Total No. of Printed Pages:2

SUBJECT CODE NO:- E-8022
FACULTY OF ENGINEERING AND TECHNOLOGY
M.E. (Structural Engg.) Examination Nov/Dec 2017
Finite Element Method
(Revised)

[Time: Three Hours] **[Max.Marks:80]**

Please check whether you have got the right question paper.

N.B (i) Solve any *two* questions from each section.
(ii) Assume suitable data if necessary and mention it clearly
(iii) Figures to right indicate the maximum marks.
(iv) Use of non-programmable calculator is permitted.

Section A

Q.1 (a) Explain with the help of a flowchart, stepwise procedure adopted in finite element method of analysis? 10

(b) Derive shape functions and their derivatives for a line element with quadratic interpolation function. 10

Q.2 (a) Draw the diagrams of various types of 2D elements? 05

(b) Analyze the continuous beam shown in figure 1 and draw SFD and BMD. The spring stiffness is ($30EI/L^3$) and EI=300 units. 15

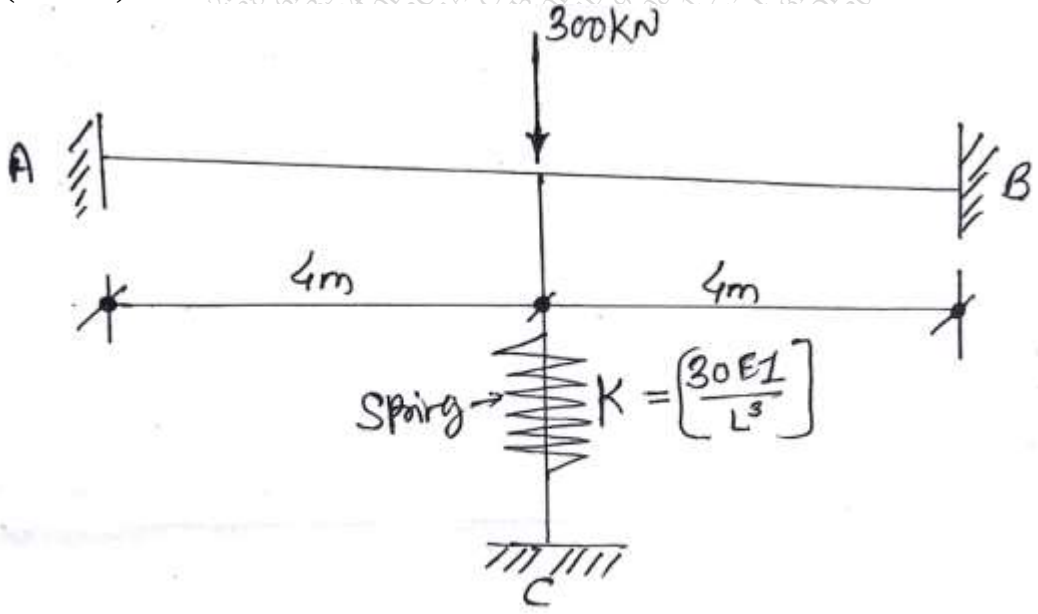

Figure no. (1)

Q.3 (a) Explain difference in between stiffness matrix method & finite element method? 05

