SULIT

KEMENTERIAN PENDIDIKAN TINGGI
JABATAN PENDIDIKAN POLITEKNIK DAN KOLEJ KOMUNITI

BAHAGIAN PEPERIKSAAN DAN PENILAIAN
JABATAN PENDIDIKAN POLITEKNIK DAN KOLEJ KOMUNITI
KEMENTERIAN PENDIDIKAN TINGGI

JABATAN KEJURUTERAAN AWAM

PEPERIKSAAN AKHIR

SESI I : 2025/2026

DCW30132: WOOD MECHANIC STRUCTURE 2

TARIKH : 01 DISEMBER 2025
MASA : 2.30 PETANG – 4.20 PETANG (2 JAM)

Kertas soalan ini mengandungi **SEBELAS (11)** halaman bercetak.
Bahagian A: Struktur (2 soalan)
Bahagian B : Struktur (4 soalan)
Dokumen sokongan yang disertakan : Formula

JANGAN BUKA KERTAS SOALAN INI SEHINGGA DIARAHKAN

(CLO yang tertera hanya sebagai rujukan)

SECTION A: 50 MARKS
BAHAGIAN A: 50 MARKAH

INSTRUCTION:
This section consists of **TWO (2)** structured questions. Answer **ALL** questions.

ARAHAN:
*Bahagian ini mengandungi **DUA (2)** soalan berstruktur. Jawab **SEMUA** soalan.*

QUESTION 1
SOALAN 1

CLO1

(a) Based on Figure A1(a) below, if the reaction force at support A is 20 kN, by using the moment area method, identify the value of y_B in terms of EI.

Berdasarkan Rajah A1(a) di bawah, jika daya tindakbalas pada sokong A adalah 20 kN, dengan menggunakan kaedah momen luas kenalpasti nilai y_B *dalam sebutan EI.*

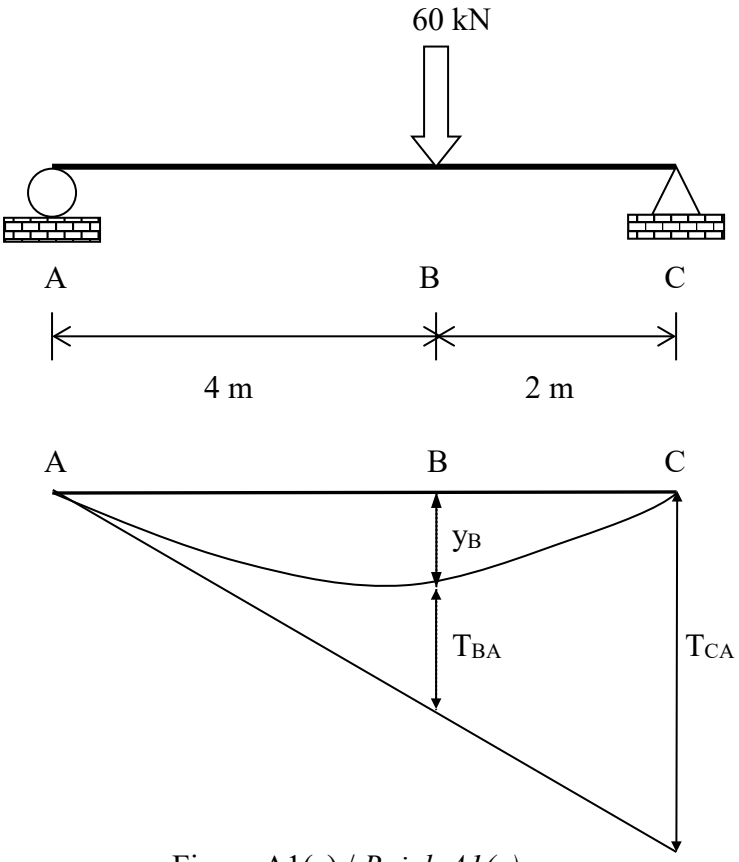


Figure A1(a) / *Rajah A1(a)*

[10 Marks]
[*10 Markah*]

