

**603****October 2017***Time – Three hours*  
*(Maximum Marks: 75)*

*[N.B: (1) Q.No. 8 in PART – A and Q.No. 16 in PART – B are compulsory. Answer any FOUR questions from the remaining in each PART – A and PART – B.*

*(2) Answer division (a) or division (b) of each question in PART-C.*

*(3) Each question carries 2 marks in PART – A, 3 marks in Part – B and 10 marks in PART – C.]*

**PART – A**

1. Define elastic curve.
2. Define point of contra flexure.
3. Define fixed beam.
4. State the Clapeyron's theorem of three moments.
5. Define carry over factor and stiffness factor.
6. What do you mean by sway and non-sway frames?
7. Define the term equivalent length of column.
8. Define angle of repose of soil.

**PART – B**

9. State Mohr's theorem I and II.
10. Define a propped cantilever beam and state the types of prop.
11. List the advantages of fixed beam compared to a simply supported beam.
12. Derive the expression for the stiffness of a beam when it is fixed at one end and freely supported at the other end.
13. What are the assumptions made in Euler's theory for long column?
14. Derive the kern of section for a rectangular section.
15. What is an elementary profile of a dam? Sketch the same.
16. A trapezoidal section retaining wall 1m wide at top, 3m wide at base and 6m high retains earth on its face. The angle of repose of soil is  $30^\circ$ . Determine the Rankine's earth pressure per metre run. Take unit weight of earth  $18\text{kN/m}^3$ .

PART - C

17. (a) A cantilever beam of length 4.0m carries an udl of 12kN/m for a distance of 2.0m from support and a point load of 15kN at its free end.  $EI=7.2 \times 10^4 \text{ kNm}^2$ . Find the slope and deflection at the free end of the beam by area moment method.

(Or)

(b) A propped cantilever beam is 8m long. It carries an udl of 20kN/m over its entire span. Determine the prop reaction and draw SFD and BMD.

18. (a) A fixed beam of span 5m carries point loads of 20kN and 15kN at 2m and 3m from the left end respectively. Find the support moments. Draw SFD and BMD.

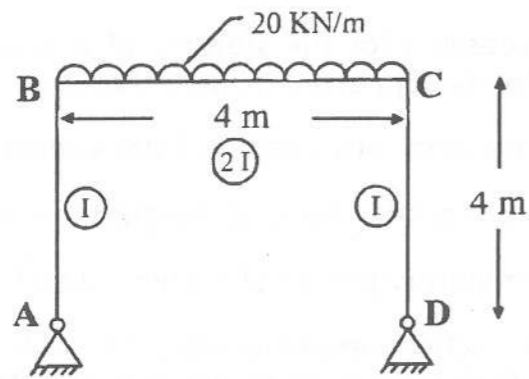
(Or)

(b) A continuous beam ABCD of 12m long is simply supported at A, B and C. Span AB=6m long and carries a point load of 10kN at its centre. Span BC=5m carries an udl of 5kN/m to its full length. Span CD carries a point load 5kN at free end D. Draw BMD by using theorem of three moments method.

19. (a) A two span continuous beam ABC, the ends A and C are fixed. Span AB=8m, span BC=6m. Span AB carries a central point load 80kN and span BC carries an udl of 10kN/m. Take  $I_{AB}=1.5I_{BC}$ . Determine the support moments by moment distribution method and draw the BMD.

(Or)

(b) For the portal frame shown in figure compute the bending moments by moment distribution and draw BMD.



20. (a) A RSJ 300mmx140mm and 5m long is used as stanchion with one end fixed and the other end free. Find the safe axial load for the stanchion using Rankine's formula. Factor of safety is 3. For RSJ,  $I_{xx}=8.6 \times 10^7 \text{ mm}^4$ ;  $I_{yy}=4.54 \times 10^6 \text{ mm}^4$ ;  $A=5626 \text{ mm}^2$ . Take  $\alpha=1/7500$  and  $f_c=330 \text{ N/mm}^2$ .

(Or)

(b) A square chimney has uniform cross section of 20m high. The internal dimensions are 1.2mx1.2m and the external dimensions are 2.40mx2.40m, subjected by the horizontal intensity of wind pressure is 1.40kN/m<sup>2</sup>. The specific weight of masonry is 22kN/m<sup>3</sup>. Calculate the maximum and minimum stress intensities at the base of the chimney.

21. (a) A masonry dam 1m wide at top, 3m wide at base retains water on its vertical face and the dam is full. Determine the max. height of dam required, so that to avoid tension and sliding. F.S against sliding=1.5. Unit weight of masonry=24kN/m<sup>3</sup> and unit weight of water=9.81kN/m<sup>3</sup>. Take  $\mu=0.60$ .

(Or)

(b) A trapezoidal section masonry retaining wall 1m wide at top, 3m wide at its bottom is 8m high. Its retaining earth having level with the top of the wall on its vertical face. The angle of response of soil is 30°. Find (i) resultant thrust (ii) the maximum and minimum stress intensities at base and (iii) draw stress distribution diagram, if unit weight of masonry is 24kN/m<sup>3</sup> and that of earth is 18kN/m<sup>3</sup>.