

lib sems
9/5/2016

Bharatiya Vidya Bhavan's
SARDAR PATEL COLLEGE OF ENGINEERING
(An Autonomous Institution Affiliated to Mumbai University)

Total Marks: 100

Class: ME Structures Sem-II

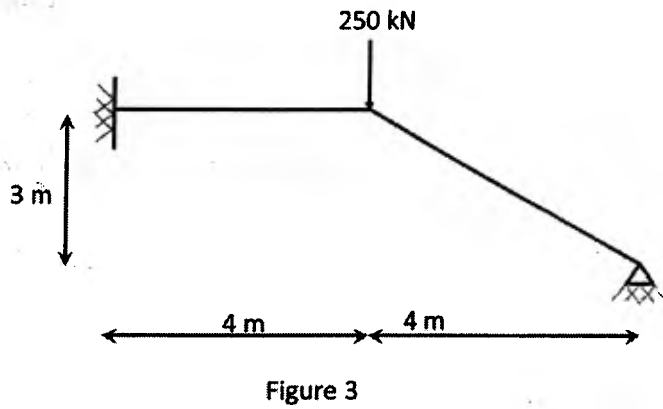
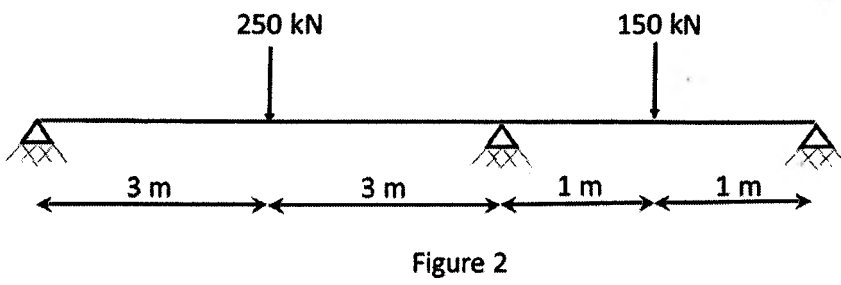
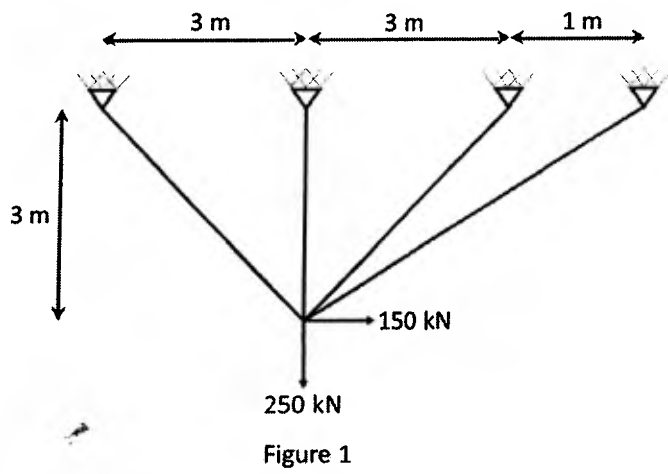
Duration: 4 Hrs

Sub: Finite Element Analysis

- 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.

Master file.

-
- Q.1 a. Explain the convergence and compatibility requirements [06]
b. Write short notes on shape functions and their uses in finite element analysis [06]
c. Explain step by step procedure of solving a complicated problem using finite element method. [08]
- Q.2 Determine the member forces and reactions developed for the truss as shown in figure 1. Take modulus of elasticity as 210 GPa and area of cross-section of all members as 1000 mm². [20]
- Q.3 Determine the member forces and reactions developed for the beam as shown in figure 2. Take modulus of elasticity as 210 GPa and Moment of Inertia of cross-section as 0.5x10⁹ mm⁴. [20]
- Q.4 Determine the member forces and reactions developed for the frame as shown in figure 3. Take modulus of elasticity as 210 GPa and Moment of Inertia of cross-section as 0.8x10⁹ mm⁴ and area of cross section as 10000 mm². [20]
- Q.5 a. Determine the stiffness matrix for the plane stress CST element having coordinates 1(0,0), 2(1,0) and 3(1,1). Take modulus of elasticity as 210 GPa and thickness of element as 0.010 m [12]
b. Determine the shape functions for 6 noded Lagrange element [08]
- Q.6 Determine the first three frequencies of the propped cantilever beam using consistent mass matrix [20]
- Q.7 a. Using functional approximation, determine the maximum deflection and bending moment developed at mid-span of the beam also determine the error associated if only first two terms of approximation is considered. [12]
b. Starting from the first principle, determine the shape function of four noded axial element. Also plot the variation of the shape functions. [08]





Bharatiya Vidya Bhavan's
Sardar Patel College of Engineering

(A Government Aided Autonomous Institute)

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

End Semester Exam

May 2016



lib seen
18/5/2016

Max. Marks: 100

Duration: 4 Hours

Class: M.Tech Semester: II Program: M.Tech in Civil Engineering with Str. Engg. Subjects

Name of the Course: Elective-II Advanced Design of Concrete Structures

Course Code : MTST 156

Master file.

