UNIVERSITY OF SOUTH AUSTRALIA
SCHOOL OF NATURAL AND BUILT ENVIRONMENTS

STRUCTURAL ANALYSIS EXAMINATION, NOVEMBER 2006

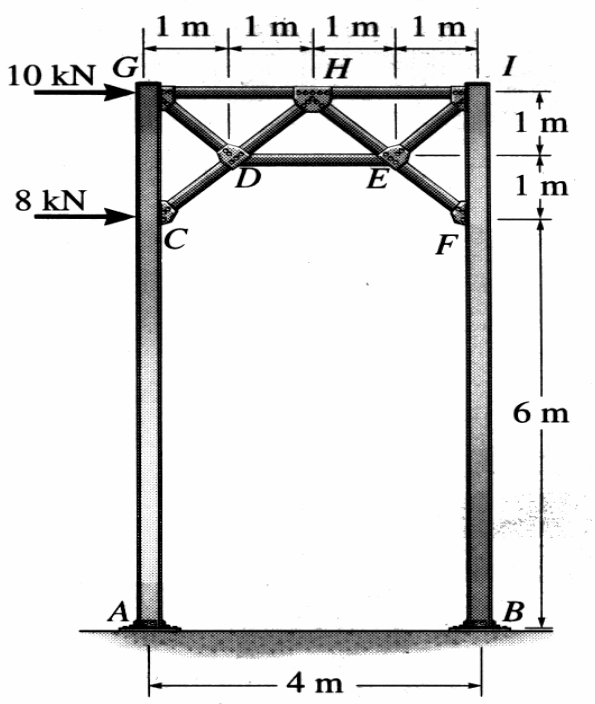
GENERAL INSTRUCTIONS TO CANDIDATES:

1. Attempt ALL questions.
2. Marks for questions are shown in brackets.
3. The following material may be taken into the exam:
   - 1 x double-sided A4 sheets of student notes

Lecturer: Y .Zhuge
Course: LBMI / LBMP/LBEC
Reading Time: **10** mins
Exam Duration: **2 hours**

QUESTION 1

Determine (approximately) the reaction at the fixed column support **A**. Also find the force in truss members **CD** and **GD** of the portal frame. Draw the moment diagram for column **ACG**. Assume all members of the truss are pin connected at their ends and the supports at A and B are fixed.

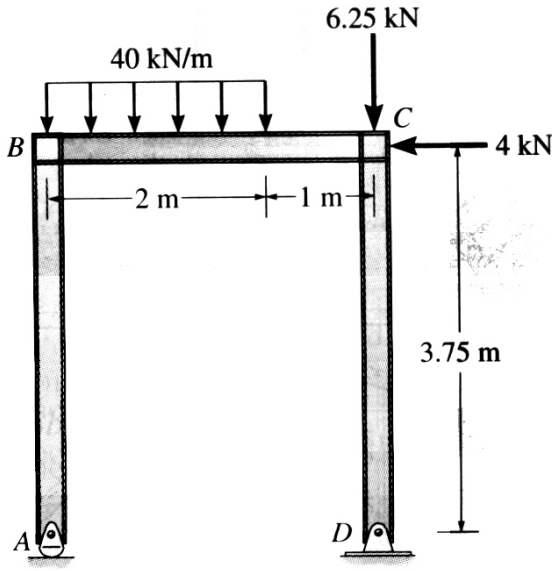


[12 marks]

Contd/…

QUESTION 2

Find out the support reactions at ***A*** and ***D*** and then draw the shear force and bending moment diagrams for the whole frame. Assume joints ***B*** and ***C*** are fixed connected (rigid joints). Also assume the support at ***A*** is a roller and ***D*** is a pin.



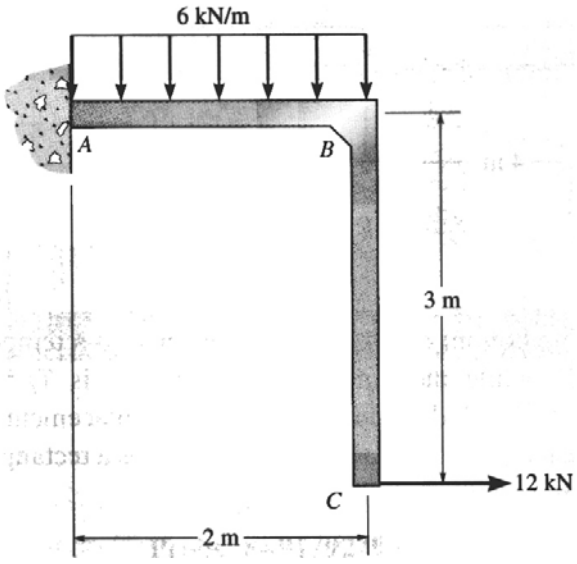
[12 marks]

QUESTION 3

Determine the horizontal displacement at **C**:

(a) using the table; **(b)** by integration.

Take E = 200 GPa, I = 90(10^6) mm^4 for each member. A table for evaluating the integrals is attached.



