B.L.D.E Association"s

VACHANA PITAMAHA DR.P.G.HALAKATTI

COLLEGE OF ENGINEERING AND TECHNOLOGY ,VIJAYPUR

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QUESTION PAPERS

1st,2nd & 4th SEMESTER

M.TECH CIVIL

JUNE/JULY 2019

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1Sem MTech CV

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18CSE11

First Semester M.Tech. Degree Examination, June/July 2019
Computational Structural Mechanics

Time: 3 hrs. Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1 a. Determine the static and kinematic indeterminacy for the following structures, shown in Fig.Q1(a). **(10 Marks)**

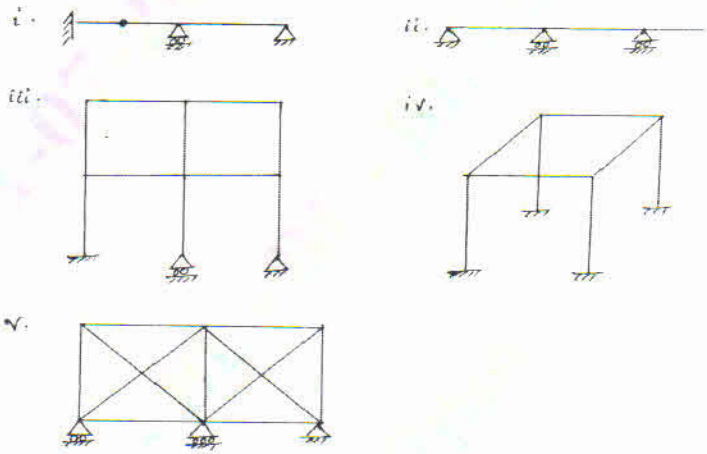

Fig.Q1(a)

b. Solve the following system of linear simultaneous equations by Gauss-Seidel procedure. Carryout 5 iterations.

$3x_1 - 2x_2 + 6x_3 = 17$
$4x_1 + 3x_2 + 6x_3 = 13$
$2x_1 - 4x_2 + x_3 = 8$

(10 Marks)

OR

2 a. Solve the following set of simultaneous equations by Gauss elimination method.

$2x_1 - x_2 + x_3 = 7$; $x_1 + 2x_2 + x_3 = 0$; $3x_1 + x_2 - 2x_3 = -2$ **(10 Marks)**

b. Solve the following system of equations by Cholesky's method.

$3x_1 + x_2 + 4x_3 = 2$; $x_1 + 4x_2 + x_3 = 12$; $4x_1 + x_2 + 6x_3 = 10$ **(10 Marks)**

Module-2

3 a. Using transformation approach, develop the global flexibility matrix for the truss shown in Fig.Q(3) with respect to the system coordinates mentioned. E = 200 kN/mm^2, A = 1000mm^2

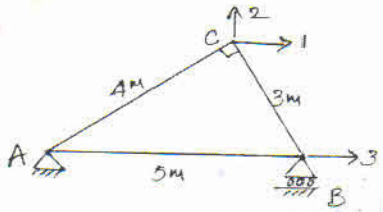

Fig.Q(3)

(10 Marks)

b. Using the transformation approach, develop the global flexibility matrix for the portal frame with respect to the system coordinates shown in Fig.Q3(b). **(10 Marks)**

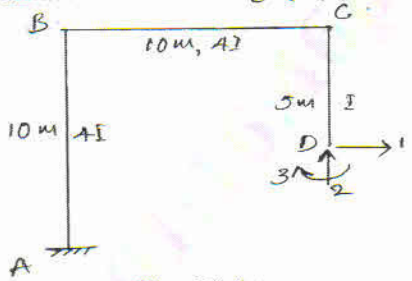

Fig.Q3(b)

OR

4 a. Develop the stiffness matrix for the continuous beam with respect to the coordinates shown in Fig.Q4(a). Flexural rigidity is constant. Use transformation approach. **(10 Marks)**

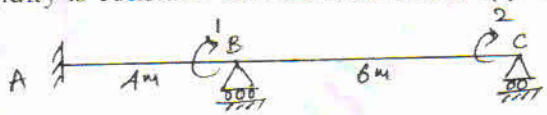

Fig.Q4(a)

b. Develop the stiffness matrix for the portal frame with respect to the coordinates shown in Fig.Q4(b). Use transformation approach. **(10 Marks)**

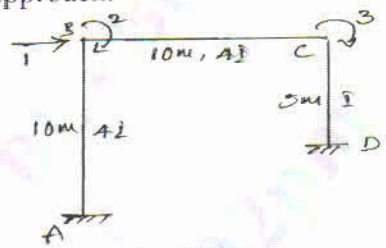

Fig.Q4(b)

Module-3

5 Analyse the continuous beam loaded as shown in Fig.Q5 by the matrix flexibility method, and draw the BMD. Adopt transformation approach. **(20 Marks)**

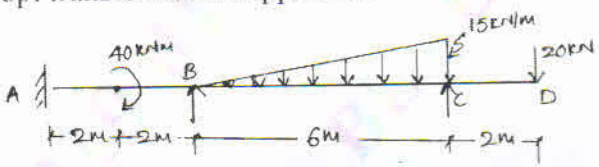

Fig.Q5

OR

6 While fabricating the pin jointed frame shown in Fig.Q6, the member AC was the last member to be fitted and was found to be 1.5mm short of required length. Determine the forces induced in all the members when AC is forced into position. Diagonal members are having 1000mm^2 area while remaining members are having an area of 2000mm^2. Take E = 2×10^5 N/mm^2. **(20 Marks)**