Instructions:

- Attempt any FIVE questions out of SEVEN questions.
- If there are sub 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.
- Use of codes IS 456:2000, IS 4995:1974 (Part I & Part II) is allowed.

Question No	Max Marks	Course Outcome Number	Modul No.
Q.1 (a) Using Whitney's stress block, find the ultimate moment of resistance of a reinforced concrete beam of rectangular section 250 mm x 500 mm reinforced with 3 numbers of 25 mm diameter bars. Use M20 concrete and Fe415 steel.	(08)	1,3	1
Q.1 (b) If the rectangular section referred in Q1 (a) above is made monolithic with 120 mm thick R.C. C. slab of the same grade and top level flush with top of the beam, find the ultimate moment of resistance of the resulting T section assuming flange width as 1000 mm. Use Whitney's stress block	(08)	1,3	1
Q.1 (c) Distinguish between Cambridge method and Baker's method of ultimate load analysis of structure.	(04)	1	2
Q.2 (a) What is yield line? State the assumptions made in predicting yield line patterns.	(05)	1	2
Q.2 (b) A reinforced concrete slab of effective plan dimensions of 4m X 6m size is fixed on all its edges. The working load due to finish is 1.5 kN/m ² and superimposed live-load is 3 kN/m ² . The amount of reinforcement at the bottom provided along long span is 60% of that provided along short-span. Design the slab using yield line theory, considering overall load factor of 1.5. Use M 20 grade concrete and Fe415 steel.	(15)	1	2

Q.3 (a)	Explain the various limit states as per IS: 456	(05)	3	3
Q.3 (b)	Using limit state method, design a T beam with the following data. $B_f = 1500$ mm, $D_f = 100$ mm, $b_w = 300$ mm and $M_u = 400$ kNm. Use M 20 grade of concrete and Fe 415 steel.	(10)	3	3
Q.3 (c)	Explain how the rotation capacity of a reinforced concrete section can be increased.	(05)	1	2
Q.4 (a)	Explain the advantages and disadvantages of flat slab construction	(05)	1,3	4
Q.4 (b)	Design a simply supported slab 6.5 m x 5 m is simply supported on four sides. The slab is to be cast monolithically over the beams with corners held down. The width of the supporting beam is 250 mm. The slab carries a superimposed load of 3 kN/m ² . Use M20 grade concrete and Fe415 steel. Use limit state method.	(15)	1,3	4
Q.5 (a)	What are advantages and disadvantages of folded plates as compared to shells?	(04)	2	5
Q.5 (b)	Explain the steps involved in Whitney's method of analysis of folded plate.	(16)	2	5
Q.6	A circular wheat silo is has an internal diameter of 7m and a wall height of 25m. It has a conical hopper of height 2.5m. The inner diameter of the opening at the base of the hopper is 0.5m. Design the silo wall and hopper bottom. Density of wheat is 8 KN/m ³ Angle of internal friction is 20° and co-efficient of friction between wheat and concrete wall is 0.42. Use M20 concrete and Fe 415 steel.	(20)	2	6
Q.7 (a)	Write a note on			
	(i) Deep beams	(06)	2,3	7
	(ii) Shear Walls	(10)	2,3	7
Q.7 (b)	Differentiate between a silo and a bunker.	(04)	2	6



Bharatiya Vidya Bhavan's
Sardar Patel College of Engineering

(A Government Aided Autonomous Institute)
Munshi Nagar, Andheri (West), Mumbai – 400058.
End Semester Exam
November 2015 / May 2016



lib seekh
13/11/2016

Max. Marks: 100

Class: M Tech Structural Engg.

Name of the Course: Bridge Engineering

Semester: II

Program: M Tech Structural Engg

Q. P. Code: MTST153

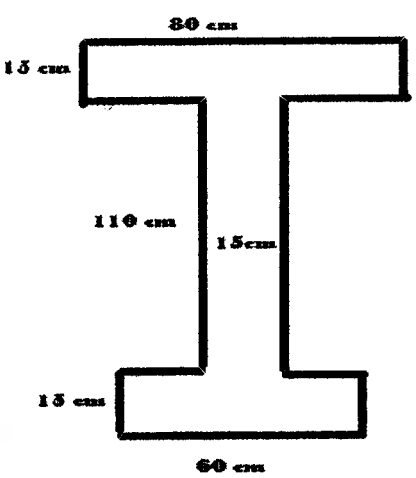
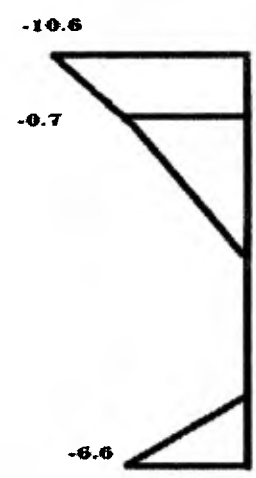
Duration: 4hrs

Course Code : MTST153

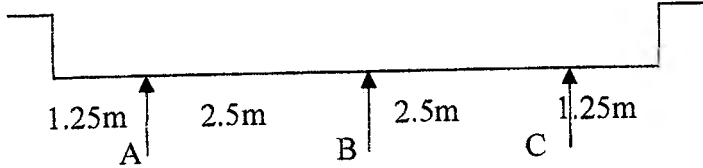
Master file.