CLO1

(b) A circular column of 5 m length is shown in Figure A1(b) below. The column is subjected to a compressive load of 250 kN. As a result of these forces, the column has shortened by 3 mm. The column is one pinned and one fixed end. Determine:

Satu tiang berkeratan bulat dengan panjangnya 5m ditunjukkan seperti dalam Rajah A1(b) di bawah. Tiang itu menanggung beban mampatan sebanyak 250 kN. Akibat daripada daya tersebut, tiang mengalami pemendekan sebanyak 3 mm. Tiang tersebut dipinkan pada satu hujung dan diikat tegar hujung satu lagi. Tentukan:

i. the minimum radius of gyration. [7 Marks]
jejari legaran minimum. [*7 Markah*]

ii. Euler critical load. [8 Marks]
beban kritikal Euler. [*8 Markah*]

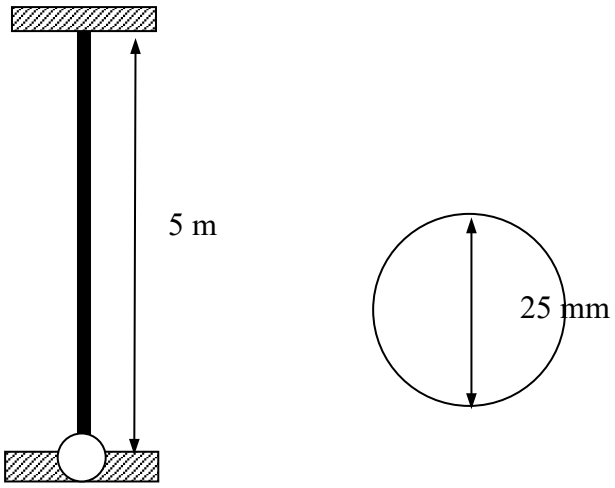


Figure A1(b) / *Rajah A1(b)*

QUESTION 2
SOALAN 2

CLO1 (a) Identify **FIVE (5)** assumptions in Euler's theory.
*Kenalpasti LIMA (**5**) andaian dalam teori Euler .*

[10 marks]
[10 *markah*]

CLO1 (b) Based on the structure frame on Figure A2(b) below, determine:
Berdasarkan kerangka struktur Rajah A2(b) di bawah, tentukan;

i. the reaction forces at support A and E. [7 Marks]
daya tindakbalas pada penyokong A dan E. [7 *Markah*]

ii. the internal forces in members AB and EB using the method of joint.
daya dalaman anggota AB dan EB *dengan menggunakan kaedah sendi.*

[8 Marks]
[8 *Markah*]

