UNIVERSITI SAINS MALAYSIA

2nd Semester Examination
2002/2003 Academic Session

February/March 2003

# EAS 564/4 – Advanced Steel Structure

Time : 3 hour

**Instruction to candidates:**

1. Ensure that this paper contains **FOUR (4)** printed pages.
2. This paper contains **FIVE (5)** question. Answer **FIVE (5)** question.
3. All questions carry the same mark.
4. All questions **CAN BE** answered in Bahasa Malaysia or English.
5. Write answered question number on the cover sheet of answer script.

1. Design the beam and the column of steel frame shown in Fig. 1.0. Total live and dead load is assumed as 25 kN/m and the lateral load due to wind is assumed as concentrated at the knee as 20 kN. Columns are braced about the weak axis at 2m intervals. It may be assumed that the plastic moment capacity of beam is 4 times that of columns.

(20 marks)

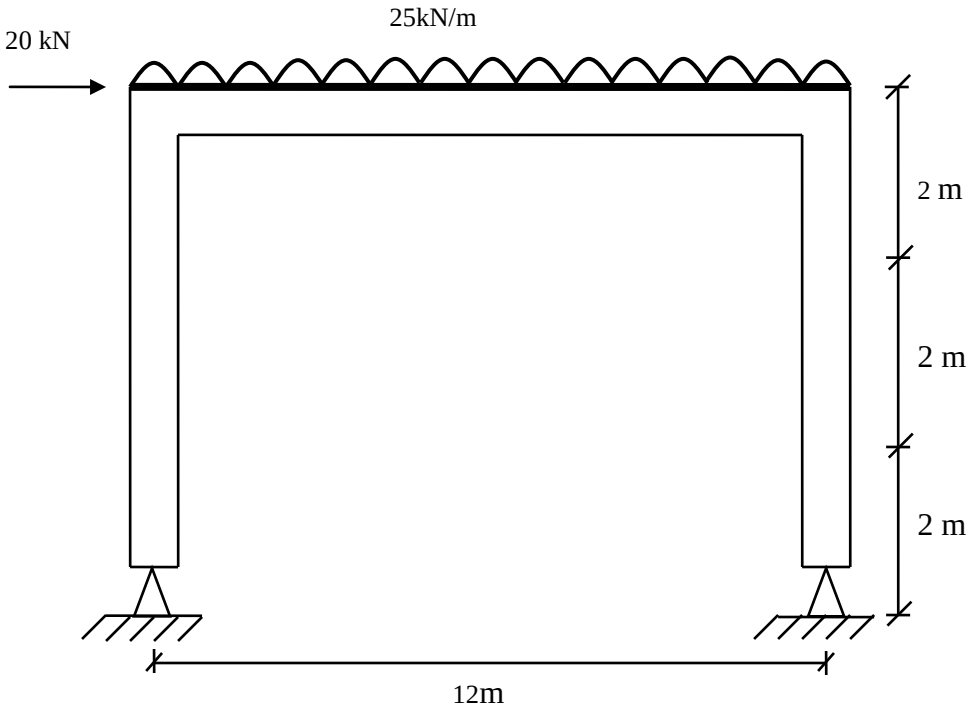


**Fig. 1.0**

2. A continuous of beam ABC carries working loads as shown in Fig. 2.0. Assuming a load factor 2.0, design suitable section for span AB and BC. Shape factor is 1.12 and yield stress of steel is 250 MPa.

(20 marks)

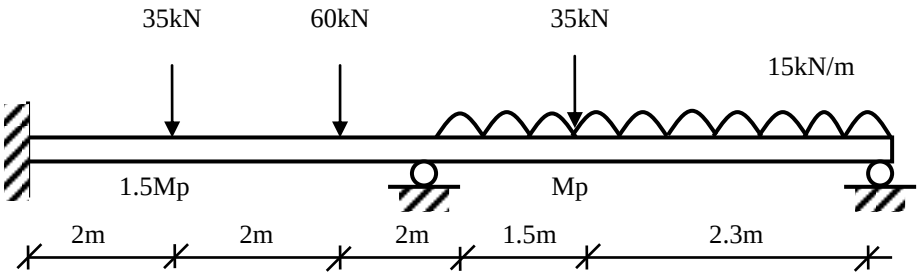


**Fig. 2.0**

3. (a) List and explain the fundamental points to be taken into account in the design of steel structure for preventing corrosion.