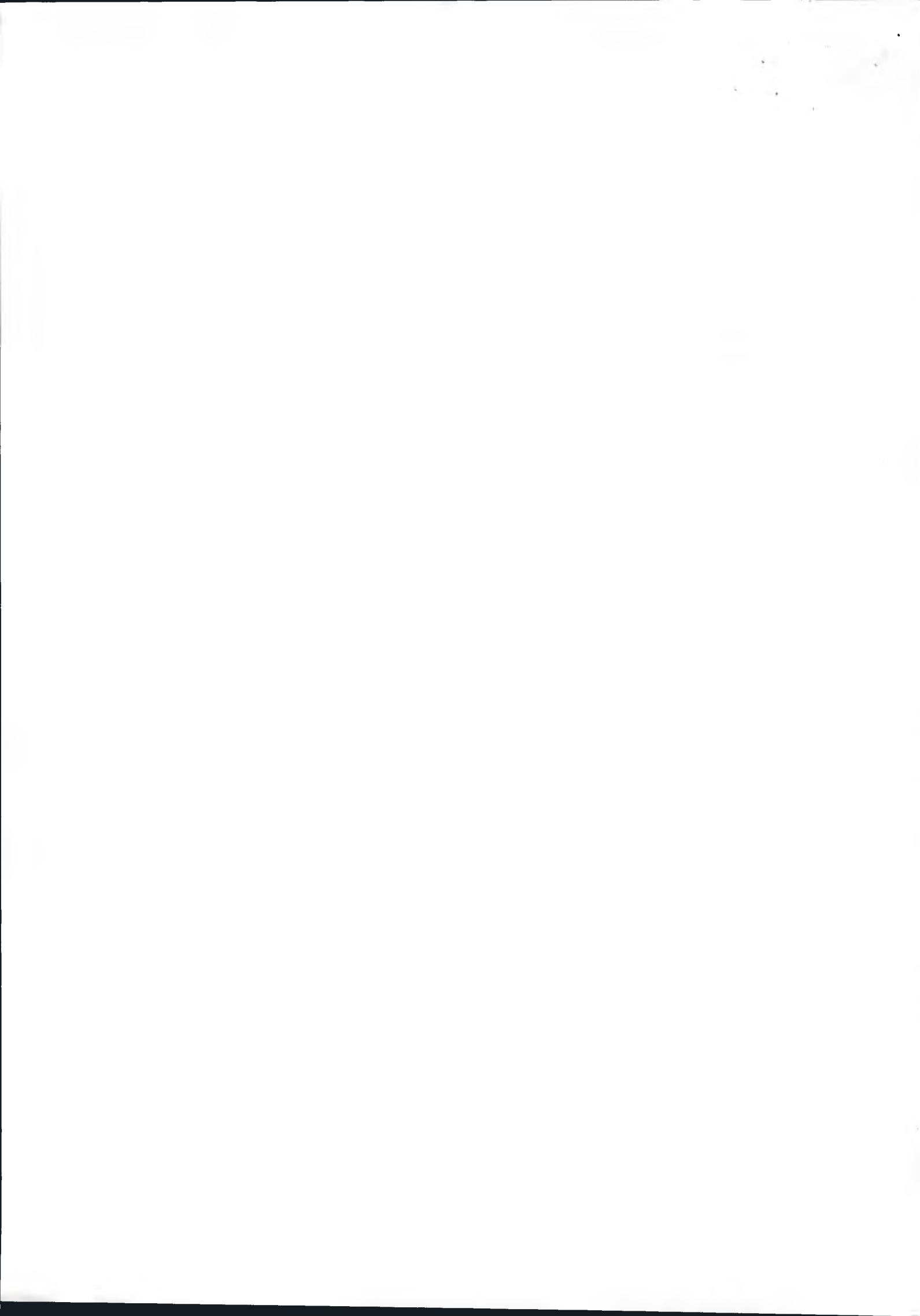
Instructions:

- Solve any four questions.
- Assume suitable data wherever necessary.
- Use of IRC-6 2014 is allowed.