(b) For a three bar assembly as shown in figure 2, determine:- 15

i. Assembled stiffness matrix

ii. Displacements of nodes 2 and 3

iii. The reactions at nodes 1 and 4

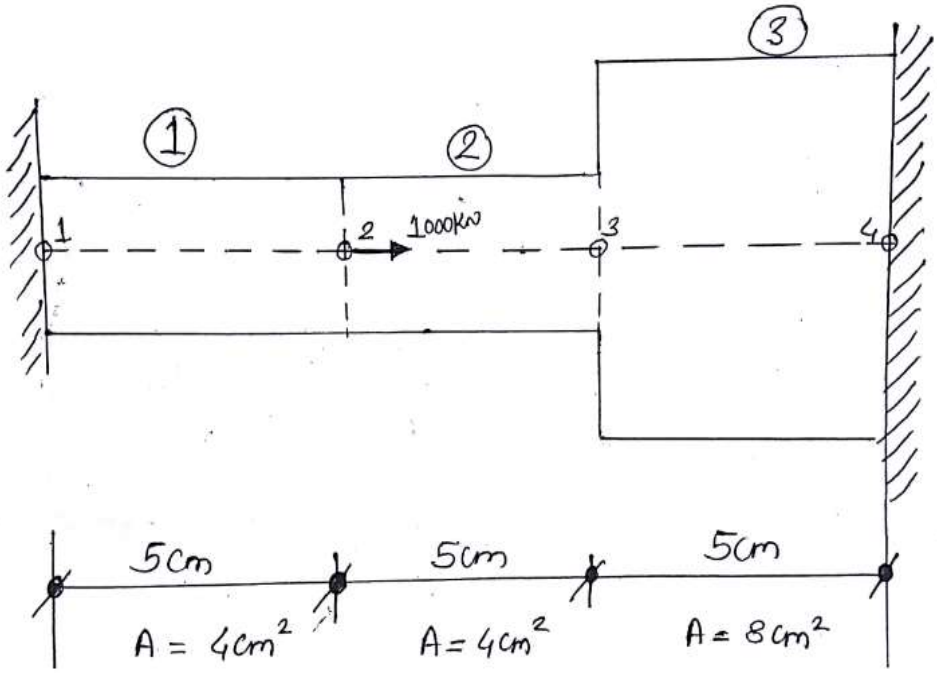

Figure No. (2)

SECTION – B

Q.4 A cantilever beam of spam 7.5 m, depth 750mm and width 230mm is subjected to a tip load of 25 kN and udl of 15kN/m over entire span. Draw finite element analysis model, if the beam is to be analyzed under plane stress condition using eight numbers of four noded rectangular elements. Show equivalent loads at nodal points? 20

Q.5 Derive shape functions for four noded rectangular element of size '2a' and '2b' in Cartesian coordinates. Hence, write shape functions in natural coordinate system. 20

Q.6 (a) Write short note on ANSYS software? Explain static and dynamic analysis of different structures using ANSYS software? 10

(b) Explain different types of meshing using in FEA? Explain different types of versions of finite element method. 10

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SUBJECT CODE NO:- E-8043
FACULTY OF ENGINEERING AND TECHNOLOGY
M.E. (Structural Engg.) Examination Nov/Dec 2017
Structural Dynamic & Earthquake Engg.
(Revised)

[Time: Three Hours] **[Max.Marks:80]**

Please check whether you have got the right question paper.

N.B
1. Solve any two questions from each section.
2. IS: 1893 [Part-I: 2002] is allowed.
3. Assume suitable data if required & state it clearly.

Section -A

Q.1 a) Derive the displacement equation for free vibration SDOF system. 10

b) A SDOF system having mass =9100kg with viscous damping is displaced from its position of rest by a distance of 30mm. it is observed that the maximum displacement on return swing is 20mm on 0.5 sec. determine spring constant 'K' & damping constant 'C'. 10

Q.2 a) Explain stodola method to find the natural frequency & mode shape of a MDOF system. 10

b) Explain in detail factor affecting the response spectrum. 10

Q.3 Write a short notes on: (any four) 20

a) Amplitude
b) Resonance
c) D. Alembert principle
d) Duhamel's integral
e) Equivalent spring coefficient
f) Logarithmic decrement