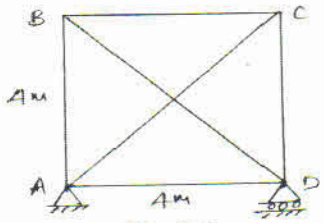

Fig.Q6

Module-4

7 Analyse the frame shown in Fig.Q7 by the matrix stiffness method. Adopt transformation approach. **(20 Marks)**

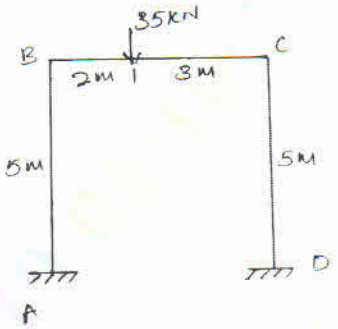

Fig.Q7

OR

8 A pin jointed frame consists of four members connected as shown in Fig.Q8. Compute the forces in members using matrix stiffness method. Adopt transformation approach. Take $E = 2\times10^5$ N/mm^2 for all members. Area of members are equal. A = 1000m^2. **(20 Marks)**

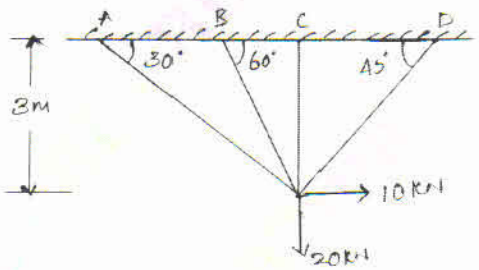

Fig.Q8

Module-5

9 Analyse the continuous beam shown in Fig.Q9 by direct stiffness method. **(20 Marks)**

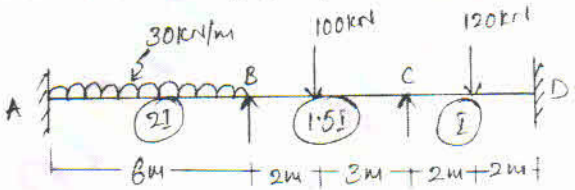

Fig.Q9

OR

10 Analyse the frame shown in Fig.Q10 by direct stiffness method. **(20 Marks)**

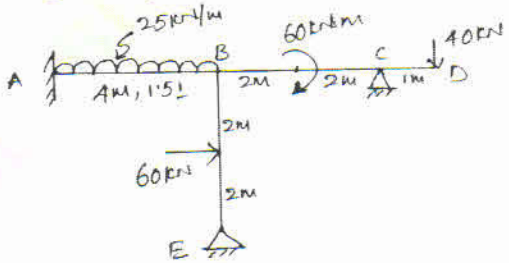

Fig.Q10

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18CSE12

First Semester M.Tech. Degree Examination, June/July 2019
Advanced Design of R.C. Structures

Time: 3 hrs. Max. Marks: 100

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. Use of IS456-2000, SP-16 permitted.

Module-1

1 a. Mention the features of yield lines. **(06 Marks)**

b. Design a rectangular slab 7.5m × 5.0m simply supported on all edges. The L.L. is 4.00 kN/m^2 and a floor finishing load of 1.0 kN/m^2. Use M20 concrete and Fe 415 grade steel. If slab is orthotropically reinforced with $\mu = 0.75$. **(14 Marks)**

OR

2 Calculate the design moments in an interior panel and exterior panel of a flat slab for middle floor of size 7.2m × 6.4m using direct design method. It is subjected to L.L. of 4 kN/m^2 and floor finish 1.0 kN/m^2. Use M20 concrete and Fe 415 grade steel. Supporting column is 450mm in diameter floor to floor height of columns ins 3.35m. **(20 Marks)**

Module-2

3 An RCC grid slab is to be provided for an auditorium 14m × 22m. Ribs are placed at 2 m c/c. L.L. on the floor is 2 kN/m^2. Floor finishing load is 1.0 kN/m^2. Design the grid slab and beams by Rankine Grashoff theory. Use M20 grade concrete and Fe 415 grade steel. Sketch the detail of reinforcement. **(20 Marks)**

OR

4 Design a two span continuous beam of clear span 6m and allowing for 15% redistribution of moments. The live load and dead load on the beam can be taken as 15kN/m and 10kN/m respectively. Adopt M20 concrete and Fe 415 grade steel. Sketch the details of reinforcement. **(20 Marks)**

Module-3

5 Design a Chimney of height 70m for the following data:

External diameter at the top is	4m and at the base is 4.8m
Shell thickness at the top	= 200mm
Shell thickness at the bottom	= 400 rpm
Wind intensity	= 1.8 kN/m^2 throughout
Thickness of firebrick lining	= 100 mm
Air gap	= 100mm
Temperature difference	= 70°C
Coefficient of expansion	= $\alpha = 11 \times 10^{-6}$/°C
E	= 210×10^3 N/mm^2
Unit weight of brick lining	= 20 kN/m^3

Use M25 grade concrete and Fe 415 grade steel. **(20 Marks)**

OR

6 Design and detail the vertical and hoop reinforcement required at the base of a RC Chimney of 60m height for the combined effect of self weight and wind load. The external diameter of Chimney is 4.8m and the thickness of concrete shell varies from 400mm at the base to 200mm at the top. The Chimney is lined with 100mm thick fire brick with an air gap of 100mm. The wind load may be assumed as 1.8 kN/m^2 for the entire height. Use M25 grade concrete and Fe 415 grade steel. **(20 Marks)**

Module-4

7 Design the side walls of a rectangular bunker of capacity 300kN to store coal using M20 grade concrete and Fe 415 grade steel. Unit weight of coal is 8 kN/m^3. Angle of repose of coal is 25°. Draw the sketch showing reinforcement details. **(20 Marks)**

OR

8 A cylindrical silo has an internal diameter of 6m and depth of 20m with a conical hopper bottom to tore wheat of density $8kN/m^3$. The coefficient of friction between wall and material is 0.444. The ratio of horizontal to vertical pressure is 0.40. Angle of repose = 25°. Design the reinforcement in the silo. Adopt M_{20} grade concrete and Fe 415 grade steel. Adopt Janssen's theory for pressure calculations. **(20 Marks)**

