

**SUBJECT CODE NO:- P-221**  
**FACULTY OF ENGINEERING AND TECHNOLOGY**  
**B.E. (Civil) Examination May/June 2017**  
**Structural Mechanics**  
**(Revised)**

[Time: Three Hours]

[Max.Marks:80]

Please check whether you have got the right question paper.

N.B

- i) Use of non-programmable calculator is permitted.
- ii) Solve any three questions from Section A and Section B, each.
- iii) Assume any suitable additional data if required and state it clearly.

Section A

- Q.1 a) Write strain displacement relations for a three dimensional state of strain and hence derive strain compatibility conditions. 07
- b) Explain Plane Stress and Plane Strain condition of the body. Write constitutive laws for the same. 07
- Q.2 Derive with usual notations, governing differential equation for deflected shape of cylindrical bending of thin rectangular plate; 13
- $\nabla^4 w = \frac{q}{D}$
- Q.3 Derive governing differential equation of bending analysis of circular plates subjected to udl q per unit area. 13
- Q.4 Explain Navier's solution of rectangular plate subjected to singly sinusoidal load with simply supported boundary conditions on all four edges. 13
- Q.5 a) State and explain assumptions made in the analysis of thin plate in Kirchhoff's theory. 04
- b) Explain stress invariants. 04
- c) Write compatibility conditions for plane stress and plane strain states. 05

Section B

- Q.6 Analyze the continuous beam as shown in figure 1) using stiffness matrix method and draw BMD. EI=constant for all spans. 14

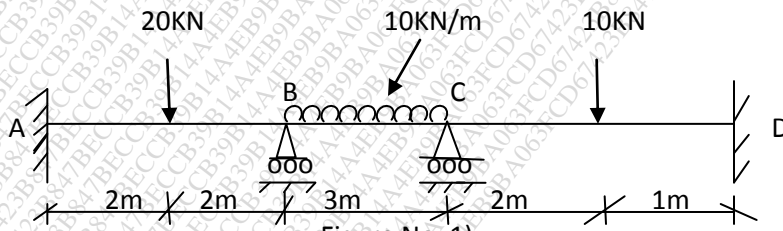


Figure No. 1)

- Q.7 a) Explain membrane theory of thin cylindrical shells subjected to transverse loads and hence derive equations for membrane stresses,  $N_x$ ,  $N_x\theta$  and  $N\theta$  08
- b) Explain general solution for membrane forces in thin cylindrical shells. 05
- Q.8 State various approaches used in FEM. Explain energy approach and variation approach with suitable example. 13
- Q.9 a) Explain what do you understand by degree of static indeterminacy of structure. Give example of truss, beam and frame at least one each. 06
- b) Explain step by step procedure adopted in flexibility matrix method of structural analysis. 07
- Q.10 Derive and explain shape functions for one dimensional two noded and three noded elements. 13