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 : 2024/2025

DCW30132: WOOD MECHANIC STRUCTURE 2

TARIKH : 5 DISEMBER 2024
MASA : 8.30 PAGI – 10.30 PAGI (2 JAM)

Kertas ini mengandungi **SEBELAS (11)** halaman bercetak.
Bahagian A: Struktur (2 soalan)
Bahagian B: Struktur (4 soalan)

Dokumen sokongan yang disertakan : Tiada

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 struktur. Jawab **SEMUA** soalan.*

QUESTION 1
SOALAN 1

CLO 1

(a) Explain **FIVE (5)** procedures for sketching the shape of a deflected beam followed by the resulting moment diagram, using the theorems of the first moment of area and the second moment of area.
*Terangkan **LIMA (5)** tatacara melakarkan bentuk rasuk terpesong diikuti bentuk rajah momen yang terjadi, menggunakan teorem-teorem momen luas pertama dan momen luas kedua.*

[10 marks]
[10 *markah*]

CLO 1

(b) A hollow column as shown in the Figure A1(b) has a length of 2.5 m. Using Euler's formula, determine:

Sebatang tiang berongga seperti yang ditunjukkan dalam Rajah A1(b) mempunyai panjang 2.5 m. Dengan menggunakan formula Euler, tentukan :

i. The slenderness ratio.
Nisbah kelansingan.

[7 marks]
[7 *markah*]

ii. Critical load that can be borne by the column.
Beban kritikal yang dapat ditanggung oleh tiang tersebut.

[8 marks]
[8 *markah*]

Given E = 2×10^5 N/mm².
Diberi E= 2 $\times 10^5$ *N/mm².*

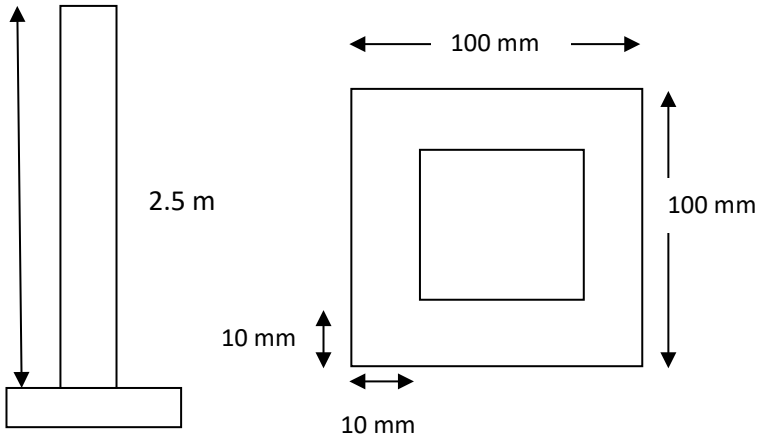


Figure A1(b) / *Rajah A1(b)*

QUESTION 2

SOALAN 2

CLO 1 (a) Discuss **FOUR (4)** of the column behaviors when load is applied.

*Bincangkan **EMPAT (4)** kelakuan tiang semasa dikenakan beban.*

[10 marks]

[10 *markah*]

CLO 1 (b) A structure frame having a span of 8 m is subjected to a point load as shown in Figure A2(b), calculate :

Kerangka struktur yang mempunyai rentang 8 m adalah tertakluk ke beban titik seperti pada Rajah A2(b), kirakan:

i. the rections at the supports.
tindakbalas di penyokong.

[7 marks]

[7 *markah*]

ii. internal force for AB, AE, DC and BD.
daya dalam untuk AB, AE, DC dan BD.