Module-5

9 a. What are the requirements of good formwork? **(06 Marks)**
b. What are the advantages and disadvantages of steel formwork? **(06 Marks)**
c. Explain with sketch the Shuttering for columns. **(08 Marks)**

OR

10 a. Explain the loads on formwork. **(05 Marks)**
b. State the stripping time of formwork for structural elements. **(05 Marks)**
c. Explain with sketch the shuttering for beam and slab floor. **(10 Marks)**

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18CSE13

First Semester M.Tech. Degree Examination, June/July 2019
Mechanics of Deformable Bodies

Time: 3 hrs. Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1 a. Derive the equilibrium equation in polar coordinate. **(12 Marks)**

b. State of stress at a point in a body is given by $\sigma_x = x^2y + 20$, $\sigma_y = x^3z + y^2$, $\sigma_z = yz^2 + 10$, $\tau_{xy} = 3x^2y$, $\tau_{yz} = yz$, $\tau_{xz} = xz$. Determine the body force distribution at the point (1, 2, 3) so that the stress are in equilibrium. **(08 Marks)**

OR

2 a. The stress components at a point in a body are given by

$\sigma_r = 3r\theta^2z + 2r \qquad \tau_{r\theta} = 0$

$\sigma_\theta = 5r\theta z + 3\theta \qquad \tau_{\theta z} = \tau_{rz} = 3r\theta^2z + 2r\theta$

$\sigma_z = r^2\theta + \theta^2z$

Determine the body force at the point (1, -1, 2). **(15 Marks)**

b. Explain strain at a point. **(05 Marks)**

Module-2

3 a. Explain: i) Hydrostatic and deviatric stress ii) Hydrostatic and deviatric strain. **(10 Marks)**

b. When the stress tensor at a point with reference to axis (x, y, z) is given by

$$\begin{bmatrix} 100 & 80 & 0 \\ 80 & -60 & 0 \\ 0 & 0 & 40 \end{bmatrix} \text{ kPa}$$

Show that by transformation of axes by 30° anticlockwise, where z′ coincides with z. Determine new coordinate system. **(10 Marks)**

OR

4 a. The state of stress of given by $\begin{bmatrix} 9 & 6 & 3 \\ 6 & 5 & 2 \\ 3 & 2 & 4 \end{bmatrix}$ MPa.

Determine Principle stresses and principle direction **(15 Marks)**

b. The stress tensor at a point is given by the following array. Calculate the deviator and spherical stress

$$\begin{bmatrix} 40 & 20 & 30 \\ 20 & 30 & 40 \\ 30 & 40 & 20 \end{bmatrix} \text{ MPa}$$ **(05 Marks)**

Module-3

5 a. Prove that the following polynomial Airy's stress function

$\phi = Ax^2 + Bx^2y + Cy^2 + Dx^2y^3 - \frac{Dy^5}{5}$. If so evaluate the corresponding stress component at (1, 1) when A = B = C = D = 2. **(15 Marks)**

b. What is "Airy's stress function"? Write conditions it should satisfy. **(05 Marks)**

OR

6 a. Derive the expression for bending of a cantilever beam subjected to a point load at the free end $\phi = b_2 xy + \frac{d_4 xy^3}{6}$. [Refer Fig.Q.6(a)] **(15 Marks)**

Fig.Q.6(a)

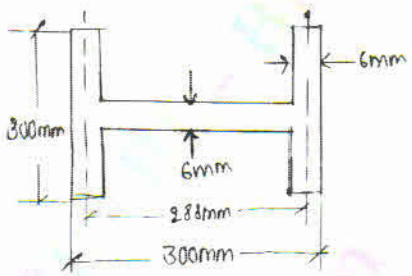
b. A thick cylinder of inner radius 10cm and outer radius 15cm is subjected to an internal pressure of 12MPa. Determine the radial and hoop stress in the cylinder at the inner and outer surface. **(05 Marks)**

Module-4

7 a. Derive the differential equation for torsion of straight bar and hence determine M_t. **(12 Marks)**

b. Calculate the maximum shear stress and angle of twist. Twisting moment = 615N-m and G = 80000 MN/m^2. **(08 Marks)**

Fig.Q.7(b)

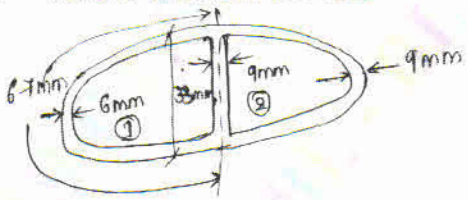


OR

8 a. Explain the membrane analogy method for determining torsion of solid section. **(12 Marks)**

b. A two cell tubular section shown in Fig.Q.8(b) is formed by conventional air voids shapes having an interior web twisting moment 10,000 N-m. Determine the shear for distribution and shear stress area of cell 1 = 680cm^2 and area of cell 2 = 2000cm^2. **(08 Marks)**

Fig.Q.8(b)



Module-5

9 a. Write short notes on: i) Tresca yielding ii) Von-Mises criteria of yielding. **(10 Marks)**

b. Define:

i) Linear elastic material
ii) Rigid materials
iii) Perfectly plastic
iv) Rigid plastic material
v) Elastic perfectly plastic material. **(10 Marks)**

OR

10 a. Discuss the theories of failures. **(10 Marks)**

b. The state of stress at a point in a material is given by σ_x = 100MPa, σ_y = 150MPa and τ_{xy} = 0, if the yield strength of the material is 200MPa. Determine whether yielding of the material will occur by the following: i) Tresca yield criterion ii) Von Mises yield criterion. **(10 Marks)**

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CBCS SCHEME

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18CSE21

Second Semester M.Tech. Degree Examination, June/July 2019
Advanced Design of Steel Structures

