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 II: 2025/2026

DCW30402: WOOD MECHANIC STRUCTURE 2

TARIKH : 07 MEI 2026
MASA : 8.30 PAG1 – 10.30 PAGI (2 JAM)

Kertas soalan ini mengandungi **LAPAN (8)** halaman bercetak.

Soalan Struktur (4 soalan)

Dokumen sokongan yang disertakan : Formula

JANGAN BUKA KERTAS SOALAN INI SEHINGGA DIARAHKAN

(CLO yang tertera hanya sebagai rujukan)

INSTRUCTION:

This section consists of **FOUR (4)** questions. Answers **ALL** questions.

ARAHAN:

*Bahagian ini mengandungi **EMPAT (4)** soalan. Jawab **SEMUA** soalan*

QUESTION 1

SOALAN 1

CLO1 (a) The parallel axis theorem relates the moment of inertia of a shape about an arbitrary axis to its moment of inertia about a Parallel Centroidal Axis. Define the principle of the Parallel Axis Theorem.

Teorem paksi selari mengaitkan momen inersia sesuatu bentuk tentang paksi arbitrari dengan momen inersianya mengenai Paksi Sentroid Selari. Nyatakan prinsip Teorem Paksi Selari.

[5 Marks]

[*5 Markah*]

CLO1 (b) Calculate the center position of the area for the shape in Figure 1(b).

Kira titik tengah bagi bentuk di dalan Rajah 1(b).

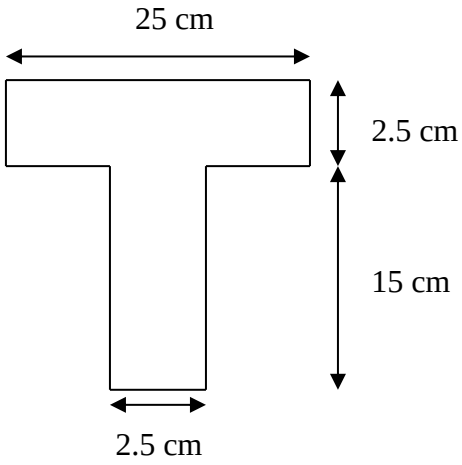


Figure 1(b) / *Rajah 1(b)*

[10 Marks]

[10 *Markah*]

CLO1 (c) A simply supported beam with a uniform distributed load of 15 N/mm in Figure 1(c) has a length of 2000 milimetres. Determine the maximum bending stress for a beam with a cross-section 30 mm wide and 70 mm deep. Draw the bending stress distribution diagram for this section.

Satu rasuk tupang mudah dengan beban teragih seragam, 15 N/mm di dalam Rajah 1(c) mempunyai panjang 2000 milimeter. Tentukan tegasan lentur maksimum bagi rasuk dengan keratan rentas 30 mm lebar dan 70 mm dalam. Lukis gambarajah agihan taburan tegasan untuk keratan ini.

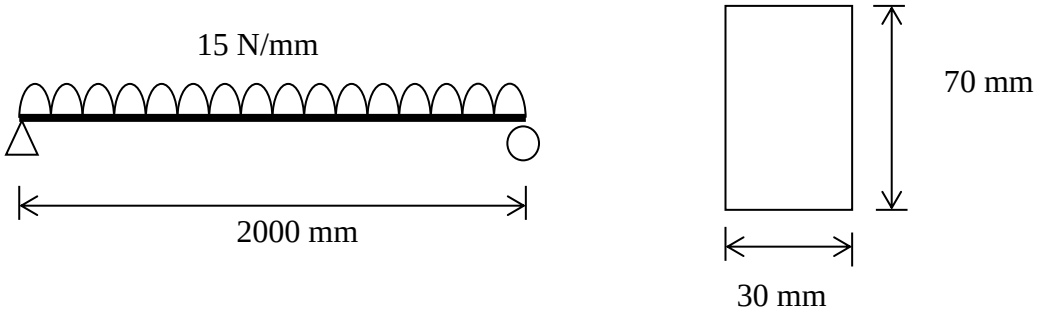


Figure 1(c) / *Rajah 1(c)*

[10 Marks]

[10 *Markah*]

QUESTION 2

SOALAN 2

CLO1 (a) A beam subjected to a load that causes slope and deflection. Sketch a table of sign conventions for bending moment, slope and deflection.

