 + 6X_2$
Subject to,
X1+X2 <= 2
2X1+3X2 <= 12
X1, X2 >= 0</td><td>10</td><td>2,4</td><td>4</td><td>2.2.2</td></tr>
<tr><td>Q1(B)</td><td>There are 5 jobs, each of which must go through the machines A and B in the order AB. The processing times (in hours) are given as
<table>
<tr><td>JOB</td><td>J1</td><td>J2</td><td>J3</td><td>J4</td><td>J5</td></tr>
<tr><td>MACHINE A</td><td>2</td><td>4</td><td>5</td><td>7</td><td>1</td></tr>
<tr><td>MACHINE B</td><td>3</td><td>6</td><td>1</td><td>4</td><td>8</td></tr>
</table>
Determine a sequence of these jobs that will minimise the total elapsed time T.
Also obtain:
I) the minimum elapsed time; and
ii) the idle time for each of the machines.</td><td>10</td><td>3,4</td><td>3</td><td>4.2.1</td></tr>
<tr><td>Q2</td><td>Solve following LPP by revised simplex method
Max Z = X1+2X2
Subject to,
X1+X2 <= 3
X1+X2 <= 5</td><td>20</td><td>1,2</td><td>4</td><td>3.2.1</td></tr>
</table>

	3X1+X2 < = 6 X1, X2 >= 0				
Q3(A)	If for a project, annual demand is 10000/year, order cost=300/order, carrying cost = Rs 4/unit/year then 1. Estimate Economic order quantity and Total cost of project 2. If backorder cost is 25/unit/year, then Estimate Economic order quantity and Total cost of project.	10	2,4	4	4.3.2
Q3(B)	 Find the maximum flow above in the Model.	10	2,4	3	2.3.2
Q4(A)	Customers arrive at the clinic at the rate of 8/hour (Poisson's Ratio), And doctor can serve at the rate of 9/hour (Exponential), 1. What is the probability that customer does not join the que and walks in doctor's room? 2. What is the probability that there is no que? 3. What is the probability that there are 10 customers in the que? 4. What is the expected number in the system? 5. What is the expected waiting time in the que?	10	3,4	4	2.3.2
Q4(B)	 The values above arrow represents flow capacity Find the maximum values for above transport network.	10	2,4	3	4.3.3

<table>
<tr><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>Q5</td><td>Minimise f(x) = $7 * X_1 * X_2^{-1} + 3 * X_2 * X_3^{-2} + 5 * X_1^{-3} * X_2 * X_3 + X_1 * X_2 * X_3$
Where, X1, X2, X3 >= 0
Solve above model using geometric programming</td><td>20</td><td>1,3</td><td>5</td><td>3.2.1</td></tr>
<tr><td>Q6(A)</td><td>A trader stocks a particular seasonal product at the beginning of the season and cannot re-order. The item costs him Rs. 25 each and he sells at Rs. 50 each. For any item that cannot be met on demand, the trader has estimated a goodwill cost of Rs. 15. Any item unsold will have a salvage value of Rs. 10. Holding cost during the period is estimated to be 10 per cent of the price. The probability distribution of demand is as follows:
<table>
<tr><td>Unit Stocked</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td></tr>
<tr><td>Probability of demand</td><td>0.35</td><td>0.25</td><td>0.20</td><td>0.15</td><td>0.05</td></tr>
</table>
Determine the optimal number of items to be stocked.</td><td>10</td><td>3,1</td><td>5</td><td>3.2.2</td></tr>
<tr><td>Q6(B)</td><td>An organization is planning to diversify its business with a maximum outlay Rs. 4 crores. It has identified three different locations to install plants. The organization can invest in one or more of these plants subject to the availability of the fund. The different alternatives and their investment (in crores of rupees) and present worth of returns during useful life (in crores of rupees) of each of these plants are summarized in table. The first row of table has zero cost and zero return for all the plants. Hence, it is known as do-nothing alternative. Find the optimal allocation of the capital to different plants which will maximize the corresponding sum of the present worth of returns.
<table>
<tr><td>Alternatives</td><td colspan="2">Plant 1</td><td colspan="2">Plant 2</td><td colspan="2">Plant 3</td></tr>
<tr><td></td><td>Cost</td><td>Return</td><td>Cost</td><td>Return</td><td>Cost</td><td>Return</td></tr>
<tr><td>1</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td></tr>
<tr><td>2</td><td>1</td><td>12</td><td>2</td><td>16</td><td>2</td><td>9</td></tr>
<tr><td>3</td><td>2</td><td>15</td><td>3</td><td>20</td><td>3</td><td>12</td></tr>
<tr><td>4</td><td>3</td><td>19</td><td>4</td><td>25</td><td>-</td><td>-</td></tr>
</table></td><td>10</td><td>1,4</td><td>5</td><td>3.2.1</td></tr>
<tr><td>Q7(A)</td><td>
<table>
<tr><td>Activity</td><td>Duration</td></tr>
<tr><td>1-2</td><td>8</td></tr>
<tr><td>1-3</td><td>10</td></tr>
<tr><td>1-4</td><td>5</td></tr>
<tr><td>2-7</td><td>6</td></tr>
<tr><td>3-4</td><td>3</td></tr>
<tr><td>4-5</td><td>7</td></tr>
<tr><td>4-7</td><td>0</td></tr>
<tr><td>5-6</td><td>4</td></tr>
<tr><td>5-7</td><td>3</td></tr>
<tr><td>5-8</td><td>6</td></tr>
</table></td><td>10</td><td>1,3</td><td>4</td><td>1.2.3</td></tr>
</table>