Section -B

Q.4 a) Factor affecting the strong ground motion. 08

b) Discuss elastic rebound theory. 05

c) What is soil liquefaction? Discuss soil alternation. 07

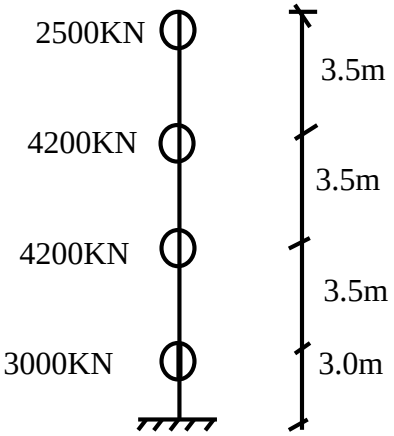
Q.5 a) What are the effect of damping on soil structure interaction? 05

b) What are the basic concept for ductile performance structure? 05

c) Mention the different variable affecting sectional ductility. 05

d) What is zero period acceleration & peak ground acceleration? 05

Q.6 a) Calculate the story shear & vertical distribution of lateral load as per IS 1893-2002. The structure is located in zone'1' IV, made with SMRF with infilled wall. Standing over hard soil strata. Take I= 1.5. Assume base dimension -12m. 15



b) Explain Base isolation 05

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SUBJECT CODE NO: E-8062
FACULTY OF ENGINEERING AND TECHNOLOGY
M.E. (Structural Engg.) Examination Nov/Dec 2017
Theory of Plates & Shells
(Revised)

[Time: Three Hours] **[Max.Marks:80]**

Please check whether you have got the right question paper.

N.B i. Solve any two questions from each section.
ii. Figures to right indicate the maximum marks.

Section -A

Q.1 Compute the maximum deflection & bending stress of the square plate with all four edges simply supported, carries a uniformly distributed load of intensity q_0. Use Navier's method or Lavy's method. 20

Q.2 Find the transverse deflection w, radial moment M_r, tangential moment M_Q and corresponding stresses and also find W_{max} for the circular plates of the following types. 20
i) A simple supported plate subjected to point load (w) at centre
ii) A simple supported plate subjected to UDL (qo)

Q.3 a) Explain in brief the assumptions of Kirchhoff's thin plate bending theory? 10

b) Explain the difference in between plates and shells? 05

c) Explain difference in between thick plate and thin plate? 05

Section -B

Q.4 a) Distinguish between the membrane theory and the bending theory of shells? 05

b) What is the importance of this subject in structural engineering? 05

c) Enlist types of different shells? Explain any two? 10

Q.5 State the assumptions made in Finster Walder theory. Obtain expression of transverse deflection using Finster Walder theory. 20

Q.6 Derive Shorer differential equations for cylindrical shell? 20

Total No. of Printed Pages:2

SUBJECT CODE NO: E-8097
FACULTY OF ENGINEERING AND TECHNOLOGY
M.E. (Structural Engg.) Examination Nov/Dec 2017
Elective-II: Inelastic Analysis of Plates
(Revised)

[Time: Three Hours] **[Max.Marks:80]**

Please check whether you have got the right question paper.

N.B
i. Solve <u>any two</u> questions from each section.
ii. All questions carry equal marks.
iii. Assume suitable data if necessary and mention it clearly.
iv. Figure to right indicate the maximum marks.
v. Use of non-programmable calculator is permitted.

Section A

Q.1 a) A reinforced concrete slab, (4.0×6.0) m is reinforced with 12 mm diameter bars at 200 mm spacing in short direction & 250 mm spacing in the log direction. The slab is 100 mm thick with an average effective depth of 80mm. If the yield lines are inclined at 45^0 to either of direction of reinforcement, find the ultimate moments $m_{uan}\ and\ m_{uat}$ for unit length along yield line. Use M_{20} concrete & fe_{500} steel. 10

b) What is the importance of this subject in structural engineering? Explain difference in between Elastic analysis & Inelastic analysis of structural components? 10

Q.2 a) Describe in detail yield line theory for analysis of slabs? 10

b) Derive an equation for moment capacity along a yield line for isotropically & orthotropically reinforced slab. 10

