UNIVERSITI SAINS MALAYSIA

Supplementary Semester Examination
Academic Session 2007/2008

June 2008

IWK 105 – Bio-resource Based Products
[Produk Berasaskan Biosumber]

Duration: 3 hours
[Masa: 3 jam]

Please check that the examination paper consists of THREE pages of printed material before you begin this examination.

Answer **FIVE** questions. Question can be answered in Bahasa Malaysia OR English.

[Sila pastikan bahawa kertas peperiksaan ini mengandungi TIGA muka surat yang bercetak sebelum anda memulakan peperiksaan ini.]

*[Jawab **LIMA** soalan. Semua soalan boleh dijawab dalam Bahasa Malaysia ATAU Bahasa Inggeris.]*

1. What is cellulose? Discuss how cellulose is extracted from wood and its products.
(100 marks)

2. Show and discuss the flow chart to produce charcoal from rice straw and the tests to assess its quality.
(100 marks)

3. Explain the types of gasifiers that are used to produce wood gas. Also discuss the criteria used in choosing the raw materials for production of wood gas.
(100 marks)

4. (a) Discuss the physical characteristics of wood which determine its technical suitability for the manufacture of veneer based panels.

(b) Describe the principles involve in producing particles using ring flaker, hammer mill and attrition mill.
(100 marks)

5. (a) Explain how mat formation is done for particle based panels.

(b) Discuss the procedures involve in producing medium density fiberboard using the dry process.
(100 marks)

6. Write short notes on the following:

(a) Presssurised disk refiner
(b) Short retention blender
(c) Adhesive spread
(d) Continuous hot press
(100 marks)

1. *Apa dia selulosa? Bincang bagaimana ia diasingkan dari kayu dan juga produk yang dihasilkan darinya.*

(100 markah)

2. *Tunjuk serta bincangkan carta aliran penghasilan arang dari jerami padi dan ujian-ujian untuk menaksirkan kualitinya.*

(100 markah)

3. *Terangkan jenis-jenis penggas yang digunakan untuk menghasilkan gas kayu. Juga bincangkan kriteria yang digunakan semasa memilih bahan mentah untuk menghasilkan gas kayu.*

(100 markah)

4. (a) *Bincangkan sifat fizikal kayu yang menentukan kesesuaian teknikal dalam menghasilkan panel berasaskan venir.*

   (b) *Nyatakan prinsip yang terlibat dalam menghasilkan partikel menggunakan 'ring flaker', hammer mill, dan 'attrition mill'.*

(100 markah)

5. (a) *Terangkan bagaiman formasi mat dilakukan bagi panel berasaskan partikel.*

   (b) *Bincangkan prosedur yang terlibat untuk menghasilkan bod gentian ketumpatan sederhana menggunakan kaedah kering.*

(100 markah)

6. *Tuliskan keterangan ringkas mengenai berikut:*

   (a) *'Presssurised refiner'*
   (b) *"Short retention blender'*
   (c) *Rebakan perekat*
   (d) *Penekan panas berterusan*

(100 markah)

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UNIVERSITI SAINS MALAYSIA

Peperiksaan Kursus Semasa Cuti Panjang
Sidang Akademik 2007/2008

Jun 2008

IWK 302 – Kejuruteraan Kayu
[Wood Engineering]

Masa : 3 jam
[Duration: 3 hours]

Sila pastikan bahawa kertas peperiksaan in mengandungi TIGA BELAS (13) muka surat yang bercetak sebelum anda memulakan peperiksaan ini.

Jawab LIMA soalan. Semua soalan boleh dijawab dalam Bahasa Malaysia ATAU Bahaga Inggeris.

Please check that the examination paper consists of THIRTEEN (13) pages of printed material before you begin this examination.

Answer FIVE questions. All questions can be answered either in Bahasa Malaysia OR English.

1. (a) Terangkan peringkat-peringkat yang terlibat dalam perebakan rekahan.

