Total No. of Printed Pages:3

SUBJECT CODE NO:- E-16
FACULTY OF ENGINEERING AND TECHNOLOGY
B.E.(Civil) Examination Nov/Dec 2017
Structural Mechanics
(REVISED)

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

Please check whether you have got the right question paper.

N.B
i. Solve any three 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 Derive governing differential equations of equilibrium for a three dimensional state of stress in static condition. Also, derive equilibrium equations for dynamic condition. 13

Q.2 State assumptions made in analysis of thin plates. With usual notations, starting from slope curvature relations derive governing differential equation of thin rectangular plate subjected to transverse load 'q' per unit area. 13

Q.3
a) Explain plane strain and plain stress condition and derive stress-strain relationship for the same. 07
b) The stress components at a point in a body subjected to two dimensional state of stress are given by 06

$$\sigma_{xx} = 2x^3 + x^2y^2 - y^2 - 3$$
$$\sigma_{yy} = 4y^3 + x^3y^2 + y^2 - 6$$
$$\tau_{xy} = 5x^3y^2$$

Determine whether given state of stress is in equilibrium or not at point(-2,3)

Q.4
a) State the assumptions in Kirchhoff's thin plate theory. 07
b) Given the following system of strains 06

$$\varepsilon_x = x^2+y^2-x^4+y^4 - 10$$
$$\varepsilon_y = x^3+y^3-x^5+y^5 - 05$$
$$\gamma_{xy} = 5xy(x^2 + y^2 - 5) + 10$$
$$\varepsilon_z = \gamma_{zx} = \gamma_{zy} = 0$$

Find the displacement components in terms of x and y, assuming that the displacement and rotation at the origin is zero. Boundary condition at (x, y)=0, displacement (5,4)=0.

Q.5 Derive with usual notations, governing differential equation of bending of circular plates. Hence write the solution for circular plate subjected to point load at center with simply supported edge over periphery. 14

Section B

Q.6 Explain membrane theory of thin spherical shells and hence derive expressions for the membrane forces in the spherical shells. 13

Q.7 a) Write down stepwise procedure of flexibility matrix method? 07
b) Draw the diagrams of various types of elements? 06

Q.8 a) State and explain stepwise procedure adopted in finite element method of structural analysis. 07
b) Differentiate between membrane theory and bending theory of shells. 06

Q.9 Draw the BMD of the continuous beam shown in fig.1 by stiffness matrix method. 13

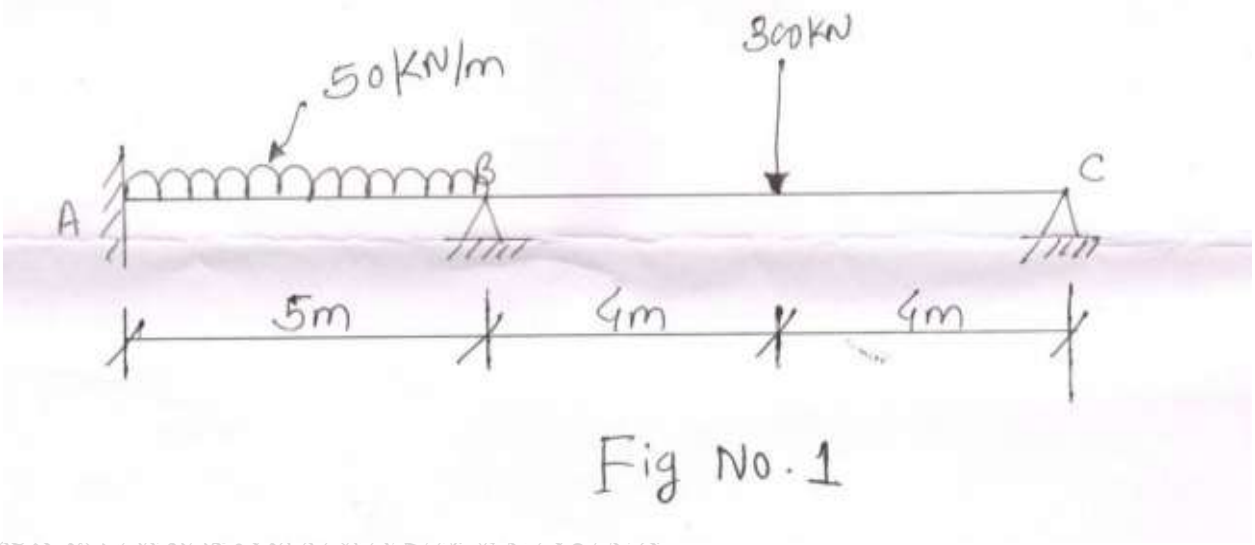

Fig No. 1

Q.10 Analyze the frame as shown in fig.2 by using stiffness matrix method. 14

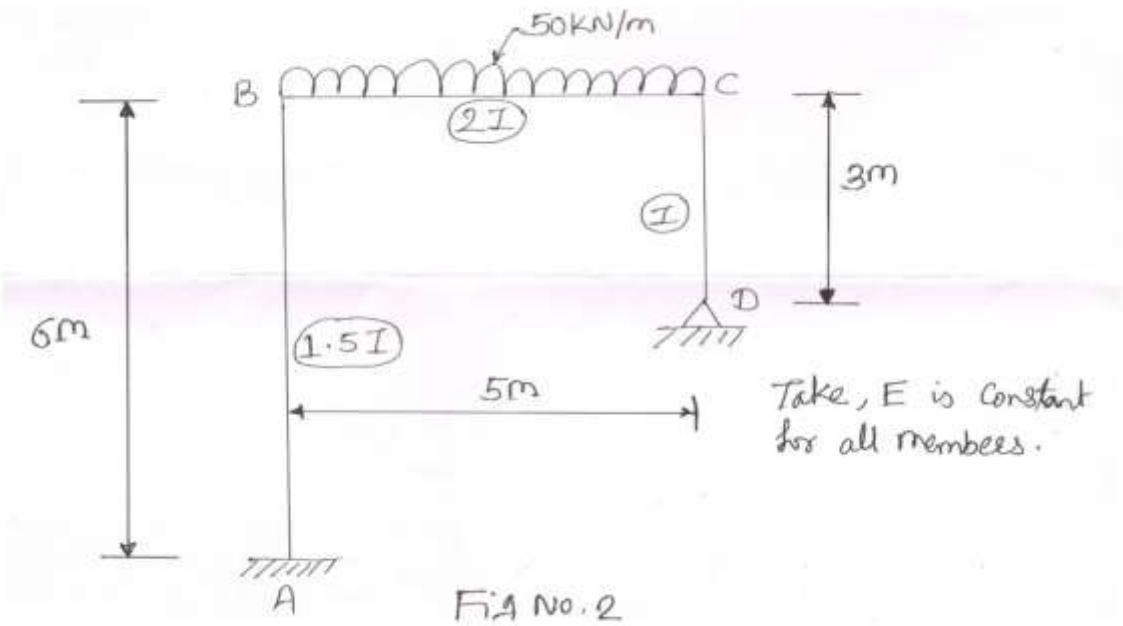

Fig No. 2