[8 marks]

[8 *markah*]

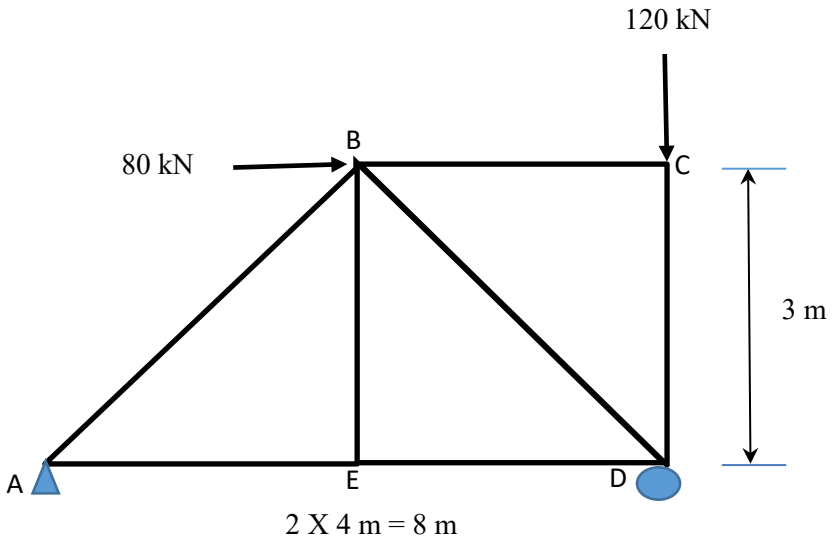


Figure A2(b) / *Rajah A2(b)*

SECTION B : 50 MARKS

BAHAGIAN B : 50 MARKAH

INSTRUCTION:

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

ARAHAN:

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

QUESTION 1

SOALAN 1

CLO 2

(a) Based from the Figure B1(a) below, determine:

Berdasarkan Rajah B1(a) di bawah, tentukan:

i) Centroid y axis around the neutral axis.

Centroid paksi y sekitar paksi neutral.

[7 marks]

[*7 markah*]

ii) Second moment of area around the neutral axis.

Momen luas kedua sekitar paksi neutral.

[8 marks]

[*8 markah*]

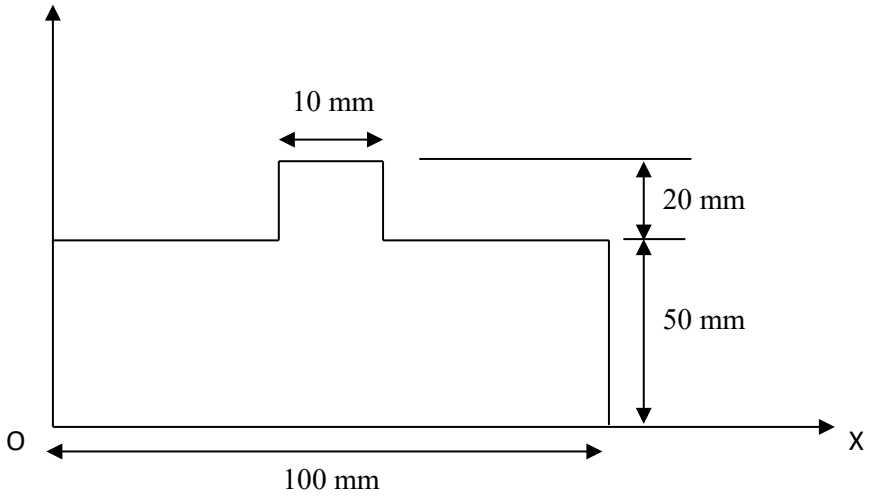


Figure B1(a)/ *Rajah B1(a)*

CLO 2 (b) Based on Figure B1(b) below, calculate the position of centroid x and y axis.
Berdasarkan Rajah B1(b) di bawah, kirakan kedudukan pusat sentroid paksi x dan y.

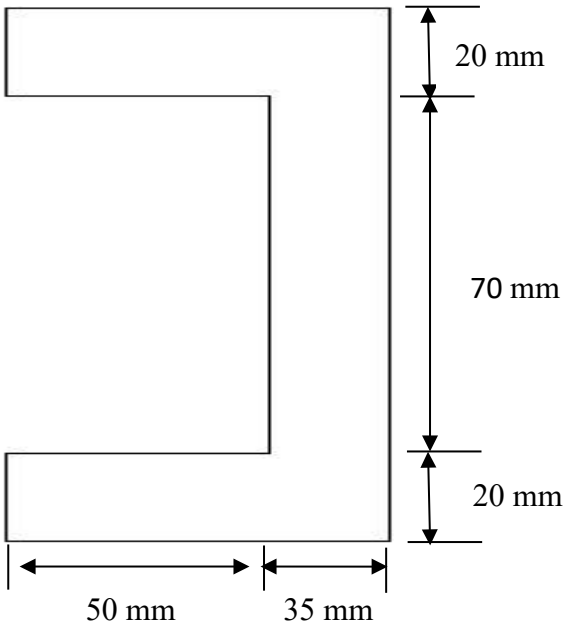


Figure B1(b) / *Rajah B1(b)*

[10 marks]
[*10 markah*]