Question No		Maximum Marks	Course Outcome Number
Q1			
A.	Describe well foundation and its components with sketch.	10	2
B.	Derive equation for stress in concrete in steel for RCC section subjected to axial thrust & any axis bending.	10	4
Q2			
A.	<p>Estimate the thermal stresses in a simply supported beam and slab concrete deck, for the given beam section and thermal gradient. i.e calculate stresses due to</p> <p>01. variation in body mean temperature of 25 degree Celsius. 02. Eigen stresses</p> <p>$E_c = 2.4 \times 10^5 \text{ kg/cm}^2$, $\alpha = 1.17 \times 10^{-5} \text{ degree Celsius}$</p> <div style="display: flex; justify-content: space-around; align-items: center;">   </div>	14	3

B.	Describe investigations to be carried out for major bridges.	6	3
Q 3.			
A.	Calculate the capacity of the pile for given data: Dia. of pile = 1m Qc (mudstone) = 29 MPa Qc (Sandstone) = 32 MPa Top of pile level = 480.00 Top of mudstone layer = 478.00 Top of sandstone layer = 458.00 Founding level = 454.00 Ksp = 0.8	14	4
B.	Calculate forces in each pile using rivet theory, 4 piles are arranged in 2 rows in a rectangular pile cap of 4m X 4m, with distance between two piles 2m and dist of pile from edge is 1m. P = 400 T M = 2500T-M	6	3
Q4			
A.	RCC section 80 cm X 150 cm, m = 14, Axial thrust P = 200 T , Moment about axis parallel breadth M = 80 T-m, clear cover= 5 cm, Asc = 40 cm ² , Ast = 60 cm ² , assume Neutral axis at 60 cm from extreme compression fibre. Find out the stress in concrete and steel.	10	4
B.	Design an isolated footing for pier of 2m X 1.5m. P = 60 T Mt = 80 T-m. SBC = 300Kn/m ² Assume data wherever it is necessary.		4
Q. 5			
A	Describe behavior of skew slab culverts and recommended reinforcement arrangement with sketches.	6	2,3
B	Design slab bridge having following arrangements: M30, Fe 415 Span of bridge is 4m. IRC Class AA loading Road Width 7.5m 600mm footpath on each side. For shear check, tc = 0.28 MPa	14	1,4

Q. 6			
A	Elaborate difference between cable stayed bridge and suspension bridge.	5	3
B	Design Post tensioned longitudinal girder with necessary checks and sketches for the following arrangement of bridge: Length of a girder is 30m. Total deck width is 10.5m. 4 girders are placed at 2.5m c-c distance, with 1.5m cantilever on each side. Assume 300mm thick slab. Take crash barrier load of 10 kN/m on both edges, no Footpath. Assume cross girders at each 5m having size 0.5m X 1.6m. Cross section of a main girder: Total depth 1.8m Top flange width 1.2m Top flange depth 0.25m Web thickness 0.2m Bottom flange width 0.6m Bottom flange thickness 0.3m Class AA load is placed at an eccentricity of 1.1m from centre of deck.	15	4
Q. 7			
A.	Obtain short pan and long span moments in case of interior panel of T beam Bridge having following details: Dimension of panel = 3m X 3.5m 1. Two wheels each of 57 kN adjusted symmetrically with respect centre of panel. Assume values of m_1 and m_2 suitably.	10	1,4
B	Determine the live load bending moment in the exterior girder, for two trains of Class A loading using Courbon's theory. First wheel load is placed at 0.4m from left edge and transverse distance between two vehicles is 1.7m. 	10	2,4



lib sen
16/5/16



Bharatiya Vidya Bhavan's
Sardar Patel College of Engineering

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



End Semester Exam
May 2016

Max. Marks: 100

Duration: 4 Hours

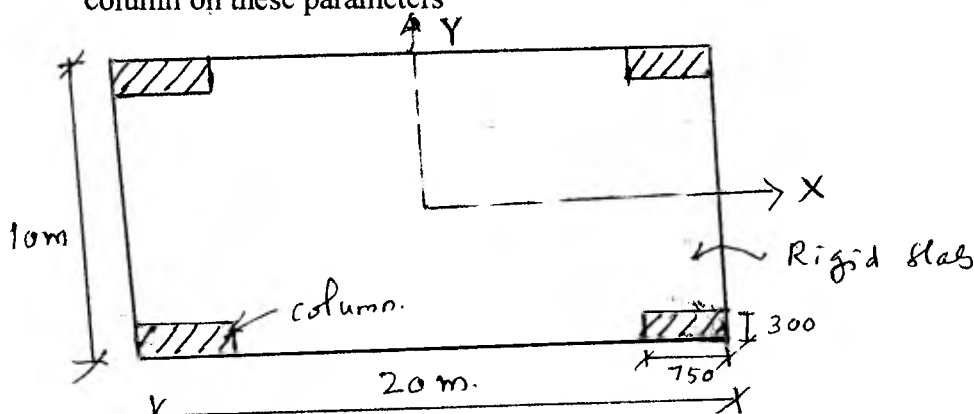
Class: M.Tech. Semester: II Program: Civil Engineering with Structural Engineering
Name of the Course: Earthquake Engineering Course Code : MTST154

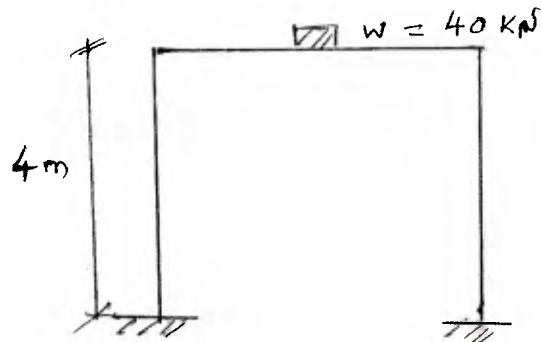
Master file.