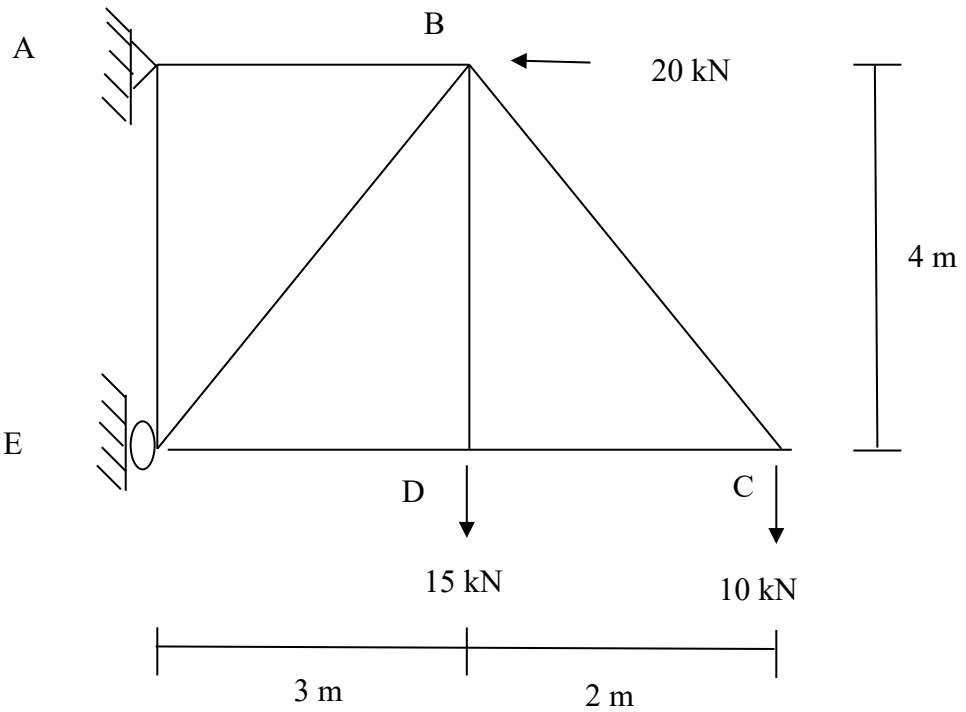


Figure A2(b) / *Rajah A2(b)*

SECTION B : 50 MARKS
BAHAGIAN B: 50 MARKAH

INSTRUCTION:
This section consists of **FOUR (4)** structured questions. Answer **TWO (2)** questions only.

ARAHAN:

*Bahagian ini mengandungi **EMPAT (4)** soalan berstruktur. Jawab **DUA (2)** soalan sahaja.*

QUESTION 1
SOALAN 1

CLO2

(a) One cross section in H shape is shown in Figure B1(a) below. Determine the centroid location by referring to:

Satu keratan berbentuk H ditunjukkan seperti dalam Rajah B1(a) di bawah. Tentukan kedudukan pusat sentroid dengan merujuk pada;

i. axis OX. [7 Marks]
paksi OX. [*7 Markah*]

ii. axis OY. [8 Marks]
paksi OY. [8 *Markah*]

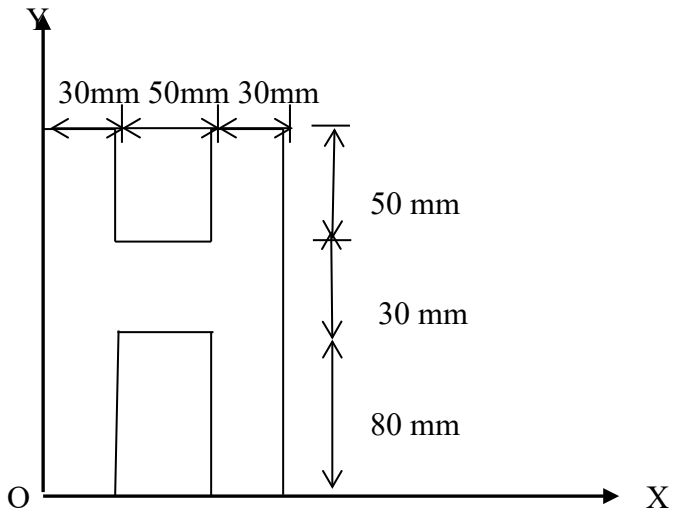


Figure B1(a) / *Rajah B1(a)*

CLO2

(b) Based on Figure B1(b) below, calculate the centroid of the section by referring to the axis OY and OX.

Berdasarkan Rajah B1(b) di bawah, kirakan kedudukan pusat sentroid bagi keratan tersebut merujuk kepada paksi OY dan OX.