[16 marks]

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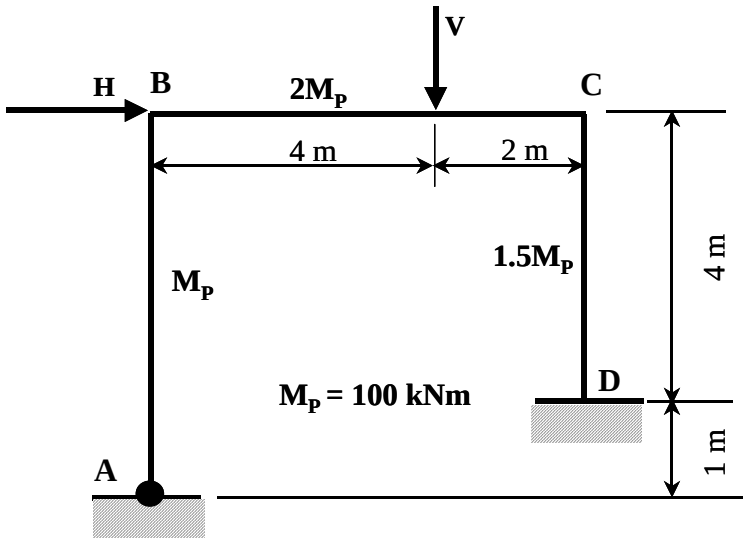
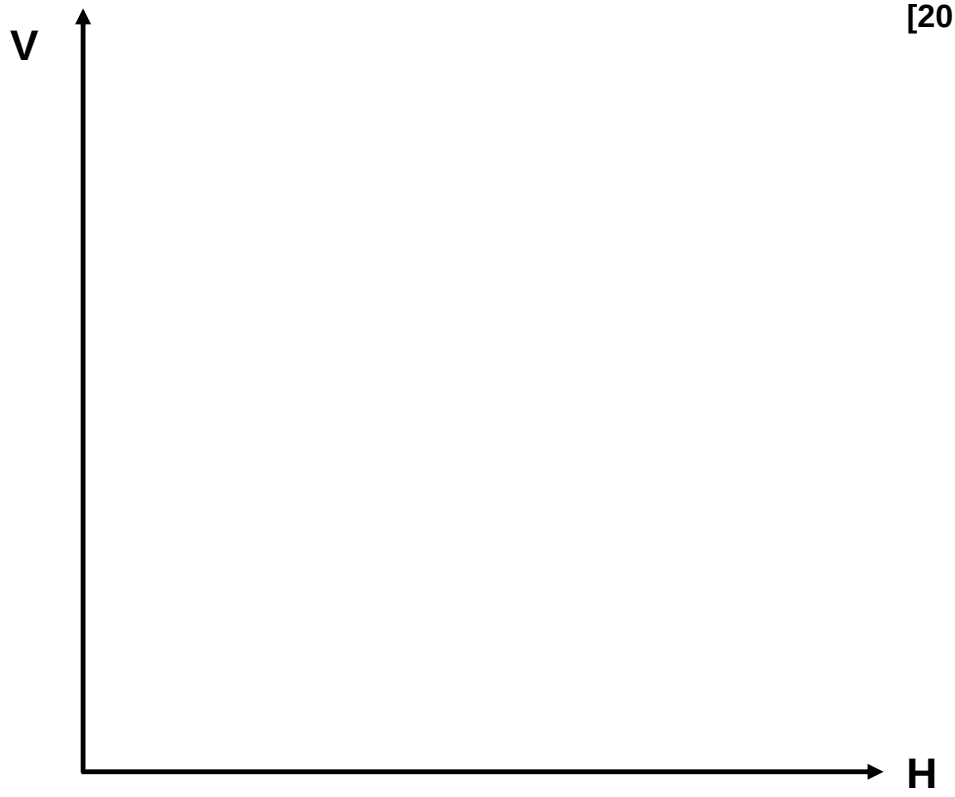
QUESTION 4

The portal frame caries the vertical (**V**) and horizontal (**H**) load.

a) Assume that ***V*** and ***H*** vary independently of each other. Draw the interaction diagram (ID) (use the graph sheet below) and shade the permissible loading region.
b) What are the collapse loads and corresponding collapse mechanism when V=2.5H?
c) Find the reactions at the supports and draw the bending moment diagram (BMD) for case under b)

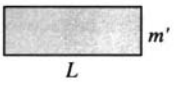
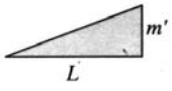
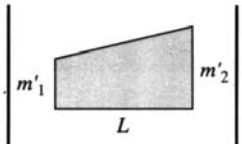
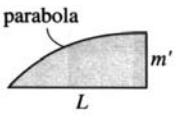
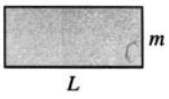
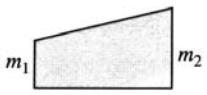
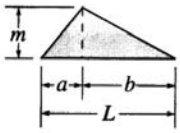


[20 marks]



END OF PAPER

Table for Evaluating $\int_0^L m\,m'\,dx$

$\int_0^L m\,m'\,dx$				
	$\frac{1}{2}mm'L$	$\frac{1}{3}mm'L$	$\frac{1}{6}m(m'_1 + 2m'_2)L$	$\frac{5}{12}mm'L$
	$\frac{1}{2}mm'L$	$\frac{1}{6}mm'L$	$\frac{1}{6}m(2m'_1 + m'_2)L$	$\frac{1}{4}mm'L$
	$\frac{1}{2}m'(m_1 + m_2)L$	$\frac{1}{6}m'(m_1 + 2m_2)L$	$\frac{1}{6}[m'_1(2m_1 + m_2) + m'_2(m_1 + 2m_2)]L$	$\frac{1}{12}[m'(3m_1 + 5m_2)]L$
	$\frac{1}{2}mm'L$	$\frac{1}{6}mm'(L + a)$	$\frac{1}{6}m_1[m'_1(L + b) + m_2(L + a)]$	$\frac{1}{12}mm'\left(3 + \frac{3a}{L} - \frac{a^2}{L^2}\right)L$