G 1423 (Pages : 4) Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, MAY 2016

Sixth Semester

Branch : Civil Engineering

CE 010 603—STRUCTURAL ANALYSIS–II (CE)

(New Scheme—2010 Admission onwards)

[Regular/Improvement/Supplementary]

Time : Three Hours Maximum : 100 Marks

Part A

Answer **all** *questions.*
Each question carries 3 *marks.*

1. Explain the term plastic moment of a section.
2. What is a substitute frame ?
3. State Muller Breslau's principle and its significance.
4. Explain plane strain with an example.
5. State and explain D'Alembert's principle.

(5 × 3 = 15 marks)

Part B

Answer **all** *questions.*
Each question carries 5 *marks.*

6. Define shape factor and determine the shape factor for a rectangular section of size $b \times d$.
7. Explain cantilever method with an example.
8. Distinguish between bending moment diagram and influence line for bending moment.
9. State and explain the compatibility equations for 2D problems.
10. Derive an expression for the equivalent stiffness of springs connected in parallel.

(5 × 5 = 25 marks)

Turn over

Part C

Answer **all** *questions.*
Each full question carries 12 *marks.*

11. (a) Write short notes on : (i) plastic hinge ; and (ii) load factor. (5 marks)

(b) Determine the shape factor for the beam section shown in Figure 1. Find also the fully plastic moment of the beam section. Take $\sigma_y = 250$ N/mm^2.

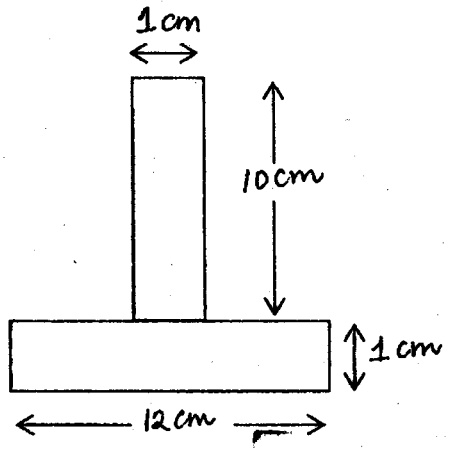

Figure 1

(7 marks)

Or

12. A beam of AB of span ℓ fixed at both ends has to carry a point load at a distance ℓ /3 from the left end. Find the value of the load at the collapse condition if the plastic moment of resistance of the left half of the beam is $2M_p$ while the plastic moment of resistance of the right half of the beam is M_p.