QUESTION 2

SOALAN 2

CLO 2

(a) A simply supported beam with burden imposed on the beam is a uniformly distributed load. The range of the beam is 3 m and the size of the beam is 100 mm x 50 mm. Determine.

Satu rasuk disokong mudah dengan beban yang dikenakan ke atas rasuk adalah beban teragih seragam. Panjang rasuk adalah 3 m dan saiz rasuk adalah 100 mm x 50 mm. Tentukan ;

i. Section Modulus

Modulus Sekysen

[8 marks]

[8 *markah*]

ii. The value of uniform load for the beam if the maximum flexible stress is 150 N/mm^2.

Nilai beban seragam untuk rasuk jika tegasan maksimum adalah 150 N/mm^2.

[7 marks]

[7 *markah*]

CLO 2

(b) Calculate the maximum flextural stress for the beam in Figure B2(b), given the value of z = 189.4 x 10^3 mm^3.

Kirakan tegasan lenturan maksimum dalam Rajah B2(b), diberikan nilai z = 189.4 x 10^3 mm^3.

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

[10 marks]

[*10 markah*]

QUESTION 3

SOALAN 3

CLO 2 (a) From Figure B1(a) below, using Moment Area Method calculate :

Berdasarkan Rajah B1(a) di bawah, dengan menggunakan Kaedah Momen Luas kirakan :

i. slope at point C.

kecerunan pada titk C

[8 marks]

[*8 markah*]

ii. deflection at point C

pesongan pada titk C

[7 marks]

[*7 markah*]

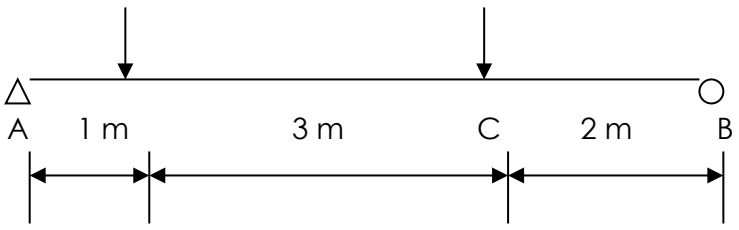


Figure B1(a) / *Rajah B1(a)*

CLO 2 (b) To use this Moment Area Method, it is important that you have skills in finding the area and centroid distance of the moment diagram shapes drawn. Explain the formula for commonly drawn moment shapes.

Untuk menggunakan Kaedah Momen Luas ini, adalah penting anda mempunyai kemahiran dalam mencari luas dan jarak sentroid bagi bentuk-bentuk gambarajah momen yang dilukis. Terangkan formula bagi bentuk-bentuk momen yang biasa dilukis.

[10 marks]
[*10 markah*]

QUESTION 4
SOALAN 4

CLO 2

(a) A 6000 mm tall column is subjected to 600 kN of compression load. Buckling occurs around the main axis with Ixx value = 3.14 x 10^6 mm^4 and the value of E = 200 x 10^3 N /mm^2. Determine the critical load that can be supported by the column if;

Sebatang tiang setinggi 6000 mm menanggung beban mampatan sebanyak 600 kN. Lengkokan terjadi di sekeliling paksi utama dengan nilai Ixx = 3.14 x 10^6 mm^4 dan nilai E=200 x 10^3 N/mm^2. Tentukan beban kritikal yang boleh ditanggung oleh tiang tersebut jika;

i. Both ends are pinned.
Tiang di pin di kedua-dua hujung.

[7 marks]
[*7 markah*]

ii. Both ends are fixed.
Tiang di ikat tegar di kedua-dua hujung.