6-8	5
7-8	5

Determines all types of floats and critical Path using information given in above table.

10	1,3	4	1.2.3

Q7(B)

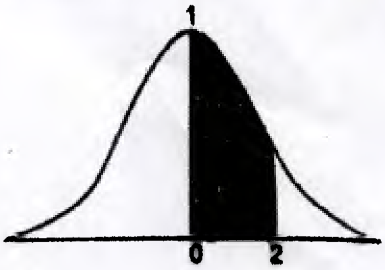
Activity	Predecessor(s)	Duration(weeks)		
		a	m	b
A	-	6	7	8
B	-	1	2	9
C	-	1	4	7
D	A	1	2	3
E	A, B	1	2	9
F	C	1	5	9
G	C	2	2	8
H	E, F	4	4	4
I	E, F	4	4	10
J	D, H	2	5	14
K	I ,G	2	2	8

I) Construct the project network
II) Find expected duration and variance of each activity
III) Find critical path and expected project duration time
IV) What is the probability of completing the project on or before 25 weeks?

If the probability of completing the project is 0.84 find expected project completion time.

Table 1: Area Under Normal Curve

An entry in the table is the proportion under the entire curve which is between $z = 0$ and a positive value of z. Areas for negative values for z are obtained by symmetry.



Areas of a standard normal distribution

z	.0	0.01	.02	.03	.04	.05	.06	.07	.08	.09
.0	.0000	.0040	.0080	.0120	.0160	.0199	.0239	.0279	.0319	.0359
.1	.0398	.0438	.0478	.0517	.0557	.0596	.0636	.0675	.0714	.0753
.2	.0793	.0832	.0871	.0910	.0948	.0987	.1026	.1064	.1103	.1141
.3	.1179	.1217	.1255	.1293	.1331	.1368	.1406	.1443	.1480	.1517
.4	.1554	.1591	.1628	.1664	.1700	.1736	.1772	.1808	.1844	.1879
.5	.1915	.1950	.1985	.2019	.2054	.2088	.2123	.2157	.2190	.2224
.6	.2257	.2291	.2324	.2357	.2389	.2422	.2454	.2486	.2517	.2549
.7	.2580	.2611	.2642	.2673	.2903	.2734	.2764	.2794	.2823	.2852
.8	.2881	.2910	.2939	.2967	.2995	.3023	.3051	.3078	.3106	.3133
.9	.3159	.3186	.3212	.3238	.3264	.3289	.3315	.3340	.3365	.3389
1.0	.3413	.3438	.3461	.3485	.3508	.3531	.3554	.3577	.3599	.3621
1.1	.3643	.3665	.3686	.3708	.3729	.3749	.3770	.3790	.3810	.3830
1.2	.3849	.3869	.3888	.3907	.3925	.3944	.3962	.3980	.3997	.4015
1.3	.4032	.4049	.4066	.4082	.4099	.4115	.4131	.4147	.4162	.4177
1.4	.4192	.4207	.4222	.4236	.4251	.4265	.4279	.4292	.4306	.4319
1.5	.4332	.4345	.4357	.4370	.4382	.4394	.4406	.4418	.4429	.4441
1.6	.4452	.4463	.4474	.4484	.4495	.4505	.4515	.4525	.4535	.4545
1.7	.4554	.4564	.4573	.4582	.4591	.4599	.4608	.4616	.4625	.4633
1.8	.4641	.4649	.4656	.4664	.4671	.4678	.4686	.4693	.4699	.4706
1.9	.4713	.4719	.4726	.4732	.4738	.4744	.4750	.4756	.4761	.4767
2.0	.4772	.4778	.4783	.4788	.4793	.4798	.4803	.4808	.4812	.4817
2.1	.4821	.4826	.4830	.4834	.4838	.4842	.4846	.4850	.4854	.4857
2.2	.4861	.4864	.4868	.4871	.4875	.4878	.4881	.4884	.4887	.4890
2.3	.4893	.4896	.4898	.4901	.4904	.4906	.4909	.4911	.4913	.4916
2.4	.4918	.4920	.4922	.4925	.4927	.4929	.4931	.4932	.4934	.4936
2.5	.4938	.4940	.4941	.4943	.4945	.4946	.4948	.4949	.4951	.4952
2.6	.4953	.4955	.4956	.4957	.4959	.4960	.4961	.4962	.4963	.4964
2.7	.4965	.4966	.4967	.4968	.4969	.4970	.4971	.4972	.4973	.4974
2.8	.4974	.4975	.4976	.4977	.4977	.4978	.4979	.4979	.4980	.4981
2.9	.4981	.4982	.4982	.4983	.4984	.4984	.4985	.4985	.4986	.4986
3.0	.4987	.4987	.4987	.4988	.4988	.4989	.4989	.4989	.4990	.4990