Time: 3 hrs. Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1 a. Explain shear centre and identify the shear centre for 'I' and channel section as shown in Fig.Q1(a)(i) and Fig.Q1(a)(ii). **(08 Marks)**

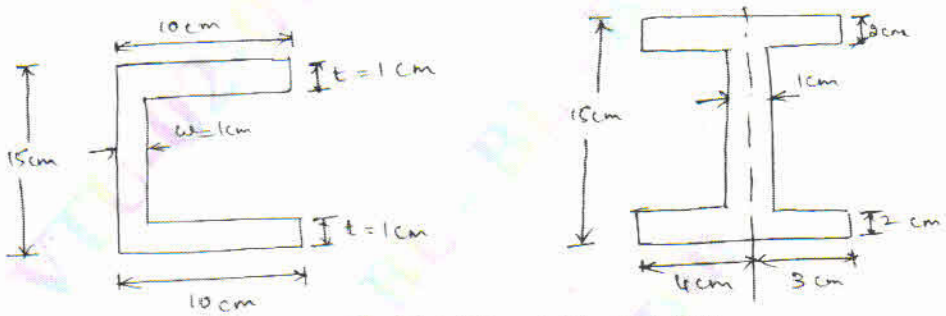

Fig.Q1(a)(i) and Fig.Q1(a)(ii).

b. Calculate the moment carrying capacity of a laterally unrestrained ISMB 400 member of length 3m. **(12 Marks)**

OR

2 Design a continuous beam of span 4.9m, 6m and 4.9m carrying a total uniformly distributed load of 32.5 kN/m and laterally unrestrained with a bearing length of 100mm. **(20 Marks)**

Module-2

3 Check the adequacy of a beam – column ISHB 450@ 855.4 N/m for the factored loads as shown in Fig.Q3. The column is part of a non-sway frame with bottom end hinged. The effective length of the member is 3.5m about both the axis. Steel is of grade Fe 410. **(20 Marks)**

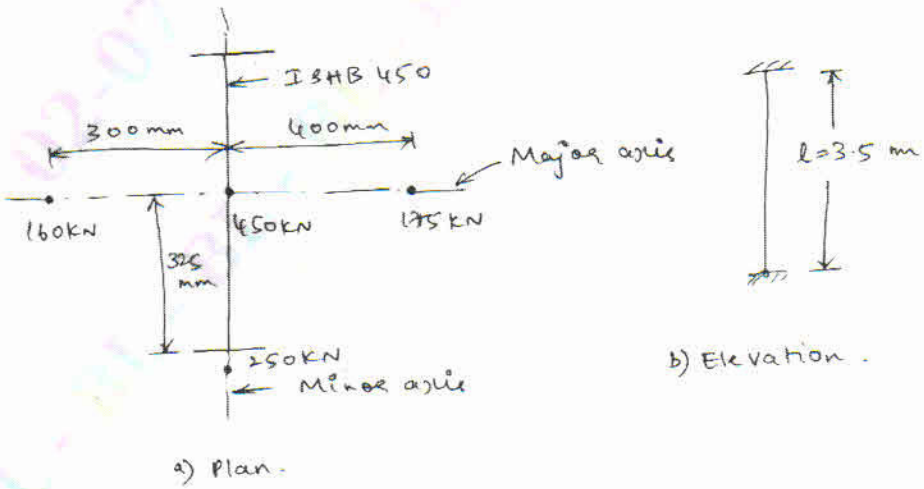

Fig.Q3

4 A non-sway column in a building frame with flexible joints is 4m high and subjected to the following load and moment :
Factored axial load = 500kN
Factored moment Mz : At top of column = 27kN-m ; At bottom of column = 45kN-m.
Design a suitable beam column assuming $f_y = 250N/mm^2$. Take the effective length of the column as 0.8L along both the axes. **(20 Marks)**

Module-3

5 Design a castellated beam in grade Fe410 steel to carry an imposed load of 4kN/m and dead load of 4kN/m over a simply supported span of 16m. Assume that the compression flange is fully restrained. Assume self weight as 0.75kN/m. **(20 Marks)**

OR

6 Design a Vierendeel girder for covering the industrial building located at Guwahati with a span of 20m and a length of 50m. The roof is galvanized iron sheeting. Building is class 'B' building with a clear height of 8m at the eques. The design forces are as follows :
Maximum factored moment = 49.34kN-m
Maximum factored axial compressive = 200.76kN force
Maximum factored shear force = 37.14kN
Note : section to be used is square hollow section (SHS). Number of panels = 8. **(20 Marks)**

Module-4

7 a. List out merits and demerits of cold formed steel sections over hot rolled steel sections. **(10 Marks)**

b. A light gauge steel rectangular box section 200mm × 120mm × 2mm is used for a column. The effective length of the column is 3.60m. Determine the safe load carrying capacity of the section. Take basic design stress as $235N/mm^2$. **(10 Marks)**

OR

8 a. Explain the different types of stiffened and unstiffened elements. **(06 Marks)**

b. Two channel sections with bent lips 200mm × 80mm are connected with webs to act as a beam. The thickness of the channel is 2.5mm. The effective span of simple supported beam is 4m. Determine the maximum uniformly distributed load inclusive of self weight which can be supported by the beam. The beam is laterally supported throughout its length. The depth of the lip is 25mm. **(14 Marks)**

Module-5

9 a. Explain briefly the following :
i) Period of structural adequacy
ii) Section factor H_p/A
iii) Limiting steel temperature
iv) Fire resistance level. **(10 Marks)**

b. An ISMB 500 supports a concrete floor. If 30min fire resistance is required, what fraction of its capacity can the beam safely carry? Assume the live load to dead load ratio of 0.67 : 0.33. **(10 Marks)**

OR

10 a. Explain the methods of fire protection. **(10 Marks)**

b. Calculate the temperature rise on an ISMB400 heated on four sides after exposure for 15min to SIO834 fire. **(10 Marks)**

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18CSE23

Second Semester M.Tech. Degree Examination, June/July 2019
Earthquake Resistant Structures

Time: 3 hrs. Max. Marks: 100

Note: *1. Answer any FIVE full questions, choosing ONE full question from each module.*
2. Use of relevant IS codes is permitted.
3. Missing data, if any, may be suitably assumed.