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 No.	Module No.
Q1 (a)	Answer the followings:			
	(i) What is Random dynamic Load? Briefly explain how the analysis of structure to random of dynamic Load is done.	3	1	1
	(ii) What is an earthquake? How the earthquakes are classified based on their causes?	3	3	2
	(iii) Briefly explain the Plate Tectonic Theory of an earthquake occurrence	4	3	2
Q1(b)	(i) A uniform rigid slab of total mass 30 t is supported by four columns of height 6.0 m. rigidly connected to the top of slab and fixed at bottom. Each column is rectangular section of 750 mm x 300 mm as shown in figure. If the system is subjected to harmonic ground motion of amplitude 0.2g at frequency of 10 rad/sec in X direction only, calculate the maximum lateral displacement of slab in X direction and maximum stress in each column $\zeta = 5\%$ and $E = 20,000$ MPa.	4	2	1
	(ii) In the above problem, If the columns are hinged at bottom, then calculate the maximum lateral displacement of slab in X direction and maximum stress in each column. Comment on the effect of fixity of column on these parameters	3	2	1



Q1 (c).	Explain the characteristics of ground motions	3	3	3																				
Q2 (a)	The mass m , stiffness k , and natural frequency ω of an undamped system are unknown. These properties are to be determined by harmonic excitation tests. At an excitation frequency of 4 Hz, the response tends to increase without bound (i.e, a resonant condition). Next, a weight $\Delta w = 50$ N is attached to the mass m and the resonance test is repeated. This time resonance occurs at $f = 3$ Hz. Determine the mass and the stiffness of the system.	4	2	1																				
Q2 (b)	<p>A one story RCC building is idealized as plane frame as shown in figure. The cross section of columns is 250 mm x 250 mm and $E = 20,000$ Mpa. If the building is to be designed for ground motion, the response spectrum of which is shown in figure! 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:</p> <p>(i) The cross section of beam is much larger than that of columns, so the beam may be assumed as rigid.</p> <p>(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 design quantities</p> 	4	3	4																				
Q2 (c)	<p>A two storey frame with free vibration characteristics as given below is subjected to a subjected to harmonic ground motion of amplitude 0.2g at frequency of 10 rad/sec Calculate maximum displacements of each storey. Take damping ratio =5%</p> <table border="1" data-bbox="247 1712 973 1927"> <thead> <tr> <th rowspan="2">Floor No.</th> <th rowspan="2">Mass (t)</th> <th rowspan="2">Mode No.</th> <th rowspan="2">ω, rad/sec</th> <th colspan="2">Mode Shapes</th> </tr> <tr> <th>Φ_{i1}</th> <th>Φ_{i2}</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>20</td> <td>1</td> <td>14.58</td> <td>1.0</td> <td>1.481</td> </tr> <tr> <td>2</td> <td>15</td> <td>2</td> <td>38.07</td> <td>1.0</td> <td>-0.822</td> </tr> </tbody> </table>	Floor No.	Mass (t)	Mode No.	ω , rad/sec	Mode Shapes		Φ_{i1}	Φ_{i2}	1	20	1	14.58	1.0	1.481	2	15	2	38.07	1.0	-0.822	8	2	1
Floor No.	Mass (t)					Mode No.	ω , rad/sec	Mode Shapes																
		Φ_{i1}	Φ_{i2}																					
1	20	1	14.58	1.0	1.481																			
2	15	2	38.07	1.0	-0.822																			

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 $b=30 \text{ m}$ $d=20\text{m}$. $E= 20,000 \text{ Mpa}$.