Sebuah rasuk menanggung beban yang menyebabkan berlakunya kecerunan dan pesongan. Lakar jadual yang menunjukkan tanda lazim bagi momen lentur, kecerunan dan pesongan.

[5 marks]

[5 *markah*]

CLO1

(b) By referring to Figure 2(b) below, if the reaction force at support A is 8.75 kN, using the moment area method. Determine slope and deflection at point B:
Berdasarkan Rajah 2(b) di bawah, jika daya tindakbalas pada sokong A adalah 8.75 kN, dengan menggunakan kaedah momen luas. Tentukan kecerunan dan pesongan pada titik B:

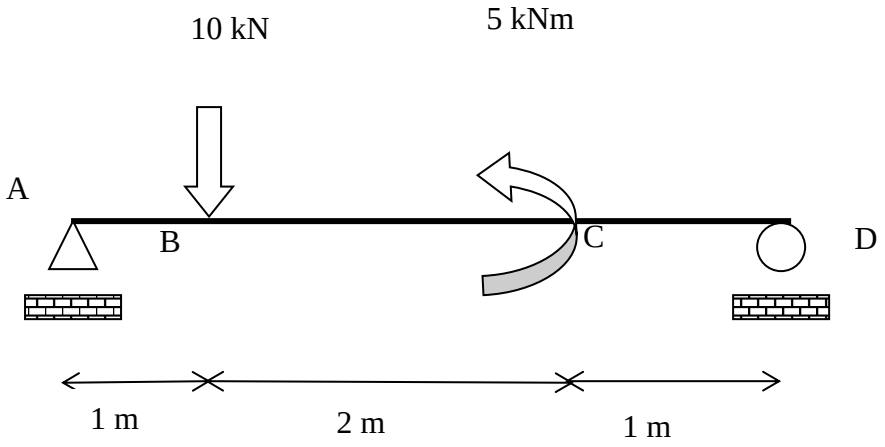


Figure 2(b) / *Rajah 2(b)*

[10 marks]
[*10 markah*]

(c) Based on the simply supported beam in Figure 2(c), calculate the deflection at point C using the section method.
Merujuk pada rauk tupang mudah di dalam Rajah 2(c), kira pesongan pada titik C menggunakan kaedah keratan.

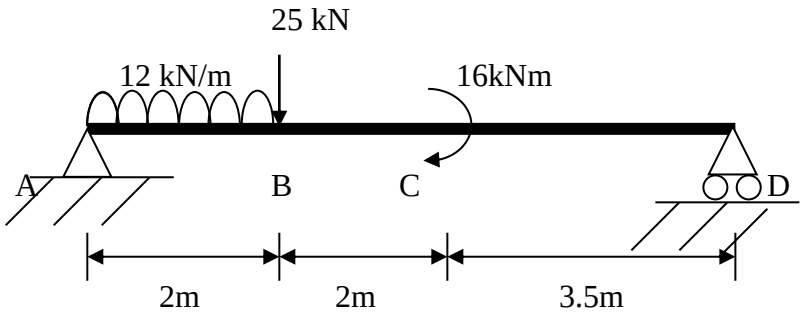


Figure 2(c) / *Rajah 2(c)*

[10 marks]
[*10 markah*]

QUESTION 3

SOALAN 3

CLO2

(a) A column with a height of 6 meters and dimensions of 80 mm x 12 mm is pinned at both ends. Given E = 2.0 x 10^5 N/mm^2. Determine:

Satu tiang 6 meter mempunyai dimensi 80 mm x 12 mm dipin pada kedua-dua hujung. Diberi E = 2.0 x 10^5 N/mm^2. Tentukan:

i. Slenderness ratio [7 marks]

i. Nisbah kelangsingan [7 *markah*]

ii. Critical Euler load [3 marks]

ii. Beban Euler kritikal [3 *markah*]

(b) A column is a long, slender bar under axial compression. The term 'column' is often used to describe a vertical member. Explain **TWO (2)** types of column failure.

