SIDDHARTH GROUP OF INSTITUTIONS :: PUTTUR
Siddharth Nagar, Narayanavanam Road – 517583

QUESTION BANK (DESCRIPTIVE)

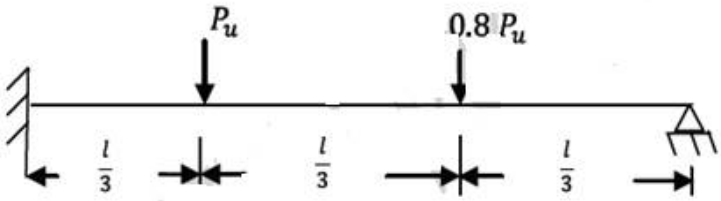
Subject with Code : SA-II (13A01505) **Course & Branch**: B.Tech – CE

Year & Sem: III-B.Tech & I-Sem **Regulation:** R13

UNIT – V

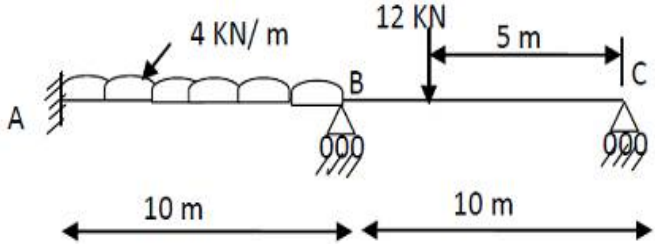
PLASTIC ANALYSIS

1. (a) Explain the lower and upper bound theorem. 5M
   (b) Calculate the collapse load for the beam shown in figure below. 5M



2. (a) Find the shape factor of a tubular section with outer diameter equal to twice the inner diameter. 5M
   (b) A portal frame ABCD with hinged foot has stanchions 4 m high and beam of 6 m span. There is horizontal point load of 40 kN at B. Whole the beam carries a point load of 120 kN at mid span. Using load factor of 1.5, establish collapse mechanism and calculate the collapse Moment. 5M

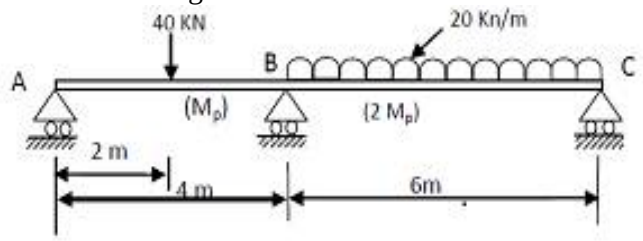
3. (a) Derive the moment curvature relationship in plastic analysis. 4M
   (b) Calculate the plastic moment capacity required for the continuous beam with working loads shown in figure. 6M



4. A T-section consists of a flange 150x10mm and a web of 140x10mm. The section modulus of the T-section is 54600mm3 This section is used as a simply supported beam of 4m span and carries a UDL of 25kN/m on the whole span. Determine the shape factor of the beam and also calculate the collapse load for the beam. Assume yield stress as 250 Mpa 10M

5. (a) Define plastic moment. 2M
   (b) Calculate the plastic moment capacity required for the continuous beam with working

loads shown in figure 8M



6. A T-section consists of a flange 150x10mm and a web of 140x10mm. The section modulus of the T-section is 54600mm3. This section is used as a fixed beam of 7m span and carries a UDL of 180kN/m on the whole span. Determine the shape factor of the beam and also calculate the collapse load for the beam. Assume yield stress as 255 MPa. 10M

7. Write the assumptions for evaluating fully plastic moment. And also derive fully plastic moment M_P and shape factor S in general. 10M

8. Derive the shape factor for
   a) Triangular section 5M
   b) Hollow circular section 5M
9. Determine the shape factor for the rectangular and circular section. 10M
10. a) Define plastic hinge and plastic moment capacity. 2M
    b) Define the collapse load and load factor 2M
    c) Give the assumptions for fully plastic moment of a section 2M
    d) A T-section consists of 20 mm web and 20 mm thick flange. Depth of the web is 180 mm. Width of the flange is 120 mm. find the shape factor based on Plastic analysis. 2M
    e) Idealized stresses in plastic analysis. 2M

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UNIT – V

PLASTIC ANALYSIS

1. For the plastic analysis, the criteria for the analysis of a structure are based on [ ]

   A) Working Load B) Yield Load C) Ultimate Load D) breaking load

2. The bending moment at a plastic hinge is equal to [ ]

   A) equal to zero

   B) equal to yield moment of the section

   C) equal to plastic moment of the section

   D) greater than plastic moment of the section

3. The plastic modulus of a square of section of side 'd' is [ ]

   A) $d^3/3$ B) $d^3/4$ C) $d^3/6$ D) $d^3/2$

4. The shape factor of a diamond section is: [ ]

   A) 1 B) 1.5 C) 2 D)2.5

5. The shape factor of an isosceles triangle for bending about the axis parallel to the base is:

   [ ]

   A) 1.5 B) 1.7 C) 2 D) 2.34

6. The shape factor of a rectangular section is: [ ]

   A) 1 B) 1.5 C) 2 D) 2.5

7. The ratio of load carrying capacity of a fixed beam to that of a simply supported beam having

same maximum bending moment under UDL throughout the span is: [ ]

A) 1.5 B) 1 C) 0.6667 D) 3

8. Effects of shear force and axial force on plastic moment capacity of a structure are respectively to [ ]

A) Increase and decrease B) increase and increase
C) Decrease and increase D) decrease and decrease

9. The moment which makes all the fibers at the section to yield is known as [ ]

A) Flexural Rigidity B) moment of resistance

C) Plastic moment capacity D) Yield Moment

10. In plastic analysis of structures the following assumptions are made

I. Plane section before bending remains plane even after bending

II. The relationship between compressive stress and compressive strain is the same as between tensile stress and tensile strain.