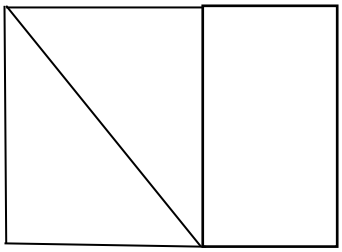
[8 marks]
[*8 markah*]

CLO 2

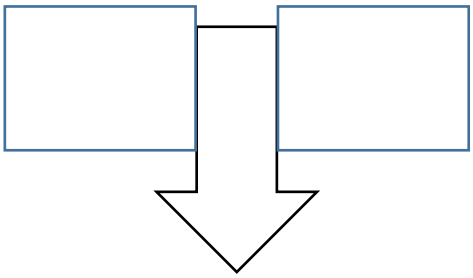
(b) Categorize the types of frame below.

Kategorikan jenis kerangka di bawah.

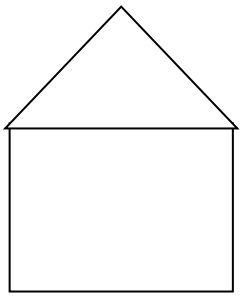
i.



ii.



iii.



[10 marks]

[*10 markah*]

SOALAN TAMAT

FORMULA DCW 30132

CENTROID AND SECOND MOMENT OF AREA

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

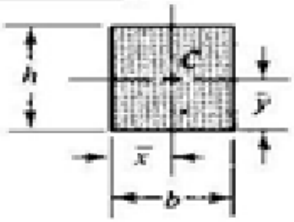
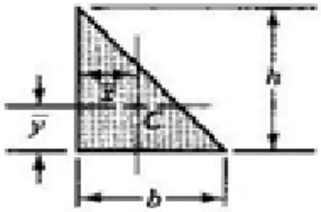
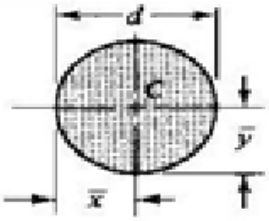
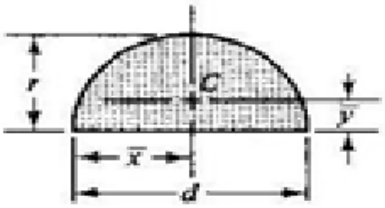
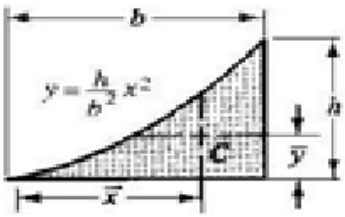
Shapes		Area	$\bar{x}$	$\bar{y}$
Rectangle		bh	$\frac{b}{2}$	$\frac{h}{2}$
Triangle		$\frac{bh}{2}$	$\frac{b}{3}$	$\frac{h}{3}$
Circle		$\frac{\pi d^2}{4}$	$\frac{d}{2}$	$\frac{d}{2}$
Semi- circle		$\frac{\pi d^2}{8}$	$\frac{d}{2}$	$\frac{4r}{3\pi}$
Parabolic spandrel		$\frac{bh}{3}$	$\frac{3b}{4}$	$\frac{3h}{10}$

TABLE 1 : Centroid of Simple Geometric Shape

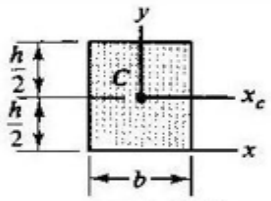
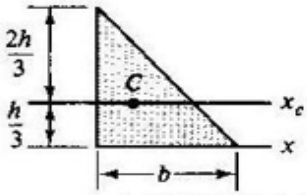
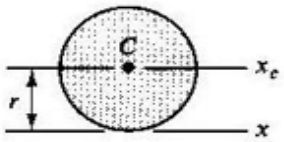
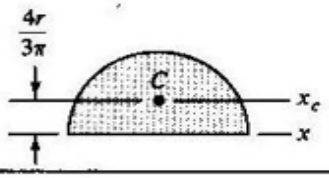
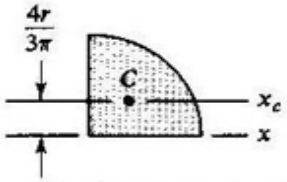
Shapes		I_x	I_{x_c}
Rectangle		$\frac{bh^3}{3}$	$\frac{bh^3}{12}$
Triangle		$\frac{bh^3}{12}$	$\frac{bh^3}{36}$
Circle		$\frac{5\pi r^4}{4}$	$\frac{\pi r^4}{4}$
Semicircle		$\frac{\pi r^4}{8}$	$0.0349\pi r^4$
Quarter-circle		$\frac{\pi r^4}{16}$	$0.01747\pi r^4$