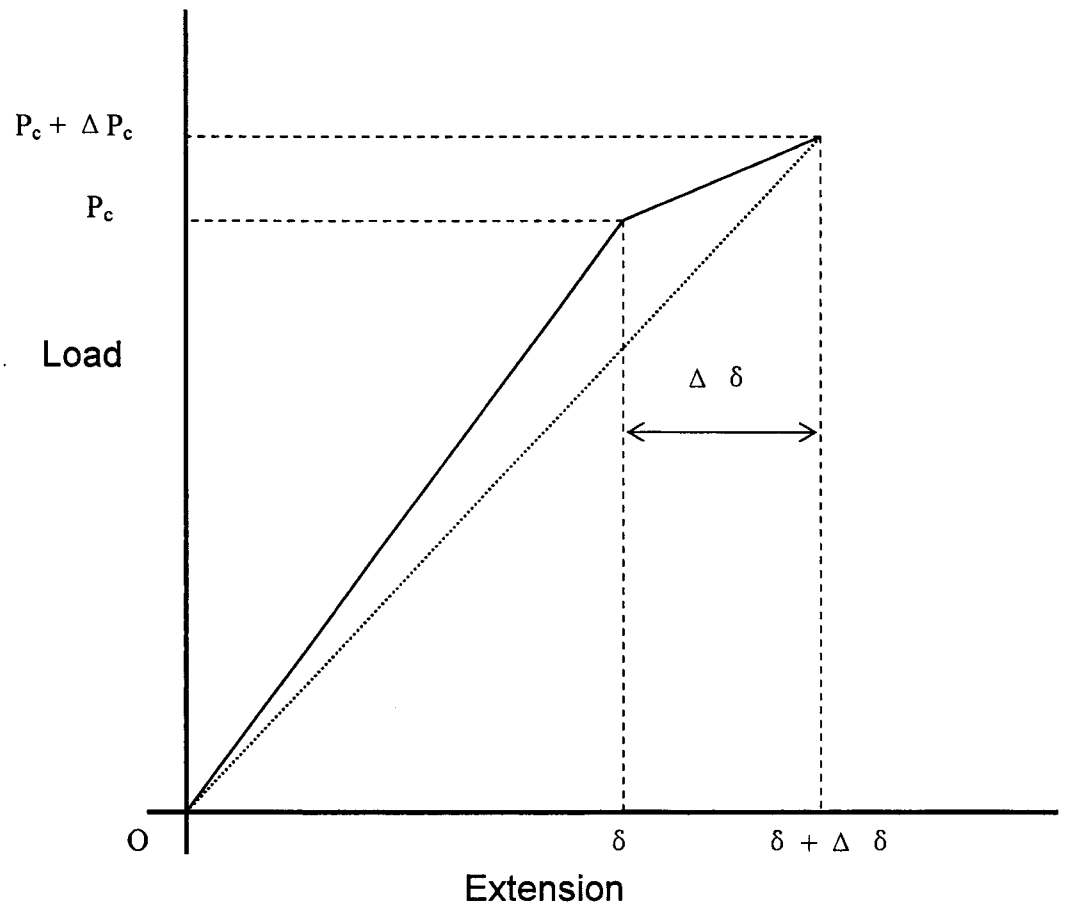
(5 markah)

(b) Berdasarkan hubungan Irwin-kies dan Rajah 1, tunjukkan bahawa kadar pembebasan tenaga terikan (G) adalah diberikan oleh

$$G = P_c^2/2B(dC/da),$$

dengan

P_c = Beban rekahan
B = Ketebalan
C = Komplians
a = Panjang retak



Rajah 1

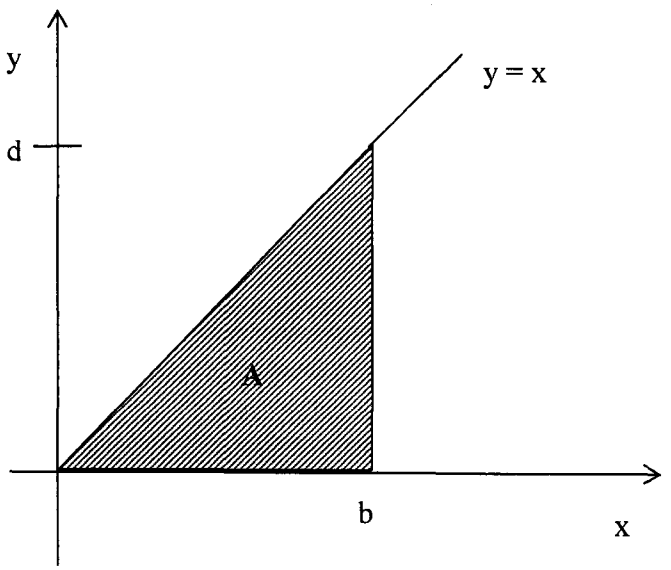
(15 markah)

2. (a) Untuk kawasan yang terlorek dalam Rajah 2, tentukan yang berikut dengan menggunakan kaedah pengamiran.