Module-1

1 a. What types of waves are generated during an earthquake? Distinguish between "Body waves" and "Surface waves". **(10 Marks)**

b. Explain magnitude and intensity as applied to an earthquake. With a neat sketch write a note on earthquake seismograph. **(10 Marks)**

OR

2 a. Explain different ground motion characteristics. **(05 Marks)**

b. Explain the concept of base isolation and applications in structural design with sketches. **(10 Marks)**

c. Explain earthquake risk evaluation and mitigation. **(05 Marks**

Module-2

3 a. Explain briefly about the seismic design philosophy. Write the basic assumptions made in the analysis of earthquake resistant design of structures. **(10 Marks)**

b. Explain briefly the different method of seismic of analysis structures. **(10 Marks)**

OR

4 Consider a four storey reinforced concrete office building of size 20m in x – direction and 15m in y–direction as shown in the Fig.Q4 (plan and elevation) below. Te building is located in seismic zone V. The soil conditions are medium stiff and it is proposed to design the building with a special moment – resisting frame. The lumped weigh due to dead loads is 12 kN/m^2 on floors and 10 kN/m^2 on the roof. The floors are to cater for a live load of 4kN/m^2 on flooring and 1.5 kN/m^2 on the roof. Determine the design seismic loads on the structure by static analysis as per IS1893 – 2002 in both directions. Take z = 0.36, I = 1.5 and R = 5. **(20 Marks)**

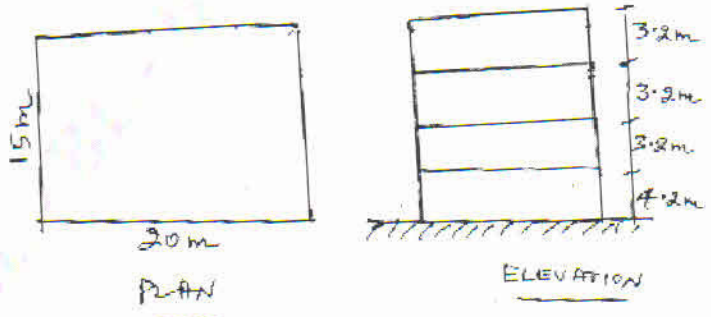

Fig.Q4

Module-3

5 a. Explain the concept of plan irregularities and vertical irregularities with neat sketches. **(10 Marks)**

b. Determine the frequency and design seismic coefficient for an ordinary masonry shear wall in school building located in a seismic zone II for the following data :

Roof load P	= 15 kM/m
Height of wall h	= 3.0m
Width of wall b	= 0.2m
Unit weight of wall w	= 19.2 kN/m^3
Soil is medium zone factor z	= 0.10
Importance factor I	= 1.5
Response reduction factor R	= 1.5
Damping coefficient	= 5%.

(10 Marks)

OR

6 a. Explain failure mechanism of infilled masonry walls with the relevant neat sketches. **(10 Marks)**

b. Design an unreinforced 6-m high and 4.9m wide masonry shear wall (centre lines of ways) as shown in the Fig.Q6(b) below based on the following data.

Unit weight of wall = γ	= 20kN/m^3
Prism strength of masonry f_m	= 10 MPa
Seismic force at roof level H	= 30 kN
Height above roof level	= 0.5m

No superimposed load is applied on the wall. **(10 Marks)**

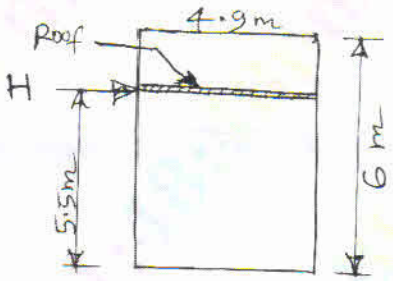

Fig.Q6(b)

Module-4

7 a. What is ductility? Discuss the factors affection ductility in RCC building. **(10 Marks)**

b. Explain in detail, with sketches the ductile defiling provision for a beam as per IS 13920. **(10 Marks)**

OR

8 a. What are the different energy absorptions in buildings? **(08 Marks)**

b. What are the principles of earthquake resistance RC design? **(06 Marks)**

c. Explain the design and detailing of shear ways with sketches. **(06 Marks)**

Module-5

9 a. Explain qualitative and analytical method of seismic evaluation. **(12 Marks)**

b. Explain any one type of local or member level retrofitting techniques for enhancing the seismic capacity of existing column, with sketches. **(08 Marks)**

OR

10 a. Explain passive, hybrid and active protective systems, with sketches. **(15 Marks)**

b. Explain non-liner procedure of seismic analysis (both state and dynamic). **(05 Marks)**

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18CSE22

Second Semester M.Tech. Degree Examination, June/July 2019
Finite Element Method of Analysis

Time: 3 hrs. Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1 a. Explain the different steps involved in finite element method analysis of structures. **(10 Marks)**

b. What are 1D, 2D and 3Dfinite elements? Give examples. **(05 Marks)**

c. Explain aspect ratio with examples. **(05 Marks)**

OR

2 a. Mention the advantages and disadvantages of finite element method. **(10 Marks)**

b. Using Rayleigh–Ritz, find the displacement at the midpoint of a beam as shown in Fig.Q2(b) carries a central point load 'P' having Young's modulus E and cross sectional area 'A'.