III. The defections are small

Select the correct answer code from the below [ ]

A) I and II are true but III is wrong

B) I and III are true but II is wrong

C) II and III are but I is wrong

D) I , II and III are true

11. The shape factor of circular section with radius 'R' is [ ]
A) $4R/3\pi$ B) $4R/\pi$ C)$16/3\pi$ D)$8/3\pi$

12. The shape factor of a diamond shaped section for bending about its diametral arise is: [ ]

A) 1.2 B) 1.5 C) 2 D) none of the above

13. The shape factor of a I section is: [ ]

A) 1.2 B) 1.5 C) 2 D) none of the above

14. For the T-section 100mm x 100 mm x 10mm, the plastic neutral axis is [ ]

A) In the flange B) at the junction of the flange and web

C) In the web D) at the top of the flange

15. For a given structure and loading, if these exists any distribution of bending moment throughout the section which is both safe and statically admissible with a set of loads 'W' the value of W must be less than or equal to collapse load 'W_c'.The above theorem is known as [ ]

A) Kinematic theorem B) Static Theorem

C) Uniqueness theorem D) none of the above

16. The collapse load for a propped cantilever of span'L' subjected to a concentrated load W at mid span is [ ]

A) $2M_P/L$ B) $3M_P/L$ C) $4M_P/L$ D) $6M_P/L$

17. Collapse load in a fixed beam of span L, carrying UDL over entire span and having plastic moment capacity M_p is [ ]

A) $6M_P/L$ B) $8M_P/L$ C) $8M_P/L^2$ D) $16M_P/L^2$

18. Simple bending equation is [ ]

A) $\frac{M}{I}=\frac{y}{\sigma}=\frac{E}{R}$ B) $\frac{M}{I}=\frac{\sigma}{y}=\frac{E}{R}$ C) $\frac{M}{I}=\frac{\sigma}{y}=\frac{R}{E}$ D) $\frac{M}{I}=\frac{R}{y}=\frac{E}{\sigma}$

19. The ratio of the plastic moment of the section to the yield moment of the section. [ ]

A) Load Factor B) Shape Factor C) Design Factor D) none

20. The ratio of the collapse load and the working load. [ ]

A) Load Factor B) Shape Factor C) Design Factor D) none

21. The section with the maximum shape factor is the [ ]

A) Circular section B) triangular section C) Rectangular Section D) none

22. The ———— permit rotation offering a constant resisting moment. [ ]

A) Plastic hinges B) Elastic hinges C) Mechanical hinges D) none

23. At mechanical hinges, the resisting moment is [ ]

A) Zero B) M/2 C) 2M D) none of the above.

24. Shape factor is always greater than [ ]

A) Unity B) zero C) two D) none of the above

25. The stress in a beam is less if it section modulus is

A) High B) medium C) low D) zero

26. A support over which the real beam is continuous will correspond to [ ]

A) An internal hinge in the conjugate beam

B) A hinged support in the conjugate beam

C) A fixed support in the conjugate beam

D) A discontinuity in the conjugate beam

27. If a basic structure is obtained by removing the roller support of an indeterminate structure the requirement the basic structure has to satisfy is that [ ]

A) The deflection in the direction perpendicular to the supporting surface must be zero

B) The displacement in the direction of supporting support must be zero

C) The displacement in any direction at that point must be zero

D) None

28. The fixed support in a real beam becomes in the conjugate beam a [ ]
A) Roller support B) hinged support
C) Fixed support D) free end

29. The largest stress that a material can withstand without permanently deformed [ ]

A) Yield point B) Elastic limit C) Plastic limit D) none

30. The stress at which there is an increase in the strain without corresponding increase in stress is called [ ]

A) Yield point B) Elastic limit C) Plastic limit D) none

31. The strain that occurs before the yield point [ ]

A) Tangential strain B) Elastic strain C) Plastic Strain D) none

32. The strain that occurs after the yield point with no increase in stress [ ]

A) Tangential strain B) Elastic strain C) Plastic Strain D) none

33. The range in the plastic zone where additional stress is necessary to produce additional strain

A) Tangential strain B) strain hardening C) Plastic Strain D) none [ ]

34. The moment that will just produce the yield stress in the outermost fibre of the section

A) Bending moment B) twisting moment C) yield moment D) none [ ]

35. For a given structure and loading to a set of loads 'W' the value of W found to any assumed mechanism must be greater than or equal to collapse load 'W_c'.The above theorem is known as [ ]

A) Kinematic theorem B) Static Theorem

C) Uniqueness theorem D) none of the above

36. Lower bound theorem also called as [ ]

A) Kinematic theorem B) Static Theorem

C) Uniqueness theorem D) none of the above

37. Upper bound thereom also called as [ ]

A) Kinematic theorem B) Static Theorem

C) Uniqueness theorem D) none of the above

38. Factor of safety [ ]

A) Ultimate stress/ working stess B) yield stress/ working stess

C) both A and B D) none of the above

39. Number independent mechanisms [ ]
r= no. of static indeterminacy, N= Number possible plastic hinges

A) N-r B) N+r C) N/r D) none of the above

40. External work done in plastic analysis [ ]

A) Load intensity X area of Triangle under the load

B) Load intensity X displacement

C) Force X displacement

D) None of the above

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