20

3

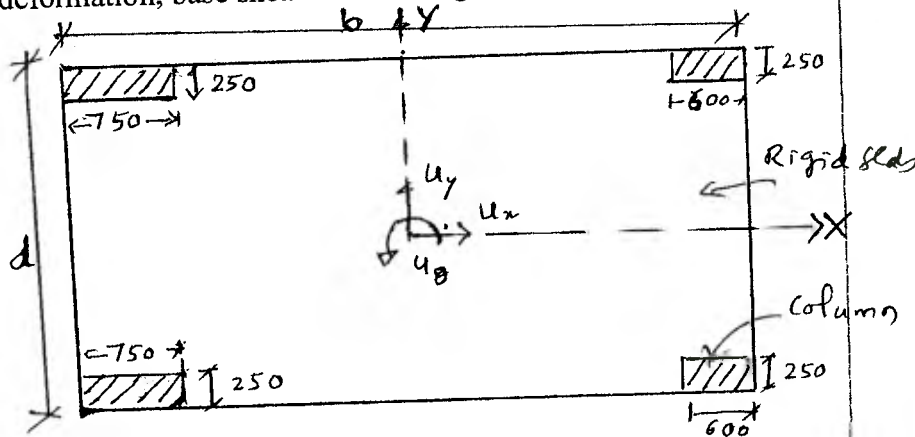
4

(i) Derive the stiffness matrix and determine the natural frequencies and modes shapes of vibrations of the structure

(ii) If the structure is subjected to ground motion \ddot{u}_{gx} only in x direction. write down the equations of motion for the system

(iii) As a special case, if all columns are of the same size, $250 \text{ mm} \times 600 \text{ mm}$, and if the system is subjected to the ground motion only in X direction, the response spectrum of which is shown in figure 1. Determine the design value of lateral deformation, base shear and bending moment for the system.

Q3



Q4 (a)

What is response spectrum? Explain briefly, the response spectrum characteristics.

5

3

3

Q4 (b)

Explain the procedure to construct elastic response spectrum for estimated peak ground motion parameters

6

3

3

Q4 (c)

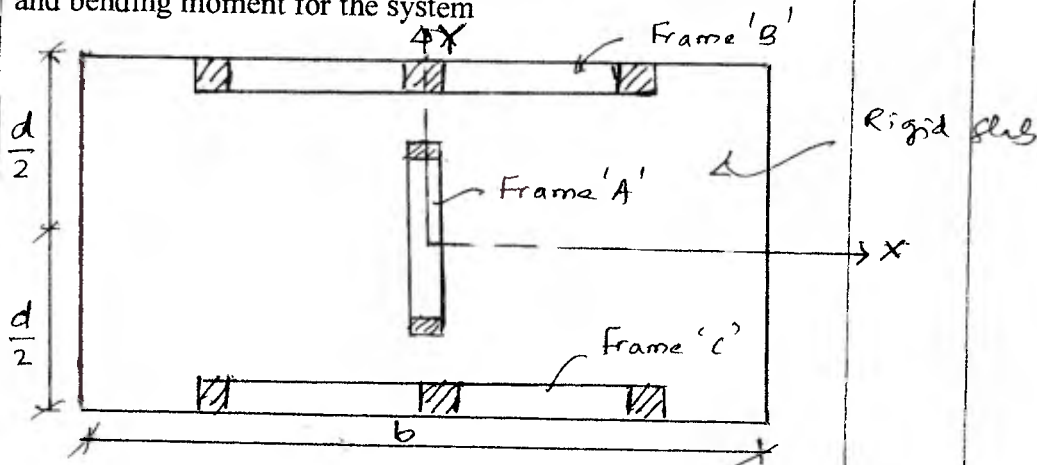
A two story frame has the following free vibration characteristics. The frame is to be designed for the ground motion characterized by the design spectrum given in the figure 1 but scaled to peak ground acceleration of $0.4g$. Calculate the design values of lateral deformation of floors.

9

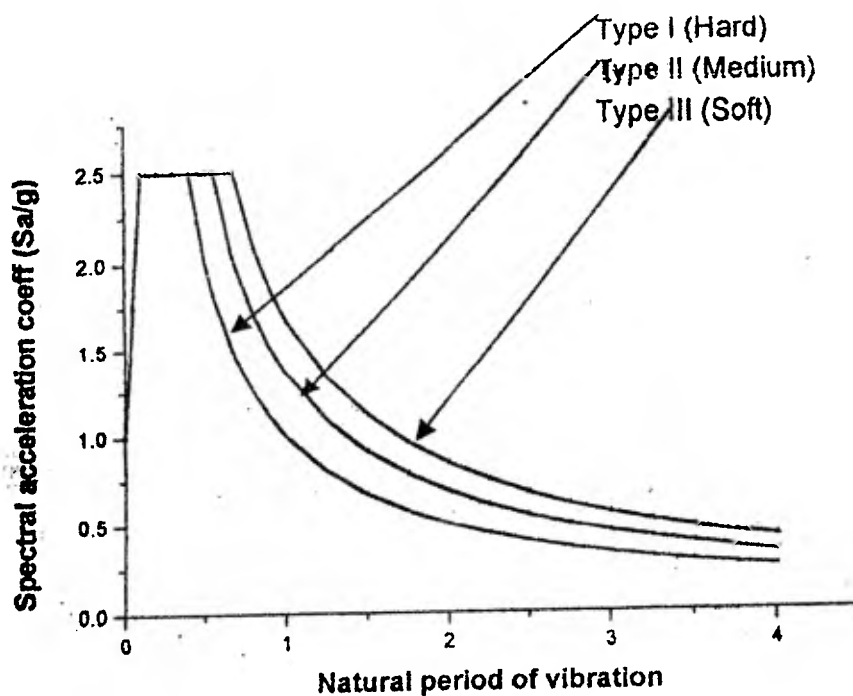
3

4

Floor No.	Mass (t)	Mode No.	ω , rad/sec	Mode shapes	
				Φ_{i1}	Φ_{i2}
1	20	1	14.58	1.0	1.481
2	15	2	38.07	1.0	-0.822