Bharatiya Vidya Bhavan's

SARDAR PATEL COLLEGE OF ENGINEERING

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

End Semester – August 2022 Examinations

Program: F Y M.Tech Civil with Str. Engg
Duration: 3 Hours
Course Code:AU-PG-03; AU-MTPX201
Maximum Points:100
Course Name: Disaster Management
Semester: II

30/8/22

30/8/22

Notes: 1. Answer any five questions.
2 All questions carry 20 points.

Q.No.	Questions	Points	CO	BL	PI
1	1.1 What is Disaster Risk Assessment? What are the seven steps in Disaster Risk Assessment?	10	4	2	2.1.2
	1.2 List out the four components of Community Risk Assessment. Explain each one of these components.	10	2	2	11.3.1
2	2.1 What are the seven Global targets of the Sendai Framework for Disaster Risk Reduction? What was the status of Target E by 2019?	10	3	2	11.3.1
	2.2 What are the four Global priorities for action of the Sendai Framework for Disaster Risk Reduction?	10	1	2	11.3.2
3	3.1 What is Disaster Mitigation? How does it differ from other disaster management disciplines/phases? What are goals of Disaster Mitigation?	10	4	2	6.1.1
	3.2 Explain structural and non-structural activities in Disaster Mitigation. What are active and passive measures in Disaster Mitigation?	10	3	2	3.1.6
4	4.1 What is the aim of Disaster/Emergency Response? List out the key activities and elements of Disaster Response.	10	3	4	3.4.1
	4.2 Explain the three Humanitarian Principles that Humanitarian agencies must observe while responding to Disasters.	10	2	3	1.2.1
Q.No.	**Questions**	**Points**	**CO**	**BL**	PI

Bharatiya Vidya Bhavan's

SARDAR PATEL COLLEGE OF ENGINEERING

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

End Semester – August 2022 Examinations

5	5.1 What are the three levels and responsibilities of Disaster Management Authorities specified in Disaster Management Act, 2005?	10	4	2	6.1.1
	5.2 What are the objectives of the National Cyclone Risk Mitigation Project? Write a note on Phase II of NCRMP.	10	4	2	2.1.2
6	6.1 Write an explanatory note on Disaster Recovery.	10	2	2	11.3.1
	6.2 Explain 'Resilience' and 'Capacity' in the context of Disaster Management	10	3	2	11.3.1
7	7.1 Riverine flooding is perhaps the most critical climate-related hazard in India. Explain	10	1	2	11.3.2
	7.2. With the help of a diagram explain the four phases of the Disaster Management Cycle. Mark the point in the cycle where the disaster occurs.	10	4	2	6.1.1