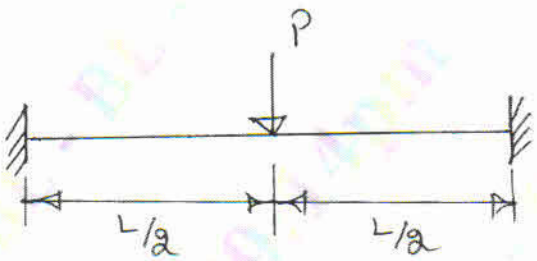

Fig.2(b)

(10 Marks)

Module-2

3 a. Explain the convergence and compatibility requirements of a good displacement model. **(10 Marks)**

b. For a four noded, two dimensional rectangular elements, derive the shape function using Lagrange's interpolation function in natural c0-ordinates **(10 Marks)**

OR

4 a. Explain the following :
i. Global–co-ordinate
ii. Local co-ordinate
iii. Natural co-ordinate
iv. Shape function
v. Lagrange interpolation function. **(10 Marks)**

b. Construct the Lagrangian interpolation function for two and four noded bar element in natural co-ordinates. **(10 Marks)**

Module-3

5 Derive the shape function [N] in natural co-ordinates and also derive strain–displacement matrix [B] for a CST (Constant Strain Triangle) element. **(20 Marks)**

OR

6 a. Using Gaussian quadrature formula, evaluate $I = \int_{-1}^{+1} (1 + r + 2r^2 + 3r^3)dr$. **(10 Marks)**

b. Define isoparametric, subparametric and superparametric elements. **(06 Marks)**

c. Obtain Jacobian for the triangular element as shown in Fig.Q6(c). **(04 Marks)**

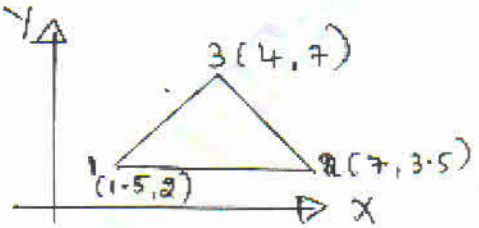

Fig.Q6(c)

Module-4

7 Consider the three bar truss as shown in Fig.Q7. It is given that $E = 2 \times 10^5$MPa. Determine the nodal displacement and stress in each member. Find the support reaction also.

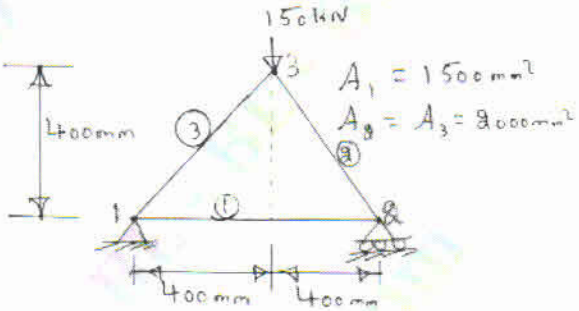

Fig.Q7 **(20 Marks)**

OR

8 a. Obtain Hermite shape functions for a two noded beam element in natural co-ordinates. **(10 Marks)**

b. Fig.Q8(b) shows a one-dimensional bar subjected to on axial loading. Taking it as a single bar element. Determine : i) Nodal displacement ii) Stress in each element iii) Reaction at the support. **(10 Marks)**

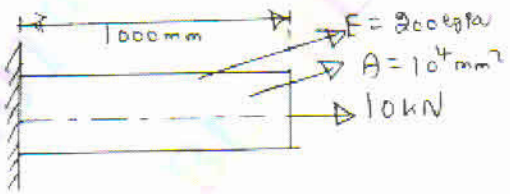

Fig.Q8(b)

Module-5

9 a. Explain material non-linearity in structures. How is this taken care in FEM? **(10 Marks)**

b. Explain geometric non-linearity in structures. How is this taken care in FEM. **(10 Marks)**

OR

10 Write short notes on :

a. C°, C' and C^2 function

b. Node numbering to minimize bandwidth

c. Pre and port processing

d. History of FEM. **(20 Marks)**

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18CSE242

Second Semester M.Tech. Degree Examination, June/July 2019
Stability of Structures

Time: 3 hrs. Max. Marks: 100

Note: **1.** ***Answer any FIVE full questions, choosing ONE full question from each module.***
2. ***Assume missing data suitably.***

Module-1

1 Derive expression for deflection of beam column subjected to:
i) Several concentrated load ii) Continuous load **(20 Marks)**

OR

2 a. Determine the buckling load for fixed-pinned column subjected to axial load using forth ordered governing differential equation. **(10 Marks)**

b. A pinned-pinned steel column with Young's modulus 210 GPa and yield stress σ_y 210 MPa has pinned-pinned length of ℓ = 5m and a solid rectangular cross section with b = 130 mm and h = 85 mm. Will the column fails first by yield or elastic buckling? **(10 Marks)**

Module-2

3 Determine the critical load for cantilever column subjected to axial load considering:
a. Static deflection due to application of horizontal load at tip.
b. Consider deflection curve as a parabola. **(20 Marks)**

OR

4 Determine the buckling load for a Cantilever built up column consisting of four angles connected by the diagonal. **(20 Marks)**

Module-3

5 Derive all the diagonal elastic element stiffness coefficient for 2 noded Euler Bernoulli beam element using cubic Hermitian polynomials. **(20 Marks)**

OR

6 Determine the buckling load for the symmetrical frame as shown in Fig.Q6.

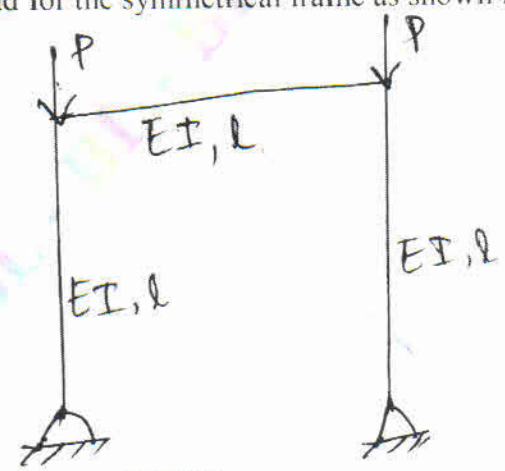

Fig.Q6 **(20 Marks)**

Module-4

7 Determine buckling load for simply supported beam of I-section subjected to central concentrated load. **(20 Marks)**

OR

8 a. Derive the governing differential equation for lateral buckling of beams in pure bending. **(10 Marks)**

b. Write a note on pure torsion and non-uniform torsion of thin walled bars of open cross-section. **(10 Marks)**