Q5(a)	<p>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 $K_y = 20000 \text{ KN/m}$ for frame A and $K_x = 25000 \text{ KN/m}$ for frames B and C. The plan dimensions are $b = 30 \text{ m}$ $d = 20 \text{ m}$. The height of building is 10 m.</p> <p>(i) Derive the stiffness matrix and determine the natural frequencies and modes of vibrations of the structure</p> <p>(ii) If the structure is subjected to ground motion \ddot{u}_{gx} only in X direction. write down the equations of motion for the system</p> <p>(iii) If the system is subjected to the ground motion only in X direction, the response spectrum of which is shown in figure 1. Determine the design value of lateral deformation, base shear and bending moment for the system</p>	8	3	4
				
Q5(b)	<p>Explain the following with reference to SDOF systems:</p> <p>(i) Allowable Ductility (ii) Ductility Demand</p>	4	4	4
Q5(c)	<p>State the limitation of Seismic Coefficient Method. As per IS 1893-2002, under what conditions the seismic coefficient method is permitted to use to calculate the earthquake forces.</p>	3	3	6
Q5(d)	<p>Explain how the base isolation helps in reducing the earthquake induced response in building structure</p>	5	4	5
Q6(a)	<p>What is soft story? Explain the provisions of IS 1893-2002 for the design of RCC elements of soft story</p>	4	3	6
Q6(b)	<p>Explain the three requirements of displacement design of structure for earthquake load as per IS 1893-2002.</p>	4	3	6
Q6(c)	<p>As per IS 1893-2002, how many mode need to be considered in the earthquake force calculation by Response Spectrum Method</p>	2	3	6

Q6(d)	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: $Z=0.24$, $I=1.5$, $R=3.0$ and $\xi=5\%$. Assume foundation strata as soft and use response spectrum given in figure 2.			10	4	6	
	Story No.	Mass No.	Mass (t)	ω rad/sec	Mode shapes		
					Φ_{i1}	Φ_{i2}	Φ_{i3}
	1	1	20	15.73	0.399	0.747	1.0
	2	2	20	49.85	1.0	0.727	-0.471
3	3	20	77.82	-0.908	1.0	-0.192	
Q7(a)	What is shear Wall? Explain the advantages of shear walls.			3	4	6	
Q7(b)	What is ductility of a structure? Explain the importance of ductility in seismic resistant structures.			3	3	7	
Q7(c)	Explain the provisions of IS 13920 for (i) Beams: General provisions, longitudinal reinforcement and web reinforcement (ii) Shear Walls: General requirements and shear strength			12	3	7	
Q7(d)	Briefly explain the earthquake design principle as per IS 1893-2002 (i.e. fail safe criteria)			2	3	6	



Response Spectrum as per IS 1893-2002 for 5 % Damping

Figure-2 Q no. 6(d)