(i) Keluasan kawasan terlorek, A

(ii) Pusat bentuk

(iii) Momen inersia terhadap paksi x, I_x



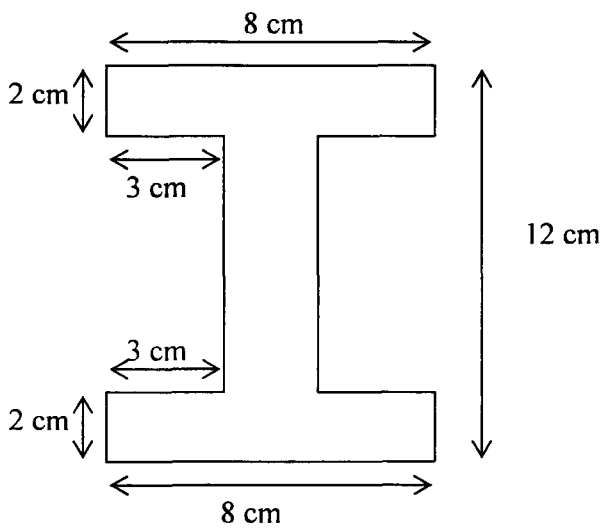
Rajah 2

(10 markah)

(b) Untuk rajah komposit yang ditunjukkan dalam Rajah 3, tentukan

(i) Kordinat pusat bentuk

(ii) Momen inersia terhadap paksi x, I_x.

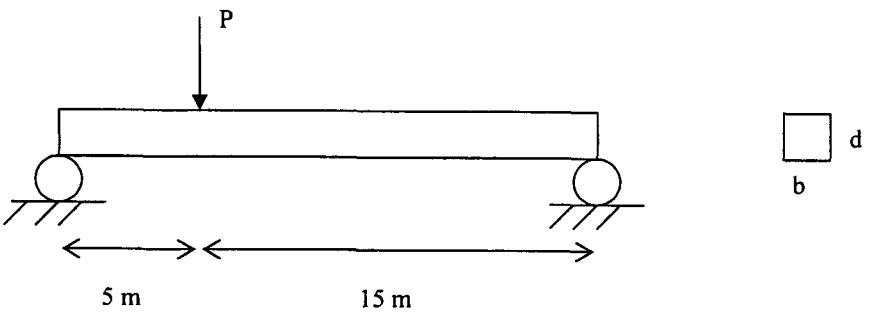


Rajah 3

(10 markah)

3. Suatu bim dibebankan dengan suatu daya seperti yang ditunjukkan dalam Rajah 4 dan spesifikasi bim dalam seperti berikut

$F_{bo} = 8500\ kN/m^2$	(tegasan lenturan izin)
$F_{vo} = 750\ kN/m^2$	(tegasan ricih izin)
b = 20 m	(lebar bim)
d = 1 m	(ketebalan bim)



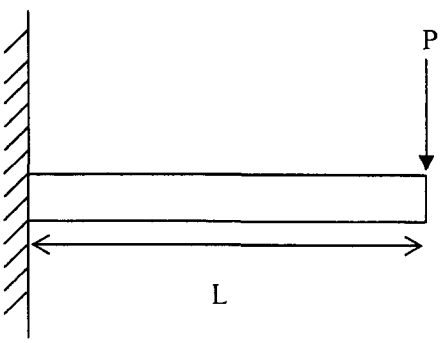
Rajah 4

Tentukan daya (P) yang dibenarkan

(20 markah)

4. Suatu bim kantilever dibebankan seperti yang ditunjukkan dalam Rajah 5. Tunjukkan pesongan maksimum bim tersebut adalah bersamaan dengan $PL^3/3EI$, dengan;

P = Beban
L = Panjang bim
E = Modulus kekenyalan
I = Moment inersia terhadap paksi neutral



Rajah 5

(20 markah)

5. Suatu bim bumbung lurus yang diperbuat daripada kayu pejal mempunyai spesifikasi berikut;

C_d = 1.25 (factor tempoh masa pengenaan beban)
L = 18ft (panjang bim)
S = 2ft (jarak antara bim)
dl = 20Ibf/ft^2 (beban mati)
ll = 10 Ibf/ft^2 (beban hidup)
F_{bo} = 1600 Ibf/in^2 (tegasan lenturan izin)
F_{vo} = 750 Ibf/in^2 (tegasan ricih izin)
E = 1700000 Ibf/in^2 (modulus kekenyalan)
P_o = L/180 (pesongan izin)