Module-5

9 Determine the critical load for a simply supported rectangular plate of size (a × b) and the thickness 't' subjected to unidirectional uniform in plane load. **(20 Marks)**

OR

10 Determine buckling load for uniformly compressed rectangular plate simply supported along two opposite sides perpendicular to the direction of compression and having various edge conditions along other 2 sides. (Explain any one condition) **(20 Marks)**

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18CSE252

Second Semester M.Tech. Degree Examination, June/July 2019
Design of High Rise Structures

Time: 3 hrs. Max. Marks: 100

Note: 1. ***Answer FIVE full questions, choosing ONE full question from each module.***
2. ***Use of IS 875, IS 1893 is permitted***

Module-1

1 a. Explain 'Gravity loading' in tall structure. **(10 Marks)**
b. Explain the methods of live load reduction in tall building. **(10 Marks)**

OR

2 a. Explain briefly : i) High performance concrete ii) Fibre reinforced concrete. **(10 Marks)**
b. Explain 'Sequential loading' in tall building. **(10 Marks)**

Module-2

3 a. Write a short notes on wind tunnel experimentation method. **(10 Marks)**
b. Explain wind as force an high rise structure. How static wind load is calculated using IS875. **(10 Marks)**

OR

4 a. Explain equivalent static method and response spectrum method for calculating lateral force due to earthquake. **(10 Marks)**
b. A 4 storeyed OMRF building with plan dimensions 12 × 12mt with column spacing of 4mt in both direction storey height = 3mt, Dead load = 4kN/m^2 on each floor, Live load = 3kN/m^2 on floor level and 1.5 kN/m^2 on roof level, weight of partition on floor = 2kN/m, Damping ratio = 5%, rocky strata, zone V importance factor 1.0. Determine the base shear at each storey using equivalent static procedure. Draw storey shear and base shear diagram. **(10 Marks)**

Module-3

5 a. Explain the behaviour of braced frame structural form used is tall building structures. **(10 Marks)**
b. Explain the factors affecting growth, height and structural form of tall building. **(10 Marks)**

OR

6 a. Explain the behaviour of In filled frames **(10 Marks)**
b. Write a note on shear wall, coupled shear walls outrigger braced system in a tall building. **(10 Marks)**

Module-4

7 a. Explain the assumptions mode during modelling of tall structures. **(10 Marks)**
b. Explain approximate modelling and accurate modelling of tall structures. **(10 Marks)**

OR

8 a. Explain the reduction techniques adopted for modelling of a tall structure. **(10 Marks)**
b. Explain approximate modelling of slabs. **(10 Marks)**

Module-5

9 a. Explain approximate method of overall buckling analysis in frames. **(10 Marks)**
b. Explain P-Delta effects of gravity loading on tall structures. **(10 Marks)**

OR

10 a. Explain analytical method of overall buckling analysis of frames. **(10 Marks)**
b. Explain creep and shrinkage effects in tall building. **(10 Marks)**

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IVSem M-Tech CV

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16/17CSE421

Fourth Semester M.Tech. Degree Examination, June/July 2019
Optimization Techniques

Time: 3 hrs. Max. Marks: 80

Note: ***Answer FIVE full questions, choosing ONE full question from each module.***

Module-1

1 a. Explain the following terms :
i) Statement ii) Design vector iii) Design constraints **(06 Marks)**

b. Find the extreme points of function
$f(x_1, x_2) = x_1^3 + x_2^3 + 2x_1^2 + 4x_2^2 + 6$ **(10 Marks)**

OR

2 a. Determine concavity/convexity of the function
$f(x) = 3_1^2 + 2x_2^3 + 4x_3^2 + x_1x_2 + 2x_1x_3 + 4x_1 + 6x_2 + x_3 + 8$ **(06 Marks)**

b. A beam of uniform rectangular section is to be cut from a log of circular c/s of $\phi 2a$, The beam is used as a cantilever of fixed length 'ℓ' to carry a point load at its free end find the dimensions of the beam corresponding to maximum tensile stress in moment carrying capacity. Solve by Lagrange's method. **(10 Marks)**

Module-2

3 Solve by pivotal operations
$2x_1 + 3x_2 - 2x_3 - 7x_4 = 1$
$x_1 + x_2 + x_3 + 3x_4 = 6$
$x_1 - x_2 + x_3 + 5x_4 = 4$ **(16 Marks)**

OR

4 Solve by Revised simplex method
Maximize $z = x_1 + 2x_2$
Subjected to $x_1 + x_2 \leq 3$
$x_1 + 2x_3 \leq 5$
$3x_1 + x_2 \leq 6$
$x_1, x_2 \geq 0$ **(16 Marks)**

Module-3

5 Minimize $f(\lambda) = \lambda(\lambda - 1.5)$ in the range [0, 1] by Golden section method to 5% accuracy consider N = (6 iterations). **(16 Marks)**

OR

6 Minimize $f(x_1, x_2) = x_1 - x_2 + 2x_1^2 + 2x_1x_2 + x_2^2$ with the starting point (0, 0) by univariate direct search method of unconstrained optimization. **(16 Marks)**