13. Analyse the plane frame shown in Figure 2 by cantilever method :

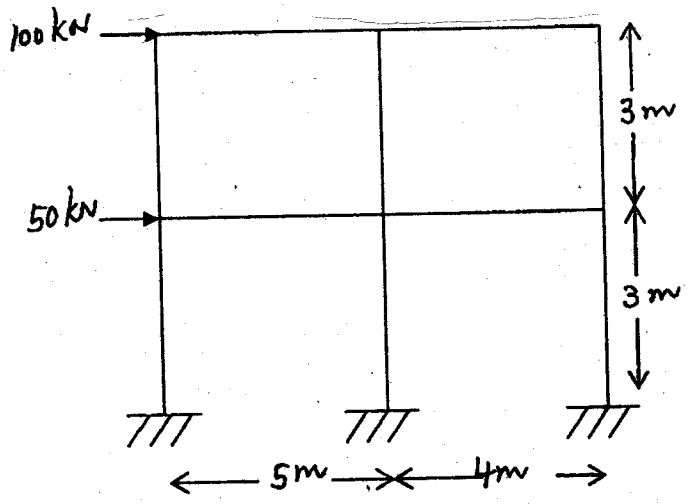

Figure 2

Or

14. Explain the tension coefficient method of analysing space frames with an example.

15. Analyse the continuous beam loaded as shown in Figure 3 by Kani's method. Sketch the bending moment diagram :

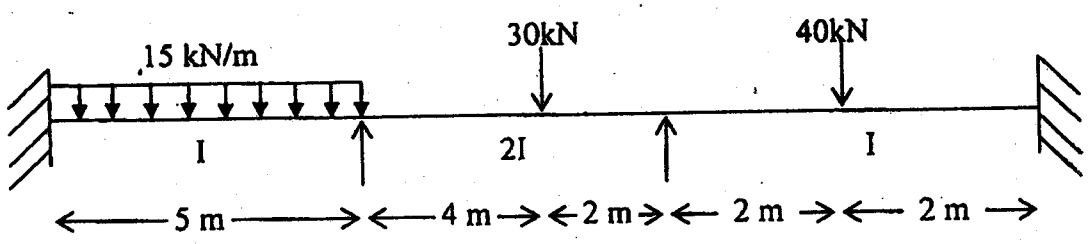

Figure 3

Or

16. Determine the influence line for reaction at A for the continuous beam shown in Figure 4. Compute the influence line ordinates at 1 m intervals :

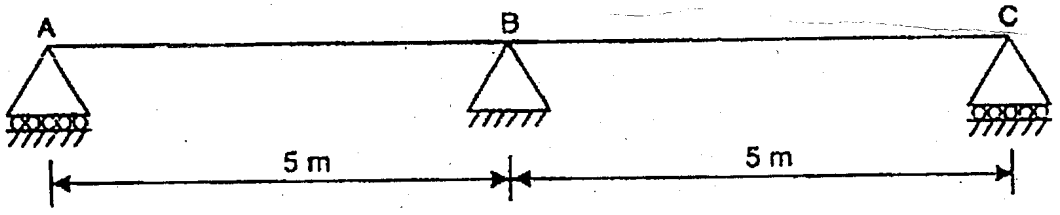

Figure 4

17. Given the following state of stress :

$$[\sigma] = \begin{bmatrix} 100 & 50 & 150 \\ 50 & 0 & 0 \\ 150 & 0 & 0 \end{bmatrix}.$$

Find the principal stresses and the principal axes.

Or

18. Prove that the following equations holds for plane stress and plane strain with constant body forces :

$$\nabla^2 \left(\sigma_{xx} + \sigma_{yy}\right) = 0.$$

19. Determine the equivalent stiffness of the system shown in Figure 5 :

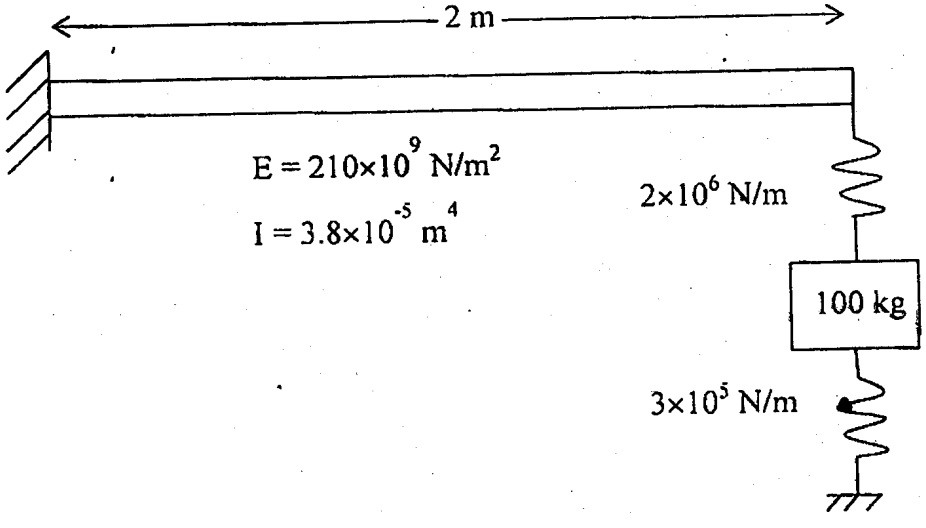

Figure 5

Or

20. A 200 kg machine is placed at the end of 1.8 m long steel ($E = 210 \times 10^9$ N/m^2) cantilever beam. The machine is observed to vibrate with a natural frequency of 21 Hz. What is the moment of inertia of the beam's cross-section about its neutral axis.

(5 × 12 = 60 marks)