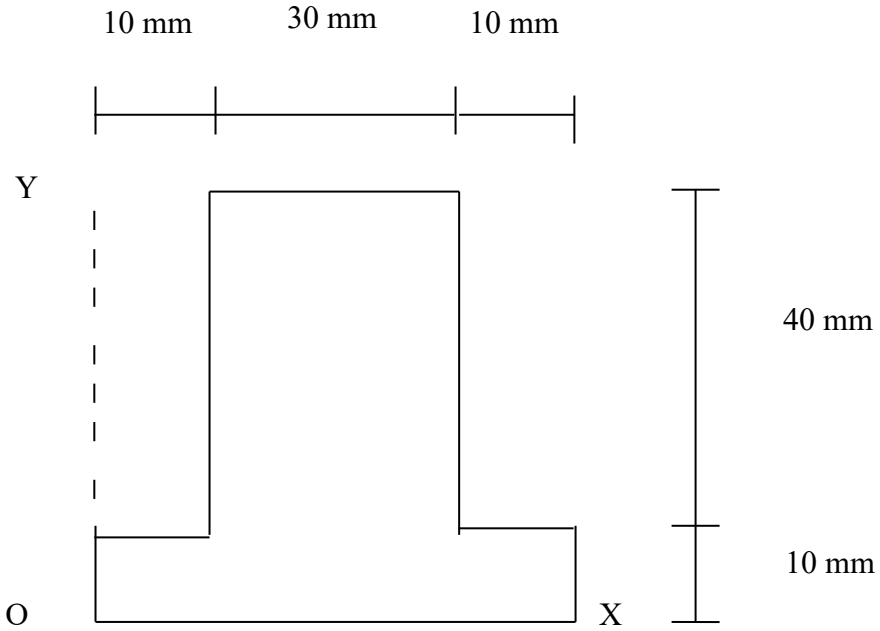


Figure B1(b) / Rajah B1(b)

[10 Marks]
[*10 Markah*]

QUESTION 2
SOALAN 2

CLO2

(a) A cross-section beam such as shown in Figure B2(a) below is simply supported beam with a 5 m span. The beam was carried a uniformly distributed load of 10 kN/m, determine:
Rasuk keratan rentas seperti yang ditunjukkan dalam Rajah B2(a) di bawah adalah disokong mudah mempunyai rentang 5 m. Rasuk adalah dibebani oleh beban teragih seragam 10 kN/m, tentukan:

i. position of the neutral axis for the beam (refer to the bottom of the beam section).
kedudukan paksi neutral bagi rasuk tersebut (rujuk bahagian bawah keratan rasuk).

[7 Marks]
[*7 Markah*]

ii. the value of the bending stress area B refers to the neutral axis [Given $I_B = 2.08 \times 10^6$ mm^4].
nilai tegasan lentur luasan B dengan merujuk kepada paksi neutral [*Diberi* $I_B = 2.08 \times 10^6$ *mm*^{4}].

[8 Marks]
[8 *Markah*]

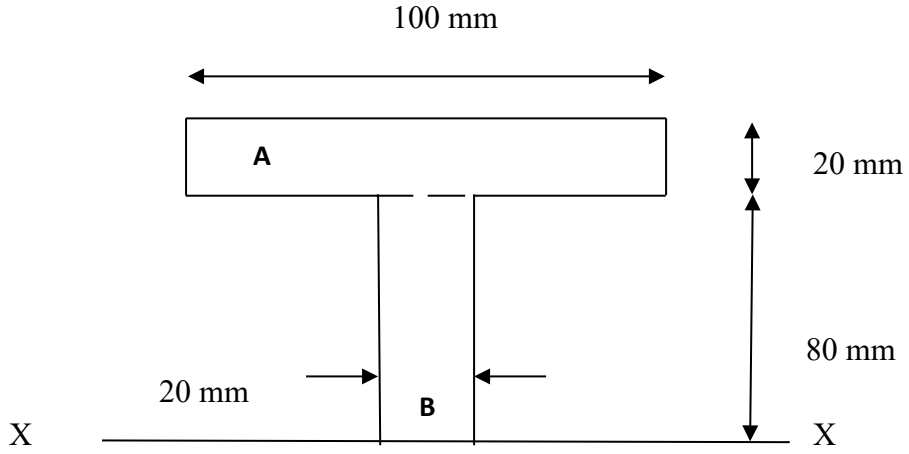


Figure B2(a) / *Rajah B2(a)*

(b) A simply supported beam carrying a uniformly distributed load of 20 N/m is shown as in Figure B2(b) below. The beam was cut with a circular cross-section with a radius of 10 mm and a length of 4 m. Calculate;
Sebatang rasuk disokong mudah menanggung beban teragih seragam sebanyak 20 N/m ditunjukkan seperti dalam Rajah B2(b) di bawah. Rasuk itu berkeratan rentas bulat dengan jejarinya ialah 10 mm dan panjangnya ialah 4 m. Kirakan;