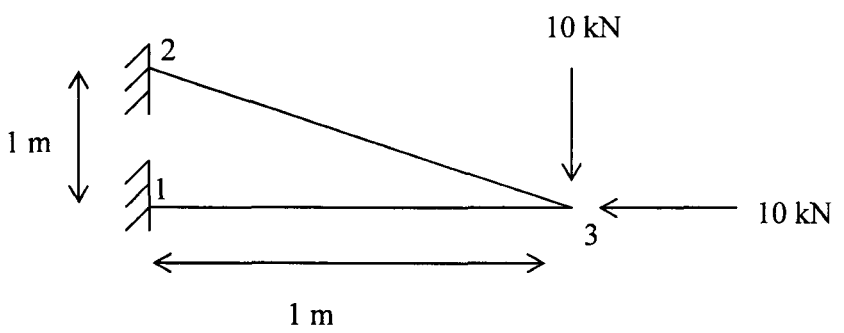
Uji kesesuaian keratan yang bersaiz 1.5 in x 9.25 in

(20 markah)

6. Suatu struktur dua dimensi dalam Rajah 6 dengan ukurannya diberikan dalam unit sebarangan. Dengan menggunakan Kaedah Elemen Terhingga, tentukan

(a) Sesaran setiap nod
(b) Daya tindak balas pada nod 1 dan 2
(c) Daya paksian setiap elemen

Elemen	E	A
13	1	1
23	1	1



Rajah 6

(20 markah)

...7/-

Senarai formula

Z = $bd^2/6$ (modulus keratan)
I = $bd^3/12$ (momen inertia)
L_e = $L - 2d$ (panjang berkesan)
V = $wL_e/2$ (tegasan ricih maksimum)
M = $wL^2/8$ (momen lenturan maksimum)
F_b = M/Z (tegasan lenturan sebenar)
F_v = $3V/2A$ (tegasan ricih sebenar)
P = $5wL^4/384EI$ (pesongan sebenar)
C_f = $(12/d)^{1/9}$ (faktor saiz)
C_c = $1 - 2000\ (t/R)^2$ (faktor lengkukan)
F_r = $3M/2R_mA$ (tegasan jejarian sebenar)

1. (a) *Explain the stages involved in crack growth.*

(5 marks)

(b) *Based on Irwin-kies Relationship and Figure 1, indicate that strain energy release rate (G) is*

