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22/05/17

Bharatiya Vidya Bhavan's

Sardar Patel College of Engineering

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

Program: M. Tech. (Civil- Structural Engineering)
Course code: MTST 152
Name of the Course: Theory of Plates
Semester: II

Date: 22/05/2017
Duration : 4 Hr
Maximum Marks : 100
Master file.

Instructions:

1) Attempt any **FIVE** questions.
2) All questions carry equal marks.
3) Answers to each question to be started on fresh page.

Q. No.		Maximum Marks	Course Outcome Number	Module No.
Q.1a)	Enlist assumptions made in Classical Plate Theory	5	1	3
b)	Discuss boundary conditions at clamped and simply supported edges of a rectangular plate	5	1	3
c)	Differentiate between Navier's and Levy's mrthod for analysis of thin plates.	5	2	6
d)	Draw neat sketch of a plate element acted upon by internal forces and moments and external load.	5	1	1
Q.2 a)	A rectangular plate of size 2.5 m X 4.5 m X 0.12 m is simply supported on all four edges and is carrying a udl of 8 kN/m^2. Calculate for this plate (i) Corner Reactions and (ii) Mx and My at center of the plate.	10	4	5
Q.2 b)	Describe expression for bending stiffness: D = $\frac{Eh^3}{12(1-\mu^2)}$ for a plate subjected to pure bending.	10	4	3
Q.3 a)	Explain difference between plate action and shell action.	05	1	1
Q.3 b)	With usual notifications derive two stage solution for a laterally loaded plate with small deflections. Also derive equation of equilibrium $q_x = -D\frac{\partial}{\partial x}\nabla^2\omega$.	15	1,4	2
Q.4 a)	A square plate of size 5 m X 5 m X 0.15 m is simply supported on all four edges and is carrying a udl of 8 kN/m^2. Determine the central deflection of the plate using Finite Defference Method. Take E = 200GPa and μ = 0.35.	10	4	7

Q.4 b)	A square plate of size 2.5 m X 2.5 m X 0.1 m is simply supported on all four edges and is carrying a udl of 8 kN/m^2. Calculate for this plate (i) transerverse shear and (ii) bending moment at center of the plate. Take E = 200GPa and $\mu = 0.3$	10	1	5
Q.5	A simply supported square plate is subjected to uniformly distributed load of intensity P_0. Determine maximum deflection and maximum bending moment using Navier's method	20	2	6
Q.6	For rectangular plate subjected to pure bending, derive the equations for the bending curvature and twisting curvature in direction 'n' and 't', where 'n' and ' t ' are any two directions perpendicular to each other issued at th e point. Also derive the relationship between twisting moment and twist of the surface of the bent rectangular plate.	20	1,2	2
Q.7	A clamped circular plate of 1 m diameter is subjected to a udl of intensity 'w' per unit length. If the maximum deflection of the plate is limited to 3 mm and thickness of the plate is 16 mm determine the safe intensity of udl. Take E = 200GPa and $\mu = 0.25$. Also determine the the bending stresses due to circumferential moment at the support and central section.	20	3	4

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End Semester Examination
May 2017

Max. Marks: 100 Duration: 4 Hours
Class: M.Tech (Str) Semester: II Program: M.Tech (Structural Engineering)
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	Module No.
Q.1 (a)	Using Whitney's stress block, find the ultimate moment of resistance of a reinforced concrete beam of rectangular section 300 mm x 700 mm reinforced with 4 numbers of 25 mm diameter bars. Use M20 concrete and Fe415 steel. Use effective cover to tension steel as 50 mm.	(10)	1	1
Q.1 (b)	If the rectangular section referred in Q1 (a) above is made monolithic with 150 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 1200 mm. Use Whitney's stress block	(10)	1	1
Q.2 (a)	Explain how the rotation capacity of a reinforced concrete section can be increased.	(05)	1	2
Q.2 (b)	A reinforced concrete slab of effective plan dimensions of 3m X 5m size is fixed on all its edges. The working load due to finish is 1.8 kN/m^2 and superimposed live-load is 3 kN/m^2. The amount of reinforcement at the bottom provided along long span is 70% of that provided along short-span. Design the slab using yield line theory, considering load factor of 1.5. Use M 20 grade concrete and Fe415 steel.	(15)	1	3
Q.3 (a)	Derive the expression for rotation capacity of a tensile plastic hinge in case of a continuous R.C. beam.	(10)	1	2

Q.3 (b)	Distinguish between Cambridge method and Baker's method of ultimate load analysis of structure. Which of these methods is suitable for concrete structures?	(04)	1	2
Q.3 (c)	Explain the different types of floor slab systems. What are the advantages and disadvantages of flat slabs?	(06)	1	5
Q.4 (a)	Calculate the moment of resistance of the concrete beam having a width of 300 mm and a depth of 450mm. It is reinforced with 6 nos 20 mm diameter TOR bars on tension side and 4 nos 20 mm diameter TOR bars on compression side. Assume effective cover of 40 mm for both tension and compression steel. Use M 20 grade of concrete and Fe 415 grade of steel.	(08)	1	4
Q.4 (b)	A reinforced concrete slab of effective plan dimensions of 3m X 4m size is simply supported 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. Design the slab using limit state method. Considering load factor of 1.5. Use M 20 grade concrete and Fe415 steel.	(12)	1	5
Q.5 (a)	Differentiate between a silo and a bunker.	(04)	2	6
Q.5 (b)	Write short note on meridional tension in hopper of cylindrical silo.	(05)	2	6
Q.5 (c)	Write short note on behavior of folded plates	(06)	2	7
Q.5 (d)	What are the assumptions made in the Whitney's method of analysis of folded plates?	(05)	2	7
Q.6	A circular RCC silo used for storing cement has a diameter of 7m and has a conical hopper of 4m height with a concentric circular opening of 600mm diameter. It is supported on 8 columns. The height of this silo is 40m. Design the silo wall and hopper bottom for the following data. Density of cement is $15KN/m^3$, angle of internal friction is 20^o and co-efficient of friction between cement and concrete wall is 0.55. Use M20 concrete and Fe 415 steel.	(20)	2	6
Q.7 (a)	Derive the three edge shear equation used in Whitney's method of folded plate analysis.	(10)	2	7
Q.7 (b)	Explain the concept of stress distribution used in folded plate analysis.	(10)	2	7