i. maximum bending moment of the beam
momen lentur maksimum rasuk

ii. maximum bending stress of the beam
tegasan lentur maksimum rasuk

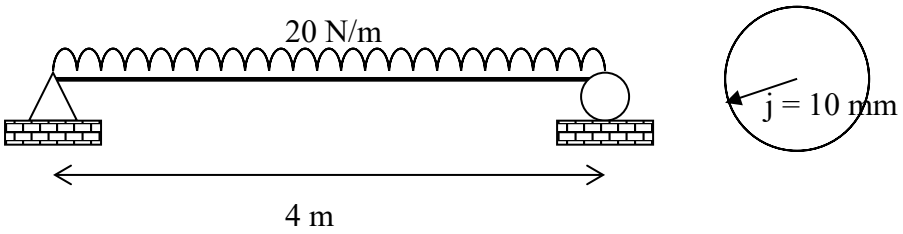


Figure B2(b) /*Rajah B2(b)*

[10 Marks]
[*10 Markah*]

QUESTION 3
SOALAN 3

CLO2 (a) By referring to Figure B3(a) below, if the reaction force at support A is 12.5 kN, using the Moment Area Method. Determine:
Berdasarkan Rajah B3(b) di bawah, jika daya tindakbalas pada sokong A adalah 12.5 kN, dengan menggunakan Kaedah Momen Luas. Tentukan:

i. slope at point B in EI value. [7 Marks]
kecerunan pada titik B dalam sebutan EI. [7 *Markah*]

ii. deflection at point B in EI value. [8 Marks]
pesongan pada titik B dalam sebutan EI. [8 *Markah*]

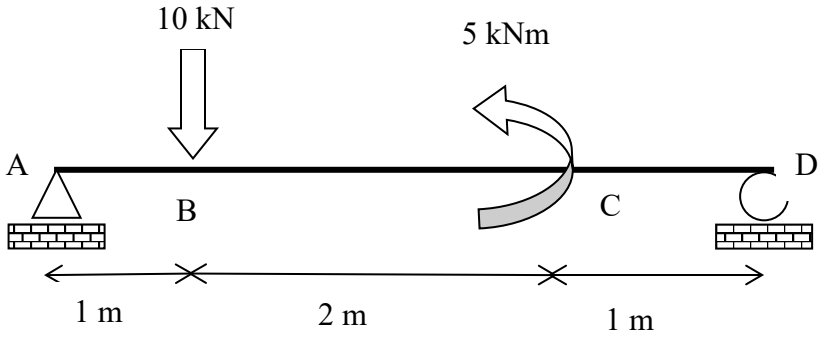


Figure B3(a) / *Rajah B3(a)*

CLO2 (b) Figure B3(b) below shows a cantilever beam loaded by 50 kN and 30 kN point load. By using the moment area method, calculate the maximum deflection of the beam. [Given M_A = -350 kNm and R_{AY} = 80 kN].

Rajah B3(b) di bawah menunjukkan satu rasuk julur yang membawa dua beban tumpu 50 kN dan 30 kN. Dengan menggunakan kaedah momen luas kirakan nilai pesongan maksimum rasuk.

[*Diberi M_A = -350 kNm dan R_{AY} = 80 kN*].

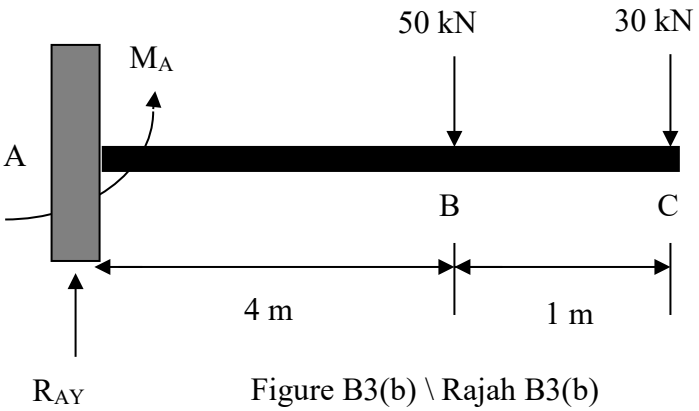


Figure B3(b) \ Rajah B3(b)