Module-4

7 Briefly write the procedure of complex method of constrained optimization. **(16 Marks)**

OR

8 Minimize $f(x_1, x_2) = \frac{1}{3}(x_1 + 1)^3 + x_2$

Subject to $g_1(x_1, x_2) = 1 - x_1 \leq 0$

$g_2(x_1, x_2) = -x_2 \leq 0$

by exterior penalty method. **(16 Marks)**

Module-5

9 An open cylindrical vessel is to be constructed to transport $100m^3$ of a chemical from a store to a factory. The sheet metal used for the bottom costs Rs 1000/- and that used for cylindrical wall costs Rs. 500/- per square meter. If it costs Rs. 100/- for each round trip of the vessel, find the dimensions of the vessel for minimizing the transportation cost. Assume that the vessel has no salvage upon completion of the operation. **(16 Marks)**

OR

10 The Four bar truss shown in Fig Q10 is subjected to vertical load of 2×10^5 lb at joint 'A' as shown. Determine the cross sectional areas of the members (bars) such that the total weight of the truss is minimum and the vertical deflection of Joint 'A' is equal to 0.5 in. Assume the unit weight as 0.01 lb/in^3 and the Young's modulus as 20×10^6 Psi.

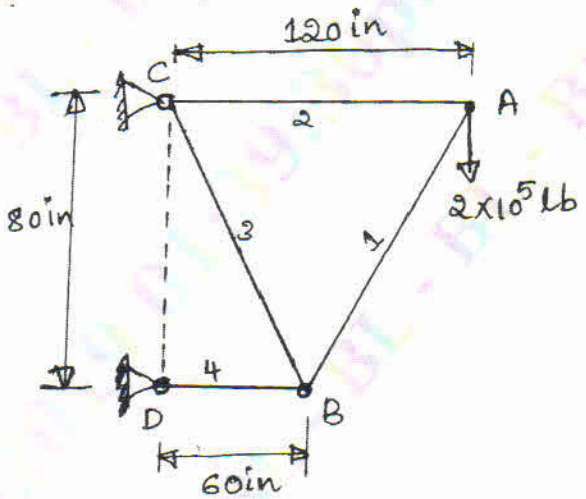

Fig Q10 **(16 Marks)**

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16/17CSE41

Fourth Semester M.Tech. Degree Examination, June/July 2019
Design of Concrete Bridges

Time: 3 hrs. Max. Marks: 80

Note: 1. ***Answer any FIVE full questions, choosing one full question from each module.***
2. ***Use of IRC6, IRC21, IS456, IS1343, Pigeard's curves are permitted.***

Module-1

1 a. Discuss in detail the factors to be considered while selecting the site for a proposed bridge. **(08 Marks)**

b. Explain in detail the various forces acting on an bridge abutment. **(08 Marks)**

OR

2 Design a double cantilever bridge to suit the following data:
Total length of bridge = 77 m
Road width between kerbs = 7.5 m
Spacing of T-beams = 1.8 m
Loading : IRC class AA tracked vehicle.
Materials : M25 grade concrete Fe-415 grade HYSD bars, Width of beam = 450 mm, Thickness of slab = 200 mm. **(16 Marks)**

Module-2

3 Design a deck slab for the following particulars:
Clear span : 5.5 m
Width of foot path on either side : 1 m
Wearing coat : 100 mm
Loading : IRC class AA tracked vehicle
Materials : M35-grade concrete and Fe-415 HYSD bars. **(16 Marks)**

OR

4 Analyse a RC box culvert by moment distribution method for the following data:
Clear vent way = 3m × 3m
Super imposed dead load on the culvert – 12.8 kN/m^2
Live load on the culvert – 50 kN/m^2
Density of soil at site – 18 kN/m^3
Angle of repose – 30° .
Material M20-grade concrete Fe-415 HYSD bars. **(16 Marks)**

Module-3

5 Design Cantilever slab portion of deck slab for a R.C.C T-beam girder bridge to suit the following data:
Clear width of road way = 7.5 m
Span (C/C of bearings) = 16 m
Live load = IRC class AA tracked vehicle
Average thickness of wearing coat = 80 mm
Materials : M25 – grade concrete and Fe-415 HYSD bars. **(16 Marks)**

OR

6 Design cross girder of a R.C.C T-beam girder bridge for the following data:
Clear width of road way = 7.5 m
Span (C/C of bearings) = 16 m
Live load = IRC class AA tracked vehicle
Average thickness of wearing coat = 80 mm
Materials : M25-grade concrete, Fe-415 grade HYSD bars. **(16 Marks)**

Module-4

7 Design longitudinal girder (outer) of a R.C.C T-beam girder bridge for the following data:
Clear width way = 9.5 m
Span (C/C bearings) = 14 m
Live load : I.R.C class AA tracked vehicle
Average thickness of wearing coat = 80 mm
Materials : M40 grade concrete and Fe-415 grade HYSD bars.
Number of longitudinal girders = 3. **(16 Marks)**

OR

8 Explain in detail the following methods to find the fraction load carried by the longitudinal girders:
(i) Guyon-Massonet method.
(ii) Hendry-Jaiger method.
(iii) Courbon's method. **(16 Marks)**

Module-5

9 a. List the factors affecting the deflection of pre-stressed concrete (PSC) members. **(04 Marks)**
b. List the factors that account for loss of pre-stress in PSC members and give the approximate values of percentage loss of pre-stress in each case. **(04 Marks)**
c. Write design steps for a post tensioned PSC deck slab. **(08 Marks)**

OR

10 Design a deck slab of post tensioned pre-stressed concrete T-beam bridge deck for the particulars mentioned below:
Effective span = 25 m
Clear width of road way = 7.5 m
Foot paths : 1 m wide on either side.
Thickness of wearing coat = 100 mm at the centre of road
Spacing of cross girders = 5 m C/C
Live load – IRC class AA tracked vehicle
Type of construction – I
Materials: M-40 grade concrete for deck slab, and M-50 grade concrete for girders, 7 mm dia high strength strands anchored at the end with a suitable diameter anchor block.
Compressive strength of concrete at transfer (f_{Ci}) = 40 MPa. **(16 Marks)**