PRESIDENCY UNIVERSITY
BENGALURU   **SET A**

SCHOOL OF ENGINEERING
END TERM EXAMINATION - JAN 2024

Semester : Semester VII - 2020   **Date :** 08-JAN-2024
Course Code : CIV3013   **Time :** 9:30AM - 12:30 PM
Course Name : Advanced Design of Steel Structures   **Max Marks :** 100
Program : B.Tech.   **Weightage :** 50%

Instructions:
(i) Read all questions carefully and answer accordingly.
(ii) Question paper consists of 3 parts.
(iii) Scientific and non-programmable calculator are permitted.
(iv) Do not write any information on the question paper other than Roll Number.

PART A

ANSWER ALL THE QUESTIONS   **5 X 2M = 10M**

1. Define Laterally supported Beams

                                                                    (CO1) [Knowledge]

2. List out the various possible locations of the formation of plastic hinges in steel section.

                                                                    (CO2) [Knowledge]

3. Define plastic hinge and plastic moment capacity of the section.

                                                                    (CO2) [Knowledge]

4. Calculate the Heated perimeter for 3-sided exposure for ISMB 500 (depth = 500mm, width of flange =180mm, thickness of flange = 17.2mm)

                                                                    (CO2) [Knowledge]

5. Define the following terms used in roof truss: a) Purlins and b) Principal rafter and Principal Tie members.

                                                                    (CO4) [Knowledge]

PART B

ANSWER ALL THE QUESTIONS   **5 X 10M = 50M**

6. When plastic analysis is used, the members shall be capable of forming plastic hinges with sufficient rotation capacity (ductility) without local buckling, to enable the redistribution of bending moment required before the formation of the failure mechanism. Based on the above concept, classify and explain the four classes of section as per IS800 code.

                                                                    (CO1) [Comprehension]

7. The structure collapses after a sufficient number of plastic hinges are formed at different locations. This Collapse load may be determined using the static method and kinematic method. Find the expression for collapse load for the Simply supported beam of span L with the point load W acting as shown in Figure below:
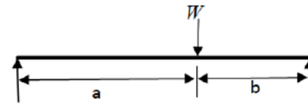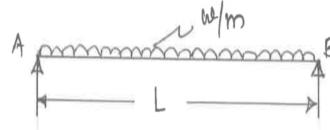

(CO2) [Comprehension]

8. Steel structure fire protection systems are designated to protect the structure from fire for a specified amount of time. Various fire protection systems are available to be used. Explain different methods adopted for fire protection.

(CO2) [Comprehension]

9. The ultimate or collapse load is reached when a mechanism is formed. The number of plastic hinges developed should be just sufficient to form a mechanism. Derive the expression for the collapse load for simply supported beam with udl load of w/m over a length L of the beam.

(CO3) [Comprehension]

10. Design the principal tie member of roof truss for the following data: Design compressive load = 185 kN, design tensile load = 60 kN, length of rafter panel =2.5m, Use Fe410 grade steel. Take ´Ym0 = 1.10 and ´Ymb = 1.25

(CO4) [Comprehension]

PART C

ANSWER ALL THE QUESTIONS   **2 X 20M = 40M**

11. Design a simply supported beam of span 4m carrying a reinforced concrete floor capable of providing lateral restraint to the top compression flange. The uniformly distributed load is made up of 20 kN/m imposed load and 20 kN/m dead load. Assume Fe410 grade steel.

(CO1) [Application]

12. Design the principal tie member of a fink-type roof truss for the following data:
    Design compressive load = 50kN, Design tensile load = 170 kN, length of rafter panel =5.5m, Use Fe410 grade steel. Take γ_{m0}= 1.10 and γ_{mb} = 1.25
    Use 12mm thick gusset plate and design connection using 20mm dia bolt of 4.6 grade

(CO4) [Application]