[10 Marks]
[*10 Markah*]

CLO2

QUESTION 4
SOALAN 4

(a) A column 5m long has a cross section of 50 mm x 50 mm. The columns have both ends fixed. Given E = 2.0 x 10^5 N/mm^2 and P_{cr} = 5.5 x 10^4 N. Determine:
Sebatang tiang yang panjangnya 5m mempunyai keratan rentas 50mm x 50mm. Tiang tersebut diikat tegar di kedua-dua hujungnya.
Diberi E = 2.0 x 10^5 N/mm^2 dan P_{cr} = 5.5 x 10^4 N . Tentukan:

i. Slenderness ratio [6 Marks]
Nisbah kelangsingan [*6 Markah*]

ii. Maximum load that can be carried by the column if the safety factor is 2.0
Beban maksima yang boleh ditanggung oleh tiang sekiranya faktor keselamatan ialah 2.0
[4 Marks]
[*4 Markah*]

CLO2

b) The trusses ABCDE are supported at points A and D as in Figure B4(a). Point loads of 50 N and 100 N are applied at point B and C respectively. By using the section method, Calculate:
Kerangka ABCDE disangga pada titik A dan D seperti dalam Rajah B4(a). Beban tumpu 50N dan 100N masing-masing dikenakan pada titik B dan C. Dengan menggunakan kaedah keratan, tentukan:

i. the internal forces for AB member [7 Marks]
daya dalaman bagi anggota AB [7 *Markah*]

ii. the internal forces for AE member [8 Marks]
daya dalaman bagi anggota AE [8 *Markah*]

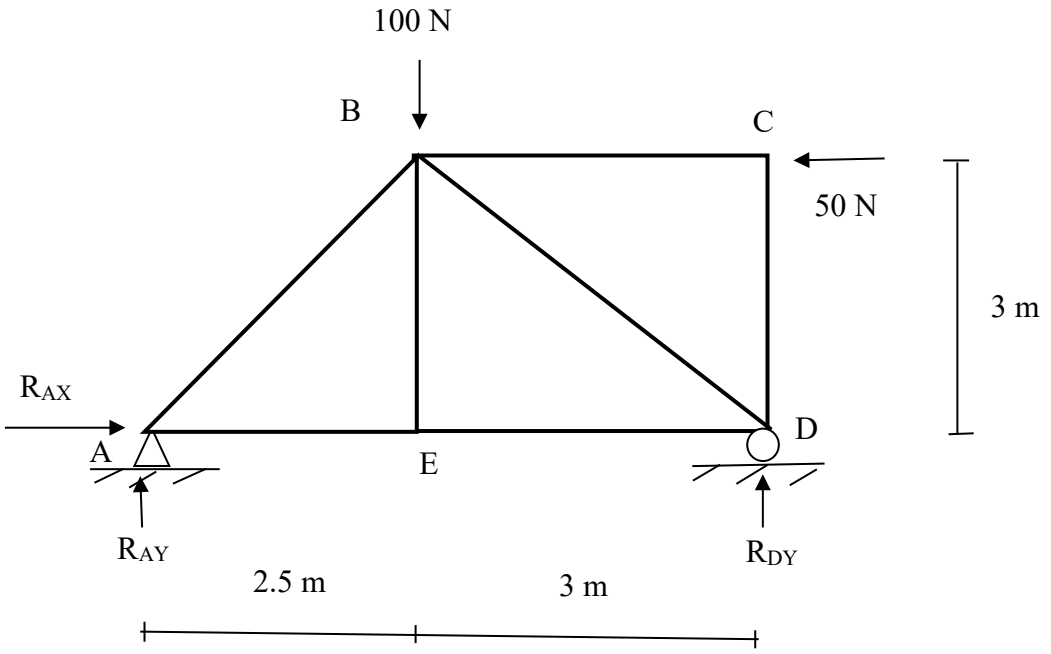


Figure B4(a) / *Rajah B4(a)*

SOALAN TAMAT

FORMULA DCW 30132

CENTROID AND SECOND MOMENT OF AREA

$$\overline{X} = \frac{\sum A\overline{X}}{\sum A} \qquad \overline{y} = \frac{\sum A\overline{y}}{\sum A} \qquad I_x = I_{pg} + Ad^2$$