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

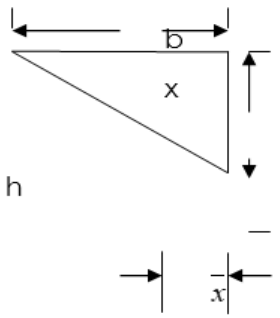
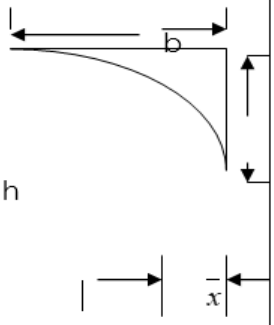
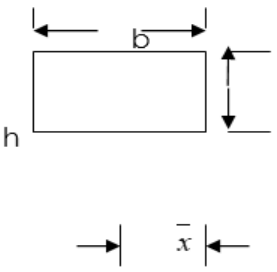
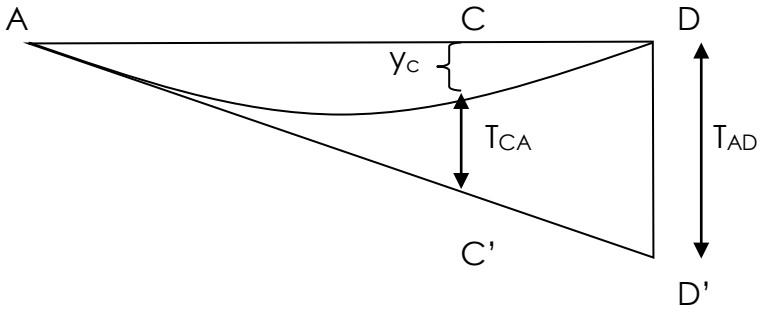
Shape	Triangle	Parabolic	Square
			
Area A	$\frac{1}{2}bh$	$\frac{1}{3}bh$	$\frac{1}{4}bh$
Centroid $\bar{x}$	$\frac{1}{3}b$	$\frac{1}{4}b$	$\frac{1}{2}b$

Table : Area and centroid for basic shape



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

$$\theta_{AC} = \frac{\Sigma luas G.M.L._{AC}}{EI}$$

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

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

COLUMN STABILITY AND SUPPORT

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

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

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

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

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

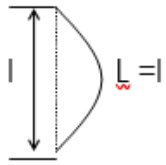
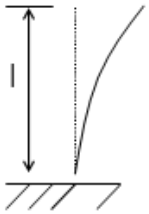
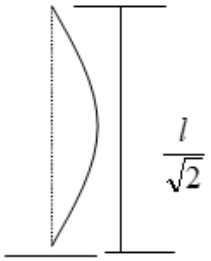
Case	Shape	Effective Length	Critical Load
Both end pinned		L =l	$P_E = \frac{\pi^2 EI}{L^2}$
One fixed and one free		L = 2l $l = \frac{L}{2}$	$P_E = \frac{\pi^2 EI}{L^2}$
Both end fixed	 $L = \frac{l}{2}$	$L = \frac{l}{2}$	$P_E = \frac{\pi^2 EI}{L^2}$
One pinned and one fixed	 $\frac{l}{\sqrt{2}}$	$L = \frac{l}{\sqrt{2}}$ $l = \sqrt{2}\,L$	$P_E = \frac{\pi^2 EI}{L^2}$

FIGURE 3: Effective Length and Critical

TWO DIMENSION STRUCTURE FRAMES

$r+b = 2n$ $r + b > 2n$ $D = r + b - 2n$ $r + b < 2n$

$\circlearrowright +\sum M = 0$ $\uparrow +\sum Fy = 0$ $\rightarrow +\sum F_x = 0$