*Tiang adalah satu bar yang panjang serta langsing di bawah tindakan mampatan paksi. Sebutan tiang sering kali digunakan untuk menerangkan satu anggota menegak. Terangkan **DUA (2)** jenis kegagalan tiang.*

[5 marks]

[*5 markah*]

(c) Figure 3(c) shows T-beam section of 5 m long. The column carries 800 kN of load. Given e = 5 mm, Iyy = 841.66 x 10^3 mm^4. Determine load critical if both ends are hinged.

Rajah 3(c) menunjukkan rasuk berkeratan T dengan panjang 5 m. Tiang membawa beban 800 kN. Diberi e=5 mm, Iyy = 841.66 x 10^3 mm^4 . Tentukan beban kritikal jika kedua-dua hujung terikat.

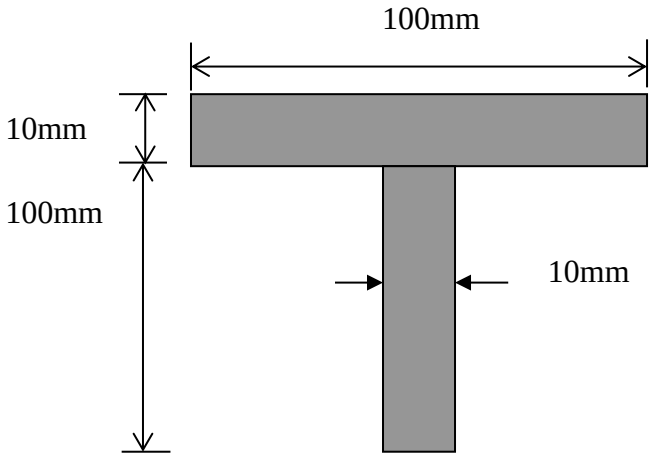


Figure 3(c) / *Rajah 3(c)*

[10 marks]
[*10 markah*]

QUESTION 4

SOALAN 4

CLO2 (a) Calculate the magnitude and types of forces in truss members in Figure 4(a) using the method of joints.

Kira magnitud dan jenis daya dalam anggota kekuda di dalam Rajah 4(a) dengan menggunakan kaedah sendi.

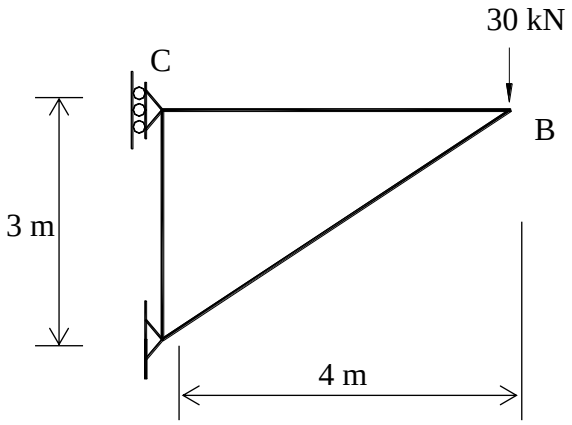


Figure 4(a) / *Rajah 4(a)*

[10 marks]
[*10 markah*]

CLO2 (b) A frame structure is an arrangement or series of main elements that form the basic framework of a building. Classify the truss in Figure 4(b) as stable or unstable.

Struktur kerangka adalah susunan atau rangkaian elemen-elemen utama yang membentuk kerangka dasar suatu bangunan. Kelaskan kerangka di dalam Rajah 4(b) stabil atau tidak stabil.