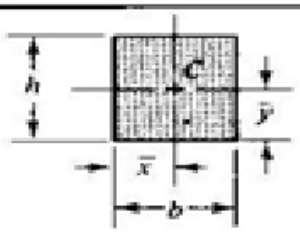
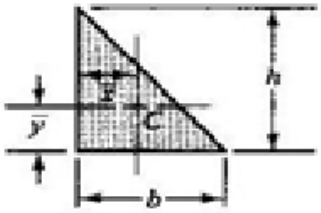
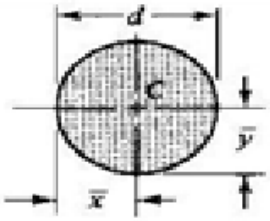
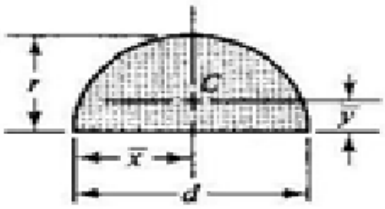
Shapes		Area	$\overline{x}$	$\overline{y}$
Rectangle		bh	$\frac{b}{2}$	$\frac{h}{2}$
Triangle		$\frac{bh}{2}$	$\frac{b}{3}$	$\frac{h}{3}$
Circle		$\frac{\pi d^2}{4}$	$\frac{d}{2}$	$\frac{d}{2}$
Semi- circle		$\frac{\pi d^2}{8}$	$\frac{d}{2}$	$\frac{4r}{3\pi}$

TABLE 1: Centroid of Simple Geometric Shape

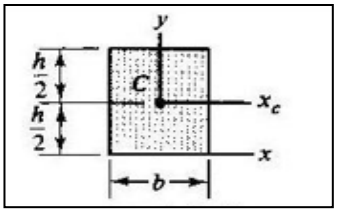
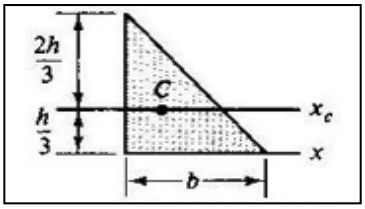
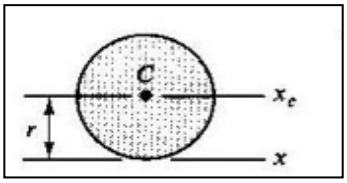
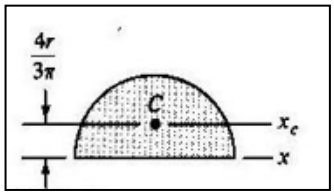
Shape		I_{xx}	I_{yy}
Rectangle		$\frac{bh^3}{12}$	$\frac{hb^3}{12}$
Triangle		$\frac{bh^3}{36}$	$\frac{hb^3}{36}$
Cricle		$\frac{\Pi d^4}{64}$	$\frac{\Pi d^4}{64}$
Semicircle		$0.11r^4$	$0.11r^4$