$$G = P_c^2/2B(dC/da),$$

where

P_c = *Crack load*
B = *Thickness*
C = *Compliance*
a = *Crack length*

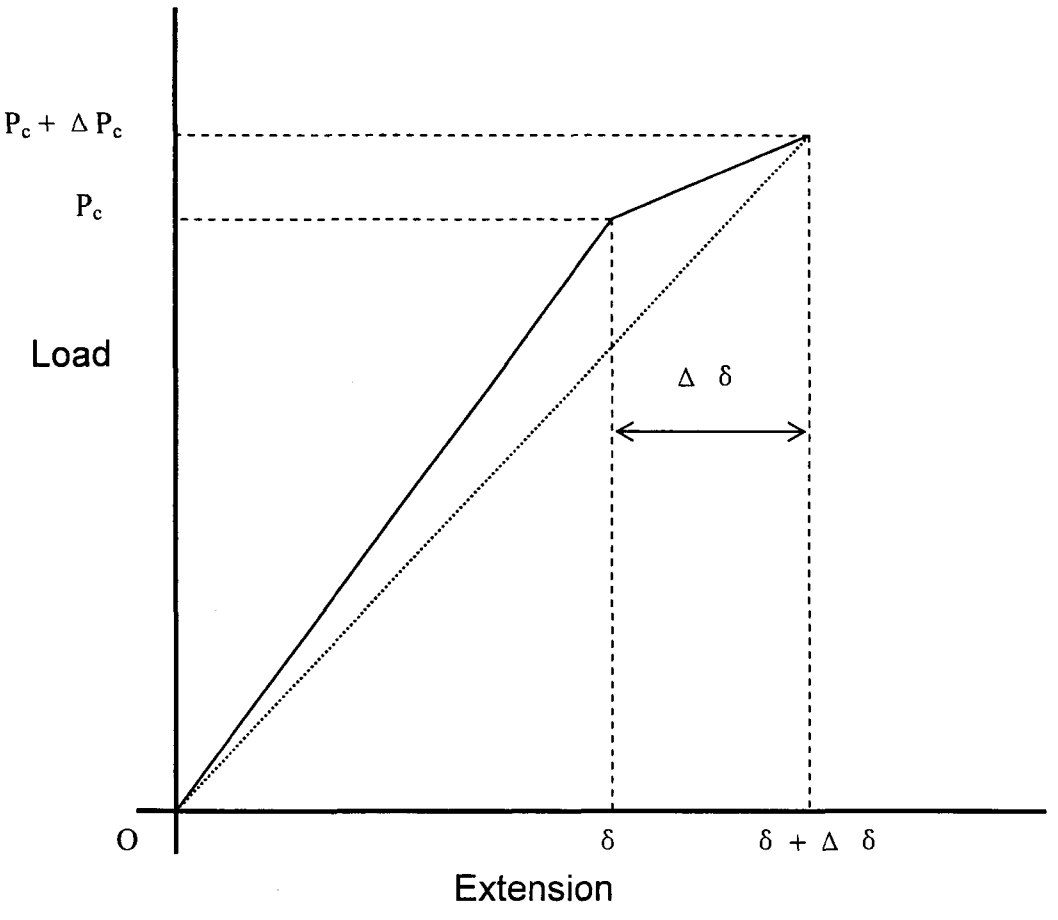


Figure 1

(15 marks)

2. (a) *For Figure 2, determine the following using integration method.*

(i) the area, A

(ii) the centroid

(iii) the moment of inertia, I_x

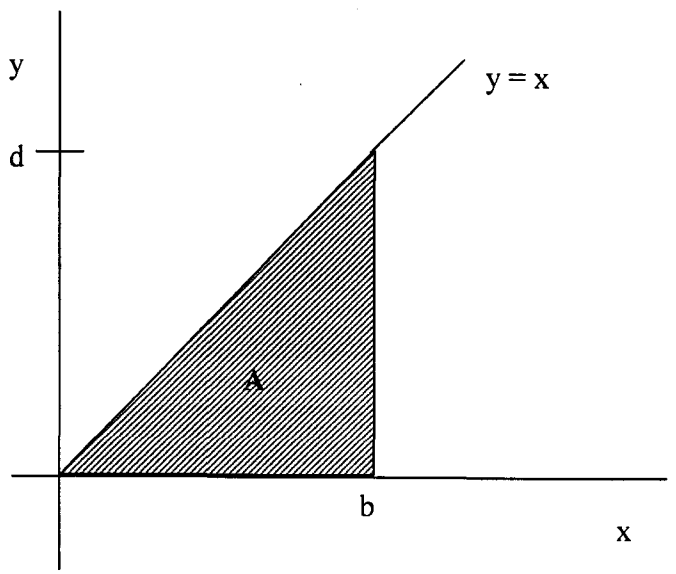


Figure 2

(10 marks)

(b) For the composite area shown in Figure 3, determine

(i) the coordinate of the centroid
(ii) the moment of inertia with respect to the x-axis, I_x.

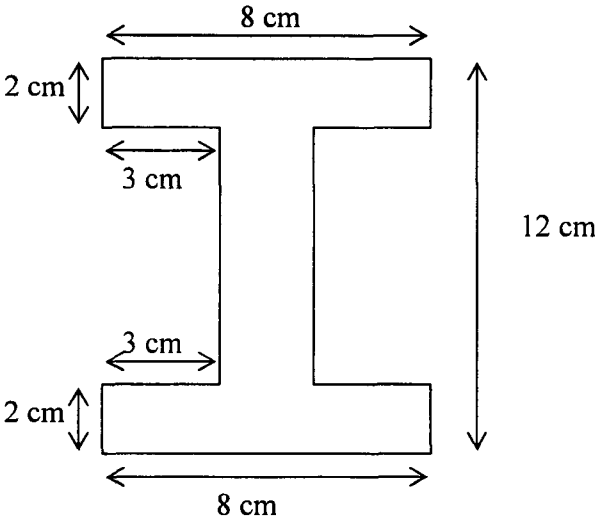


Figure 3

(10 marks)

3. *A beam is loaded by a force as shown in Figure 4, the specifications of the beam are as follow;*

$F_{bo} = 8500\ kN/m^2$	*(allowable bending stress)*
$F_{vo} = 750\ kN/m^2$	*(allowable shear stress)*
$b = 20\ m$	*(width of beam)*
$d = 1\ m$	*(thickness of beam)*