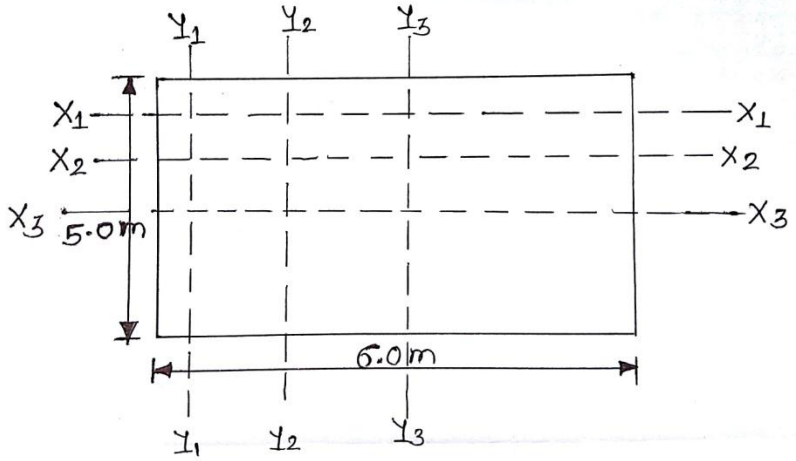
Q.3 Write short note on (<u>Any two</u>) 20
a) Upper and lower bound theorem
b) Predicting yield line pattern with neat sketches
c) Ultimate strength method

Section B

Q.4 A rectangular slab 6m in the X-direction & 5m in the Y-direction has fixed edges & carries a factored load of $25kN/m^2$ as shown in fig.1 determine:- 20

i) The design bending moments diagrams for typical strips for designing the slab by strip method

ii) The design load diagram of the edge beams.



Q.5 a) Derive an equation for moment of resistance of polygonal & circular slabs which is isotropically reinforced. 10

b) Derive an equation of moment of resistance for the following condition by using equilibrium method 10

i) Isotropically reinforced square slab (fixed along all edges)

ii) Isotropically reinforced octagonal slab (simply supported along all edges)

Q.6 Write short note on (Any two) 20

i) Strip method for the analysis of slabs
ii) Load test & acceptance criteria
iii) Deflections in R.C. slabs

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SUBJECT CODE NO: E – 8144
FACULTY OF ENGINEERING AND TECHNOLOGY
M.E. (Structural Engg.) Examination Nov/Dec 2017
Theory of Elasticity & Plasticity
(Revised)

[Time: Three Hours] **[Max.Marks:80]**

Please check whether you have got the right question paper.

N.B
i. Answer any two from section A & section B.
ii. Assume suitable data if necessary state it clearly.
iii. Figures to right indicate the maximum marks.
iv. Use of non – programmable calculator is allowed.

Section A

Q.1 State the assumption made in the theory of Torsion of Saint Venant's hence obtain the displacement field for the Prismatic bar solid cross section subjected to Torsional moments at the ends. 20

Q.2 a) The stress tenser at appoint in a material is given by 10

$$\sigma_{ij} = \begin{bmatrix} 3 & 1 & 4 \\ 1 & 2 & -5 \\ 4 & -5 & 0 \end{bmatrix} \text{MPa}$$

Determine the normal & shear stresses on a plane with direction cosines $(l = m = n = 1/\sqrt{3})$.

b) Derive stress – strain relations in the matrix form for plane stress & plane strain problems in the theory of elasticity. 10

Q.3 Derive the expressions for displacement for U, V, W for a solid prismatic bar subjected to torsional moment at the ends. Also obtain expression for M_+ Illustrate the theory of torsion for a bar of elliptical cross section & find displacements, Moment $(M+)$, shear stresses, Max shear stress & warping function. 20

Section B

Q.4 a) Define Plasticity & Yield Criteria. 03
b) State assumption of Plasticity with brief explanation. 05
c) Explain the Tresca yield with their mises yield criteria with their geometrical representation in two dimension for yield surface. 12

Q.5 a) Explain the significance of theories of failure of engineering material. 10
b) Define the following terms in plasticity theory 10
I) Yield criteria
II) Stress – Space
III) π Plane
IV) Yield surface & Yield curve

Q.6 Discuss the elastic plastic analysis of cylindrical tube under pressure (P) with usual notations according to plane strain condition & using Saint Venant's plastic flow theory & Von – mises yield Criteria. 20

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