TABLE 2: Moments of Inertia of Simple Shapes

BENDING STRESS

$$\frac{M}{I} = \frac{E}{R} = \frac{\sigma}{y}$$

$$Z = \frac{I}{y_{max}}$$

$$M_{mak} = \frac{wL^2}{8}$$

$$M_{mak} = -\frac{wl^2}{2}$$

$$M_{mak} = \frac{wab}{L}$$

SLOPE AND DEFLECTION OF BEAM

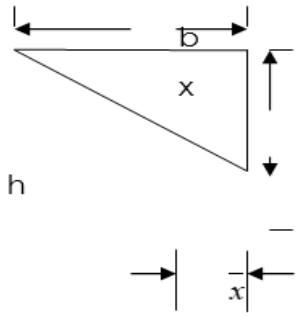
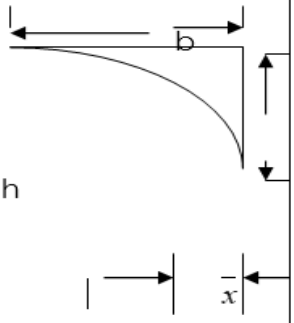
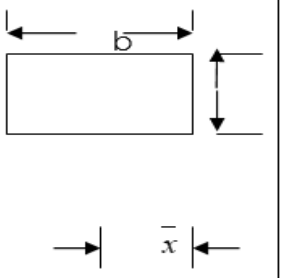
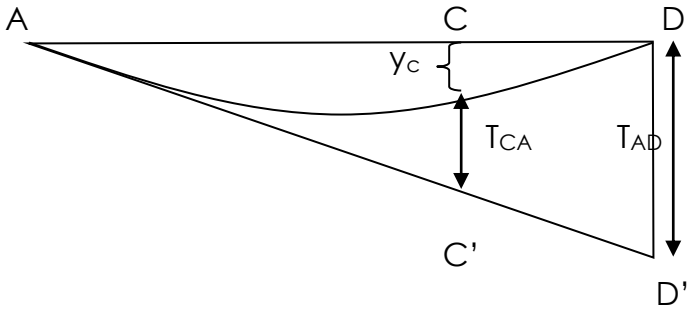
Shape	Triangle	Parabolic	Square
			
Area A	$\frac{1}{2}bh$	$\frac{1}{3}bh$	$\frac{1}{4}bh$
Centroid $\bar{x}$	$\frac{1}{3}b$	$\frac{1}{4}b$	$\frac{1}{2}b$

TABLE 3: Area and centroid for basic shape



$$T_{DA} = \Sigma\frac{A\bar{x}}{EI} = \frac{1}{EI}\Sigma A\bar{x}$$

$$\theta_{AC} = \frac{\sum luasG.M.L._{AC}}{EI}$$

$$\theta_C = \theta_{AC} - \theta_A$$

$$y_c = CC' - T_{CA}$$

COLUMN STABILITY AND SUPPORT

$$E = \frac{PL}{Ae}$$

$$r = \sqrt{\frac{I}{A}}$$

$$\lambda = \frac{L}{r}$$

$$\text{Beban Selamat} = \frac{Bebankritikal(Euler)}{Faktorkesdama\,\tan}$$

$$P_{cr} = \frac{\Pi^2 EI}{L^2}$$

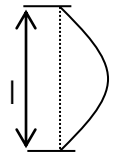
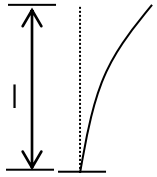
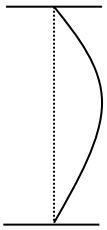
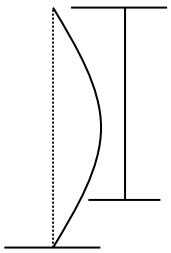
Kes	Bentuk	Panjang berkesan	Beban Genting
4.4.1		L =l	$P_E = \frac{\pi^2 EI}{L^2}$
4.4.2		L = 2l	$P_E = \frac{\pi^2 EI}{L^2}$
4.4.3		$L = \frac{l}{2}$	$P_E = \frac{\pi^2 EI}{L^2}$
4.4.4		$L = \frac{l}{\sqrt{2}}$	$P_E = \frac{\pi^2 EI}{L^2}$

TABLE 4: Effective Length and Critical

TWO DIMENSION STRUCTURE FRAMES

$m = 2n - 3$	$m > 2n - 3$	$m < 2n - 3$
$\circlearrowright + \sum M = 0$	$\uparrow + \sum Fy = 0$	$\rightarrow + \sum F_x = 0$