6

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

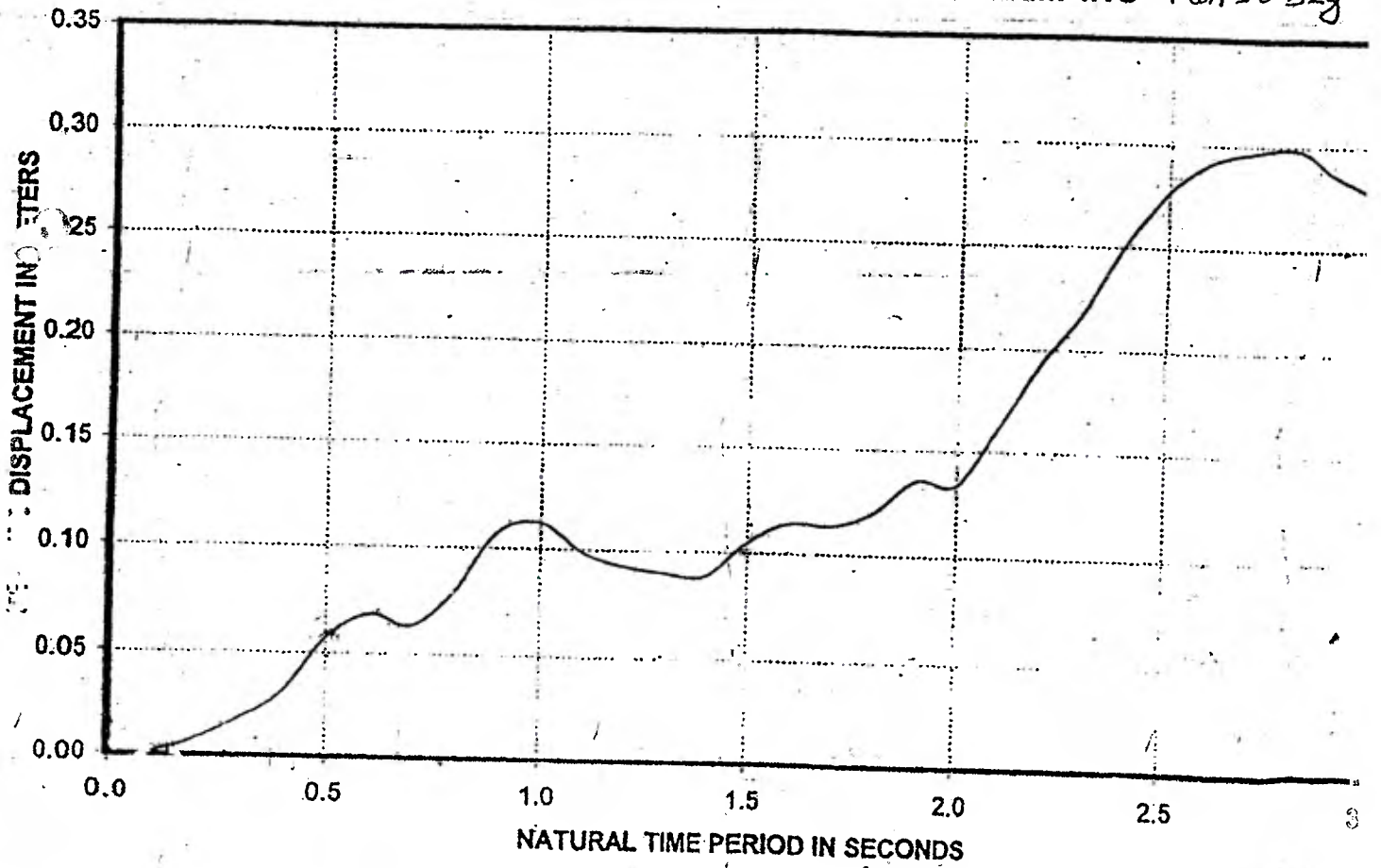


Figure 1 QNB 2(b) , QNB 3 (iii) QNB 4 (c) QNB 5 (a)

lip seen
11/5/2016

2



Bharatiya Vidya Bhavan's
Sardar Patel College of Engineering

(A Government Aided Autonomous Institute)
Munshi Nagar, Andheri (West), Mumbai – 400058.
End Semester Exam
May 2016



Max. Marks: 100
Class: M. Tech Structural Engg. (Civil) Semester: II
Name of the Course: THEORY OF PLATES

Duration: 4 hrs
Program: PG
Course Code :MTST 152

Instructions:

Master file.

1. Attempt any five questions.
2. Illustrate your answers with neat sketches wherever required, though not sought specifically.
3. Assume suitable data if necessary.

Question No	Maximu m Marks	Course Outcome Number	Module No.
Q1	(5)	(1)	(2)
Derive $D = \frac{Eh^3}{12(1-\nu^2)}$ Where D is the flexural rigidity of the plate			
b). Derive the relation between twisting moment and twist of the surface of bent rectangular plate.	(10)	(1)	(2)
c). Explain the following boundary conditions and equations used for (a) fixed edge (b) simply supported edge (c) free edge	(5)	(1)	(5)
Q2 Show that any point of the middle surface the sum of the curvatures in two perpendicular directions is independent of angle.	(10)	(1)	(2)
State conditions for which Navier's and Levy's method are applicable.	(5)	(2)	(6)
Write down the Kirchoff's assumptions for plate theory.	(5)		(3)
Q3 Explain why the corners of a simply supported laterally loaded square plate is subjected a reactive force R. Derive expression for R.	(10)	(1)	(5)

b. Explain different types of plate theories. Briefly describe classical laminated plate theory (CLPT) and first order shear deformation theory (FSDT) in terms of transverse shear strains. (10) (1 & 3)

Q4 Derive the expression for the maximum bending moments of a uniformly loaded clamped circular plate. Also, find out the expression for deflection of a circular plate with a circular hole at the centre assuming the plate is supported along the outer edge, (20) (3) (4)

Q5 A square plate with two opposite edges simply supported and other two edges clamped is subjected to a half sinusoidal load. Determine maximum deflection of plate and maximum positive moment using Levy's approach. (20) (2) (5 & 6)

Q6 Find the deflections of a simply supported rectangular plate of size $a \times b$ subjected to sinusoidal load. Determine the maximum deflection of plate using Navier's approach. (20) (2) (5 & 6)

Q7 Determine the maximum deflection of simply supported square plate subjected to a distributed load in the form of a triangular prism, as shown in Fig. Use finite difference method (20) (4) (7)