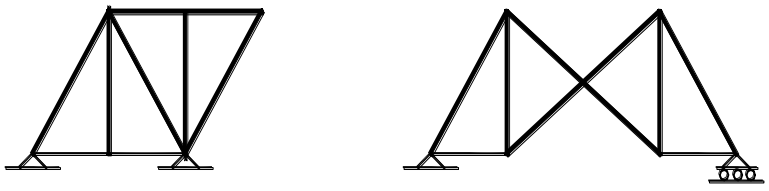


Figure 4(b) /*Rajah 4(b)*

[5 marks]
[*5 markah*]

CLO2

(b) Using the joint method, calculate the magnitude and internal force for the truss in Figure 4(c).

Menggunakan kaedah sambungan, kira magnitud dan daya dalaman bagi kerangka di dalam Rajah 4(c).

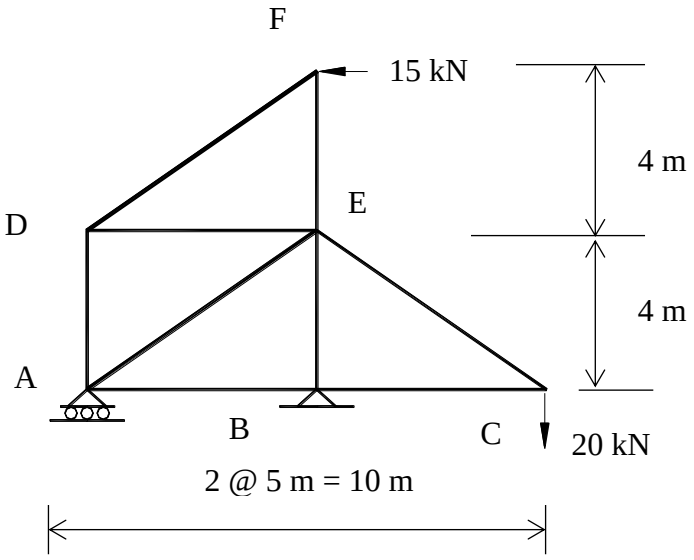


Figure 4(c) / *Rajah 4(c)*

[10 marks]

[*10 markah*]

SOALAN TAMAT

FORMULA DCW 30402

CENTROID AND SECOND MOMENT OF AREA

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

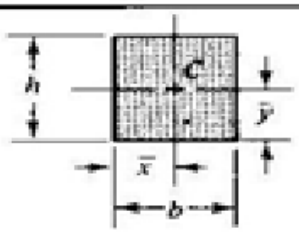
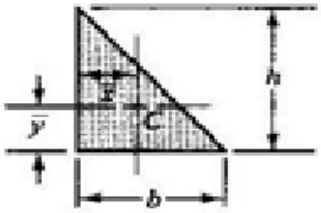
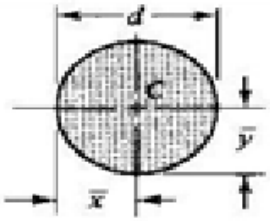
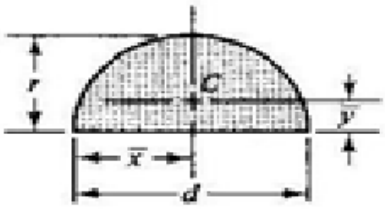
Shapes		Area	$\overline{x}$	$\overline{y}$
Rectangle		bh	$\frac{b}{2}$	$\frac{h}{2}$
Triangle		$\frac{bh}{2}$	$\frac{b}{3}$	$\frac{h}{3}$
Circle		$\frac{\pi d^2}{4}$	$\frac{d}{2}$	$\frac{d}{2}$
Semi- circle		$\frac{\pi d^2}{8}$	$\frac{d}{2}$	$\frac{4r}{3\pi}$