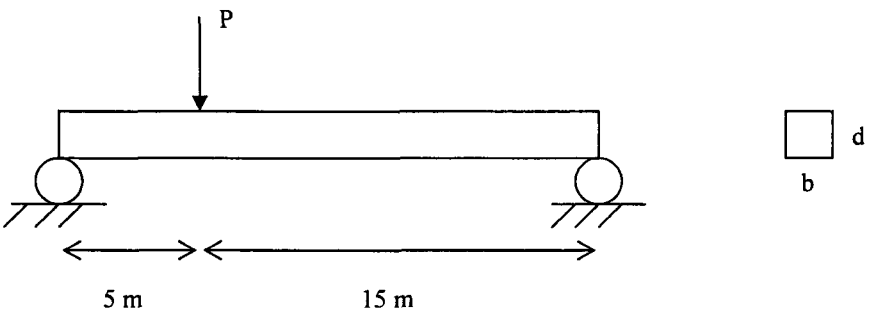


Figure 4

Determine the allowable force (P)

(20 marks)

...11/-

4. *A cantilever beam is loaded as shown in Figure 5. Indicate that the maximum deflection is $PL^3/3EI$, where;*

P = load
L = length of the beam
E = modulus of elasticity
I = moment of inertia computed about the neutral axis

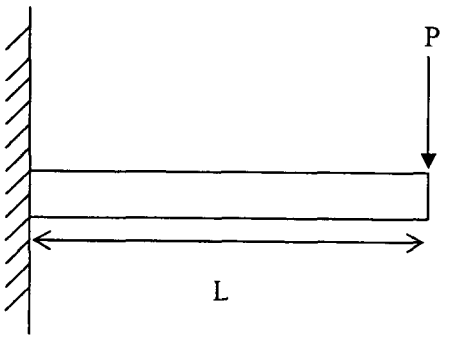


Figure 5

(20 marks)

5. *A roof made of solid wood has the following specifications;*

C_d	=	*1.25 (load duration factor)*
L	=	*18ft (length of the beam)*
S	=	*2ft (space between beams)*
dl	=	*20Ibf/ft^2 (dead load)*
ll	=	*10 Ibf/ft^2 (live load)*
F_{bo}	=	*1600 Ibf/in^2 (allowable bending stress)*
F_{vo}	=	*750 Ibf/in^2 (allowable shear stress)*
E	=	*1700000 Ibf/in^2 (modulus of elasticity)*
P_o	=	*L/180 (allowable deflection)*

Test the suitability of a section with size 1.5 in x 9.25 in.

(20 marks)

6. *A two dimensional structure in Figure 6 has dimensions in arbitrary units. Using Finite Element Method, determine*

   (a) *the displacement of each node*

   (b) *the reaction force at node 1 and 2*

   (c) *the axial force in each element*

Element	*E*	*A*
13	*1*	*1*
23	*1*	*1*

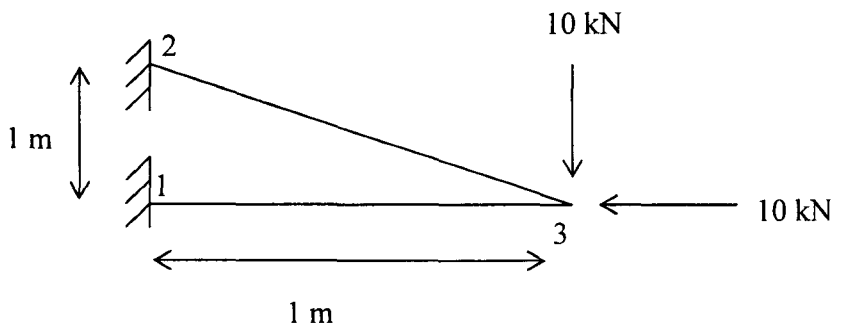


Figure 6

(20 marks)

List of formulations

Z = $bd^2/6$ *(section modulus)*
I = $bd^3/12$ *(moment of inertia)*
L_e = $L - 2d$ *(effective length)*
V = $wL_e/2$ *(maximum shear force)*
M = $wL^2/8$ *(maximum bending moment)*
F_b = M/Z *(actual bending stress)*
F_v = $3V/2A$ *(actual shear stress)*
P = $5wL^4/384EI$ *(actual deflection)*
C_f = $(12/d)^{1/9}$ *(size factor)*
C_c = $1 - 2000\ (t/R)^2$ *(curve factor)*
F_r = $3M/2R_mA$ *(actual radius stress)*