(b) Describe three methods of cleaning steel structures for removing all millscales.

(20 marks)

4. Figure 4.0 shows a single bay fixed base portal frame which has been constructed with steel grade S275, using the plastic theory of design. Details of the frames and loading are given below :-

| | | | |
|---|---|---|---|
| Data : | Frame centres | = | 4.6 m |
| | Span of portal | = | 25.0 m |
| | Height to eaves | = | 7.6 m |
| | Rafter slope | = | 3 : 10 |
| Loading : | Imposed | = | 0.75 kN/m$^2$ |
| | Sheets and insulation | = | 0.21 kN/m$^2$ |
| | Purlins | = | 0.07 kN/m$^2$ |
| | Frame | = | 0.15 kN/m$^2$ |

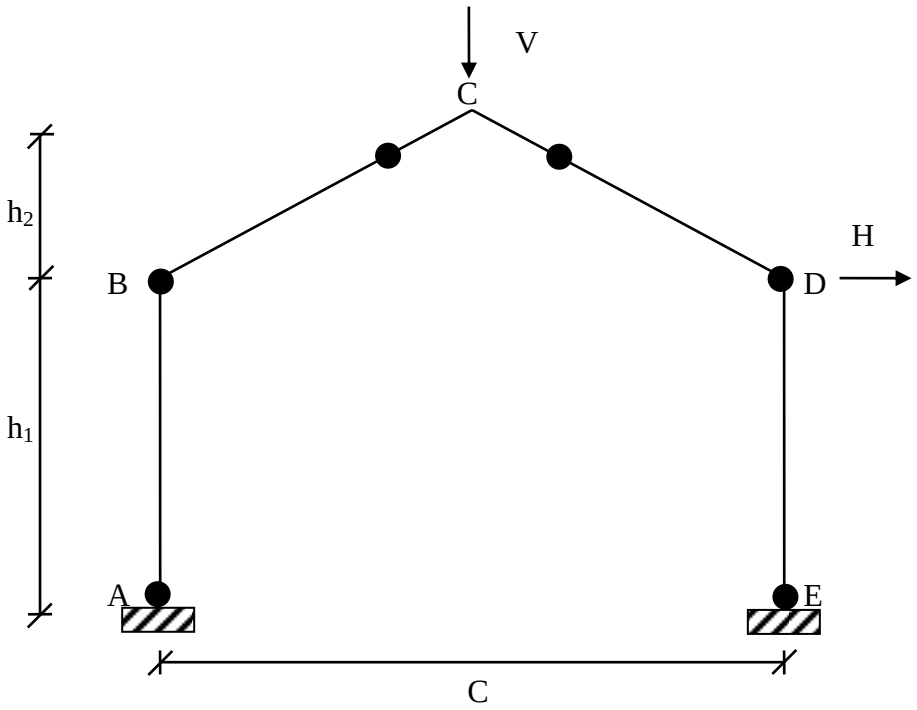


**Fig. 3.0**

By assuming modes of failure as shown in the figure,

i. Determine the values of full plastic moment for factored load Mp elastic moment M and reaction forces R.

ii. Check the lateral stability on the heights of 7.6 m for a factored load of 1.91.

5. (a) A prismatic bar with hinged ends, Fig. 4.0, is subjected to the action of axial force. Find the buckling load by assuming the initial deflection of the bar is zero. Also explain the physical meaning of the equation, if n = 1.

(10 marks)

(b) Refered to question 5.(a), find the buckling load by assuming the initial deflection of the bar is $\Delta$.

(10 marks)

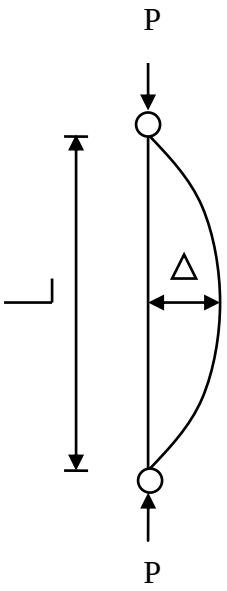


**Fig. 4.0**

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