TABLE 1: Centroid of Simple Geometric Shape

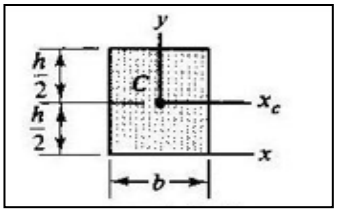
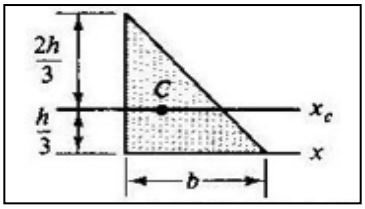
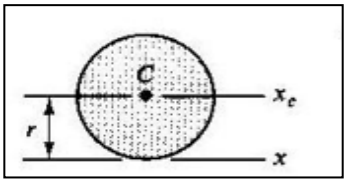
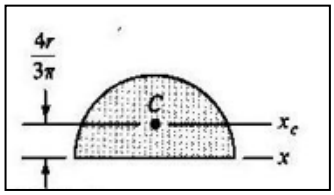
Shape		I_{xx}	I_{yy}
Rectangle		$\frac{bh^3}{12}$	$\frac{hb^3}{12}$
Triangle		$\frac{bh^3}{36}$	$\frac{hb^3}{36}$
Cricle		$\frac{\Pi d^4}{64}$	$\frac{\Pi d^4}{64}$
Semicircle		$0.11r^4$	$0.11r^4$

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

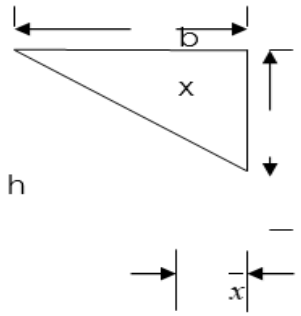
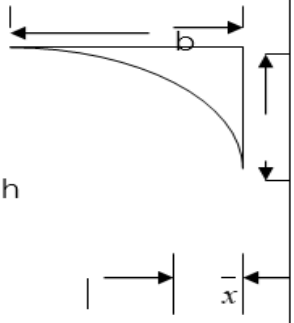
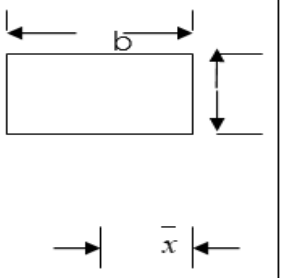
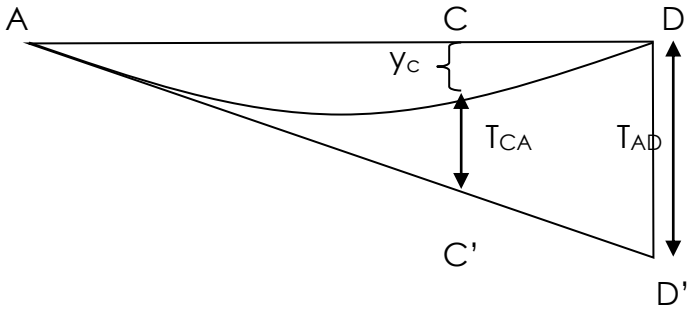
Shape	Triangle	Parabolic	Square
			
Area A	$\frac{1}{2}bh$	$\frac{1}{3}bh$	$\frac{1}{4}bh$
Centroid $\bar{x}$	$\frac{1}{3}b$	$\frac{1}{4}b$	$\frac{1}{2}b$

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

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

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

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

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

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

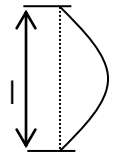
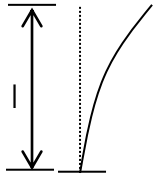
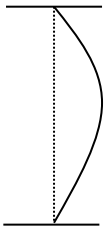
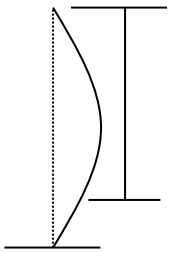
Kes	Bentuk	Panjang berkesan	Beban Genting
4.4.1		L =l	$P_E = \frac{\pi^2 EI}{L^2}$
4.4.2		L = 2l	$P_E = \frac{\pi^2 EI}{L^2}$
4.4.3		$L = \frac{l}{2}$	$P_E = \frac{\pi^2 EI}{L^2}$
4.4.4		$L = \frac{l}{\sqrt{2}}$	$P_E = \frac{\pi^2 EI}{L^2}$

TABLE 4: Effective Length and Critical

TWO DIMENSION STRUCTURE FRAMES

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