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

DCC30373 : STRUCTURAL MECHANICS

TARIKH : 5 DISEMBER 2025
MASA : 3.00 PETANG – 5.00 PETANG (2 JAM)

Kertas soalan ini mengandungi **SEPULUH (10)** halaman bercetak.

Subjektif (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)** subjective questions. Answer **ALL** questions.

ARAHAN:

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

QUESTION 1

SOALAN 1

CLO1 (a) A beam is a structural element that is functioned to primarily resist loads that are applied laterally across the beam's axis. Describe **TWO (2)** types of beams with the aid of a diagram.

*Rasuk ialah elemen struktur yang berfungsi untuk menahan beban yang dikenakan secara melintang pada paksi rasuk. Huraikan **DUA (2)** jenis rasuk dengan bantuan gambarajah.*

[8 marks]

[*8 markah*]

CLO1 (b) A steel rod has a length of 5m carrying 25kN force. If the reduction of rod does not exceed 0.8mm and modulus of elasticity is 206kN/m^2, determine cross section area, compression stress and strain of rod.

Sebatang rod keluli mempunyai panjang 5m membawa beban 25kN. Jika pemendekan rod yang berlaku tidak melebihi 0.8mm dan modulus keanjalan sebanyak 206kN/m^2, tentukan luas keratan, tegasan mampatan dan terikan bagi rod.

[10 marks]

[*10 markah*]

CLO1 (c) A beam is subjected to a set of loads as shown in Figure 1(c), calculates the reaction force in every support.

Sebuah rasuk dikenakan beban-beban seperti dalam Rajah 1(c), kirakan daya tindakbalas pada setiap penyokong.

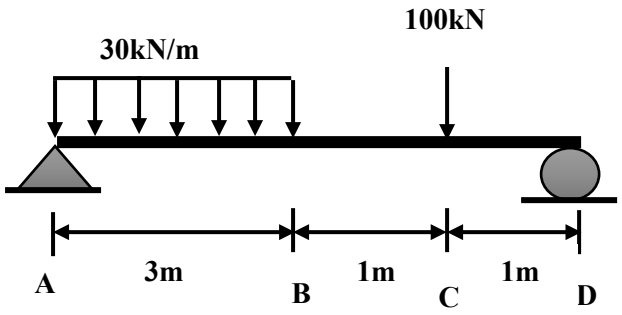


Figure 1(c) / *Rajah 1(c)*

[7 marks]

[*7 markah*]

QUESTION 2

SOALAN 2

CLO1 (a) The cantilevered beam in Figure 2(a) is embedded into a fixed vertical wall at A. Identify the free body diagram of the beam along with the known and the unknown forces.

Rasuk julur seperti dalam Rajah 2(a) dipasang kedalam dinding menegak secara terikat pada titik A. Kenal pasti rajah jasad bebas rasuk beserta daya yang diketahui dan tidak diketahui.

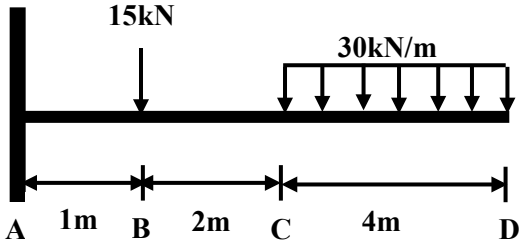


Figure 2(a) / *Rajah 2(a)*

[5 marks]

[*5 markah*]

CLO1 (b) A simply supported beam is loaded to uniformly distributed load, point load and moment load as shown in Figure 2(b). Calculate reaction force at support A and support E.

Rasuk yang disokong mudah dikenakan beban teragih seragam, beban tumpu dan beban momen seperti Rajah 2(b). Kirakan daya tindak balas pada sokong A dan sokong E.

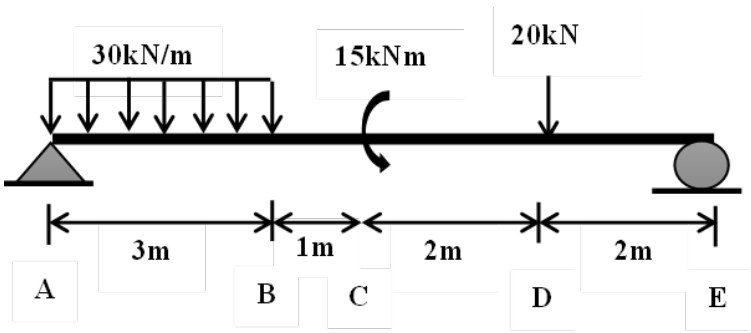


Figure 2(b) / *Rajah 2(b)*

[10 marks]

[*10 markah*]

CLO2 (c) A simply supported beam with a shear force diagram is as shown in Figure 2(c). Based on the shear force diagram, illustrate the bending moment diagram with its value at each point in the diagram.

Rasuk yang disokong mudah beserta gambar rajah daya ricih adalah seperti Rajah 2(c), Berdasarkan gambarajah daya ricih, lakarkan rajah momen lentur dengan nilainya pada setiap titik daripada rajah tersebut.

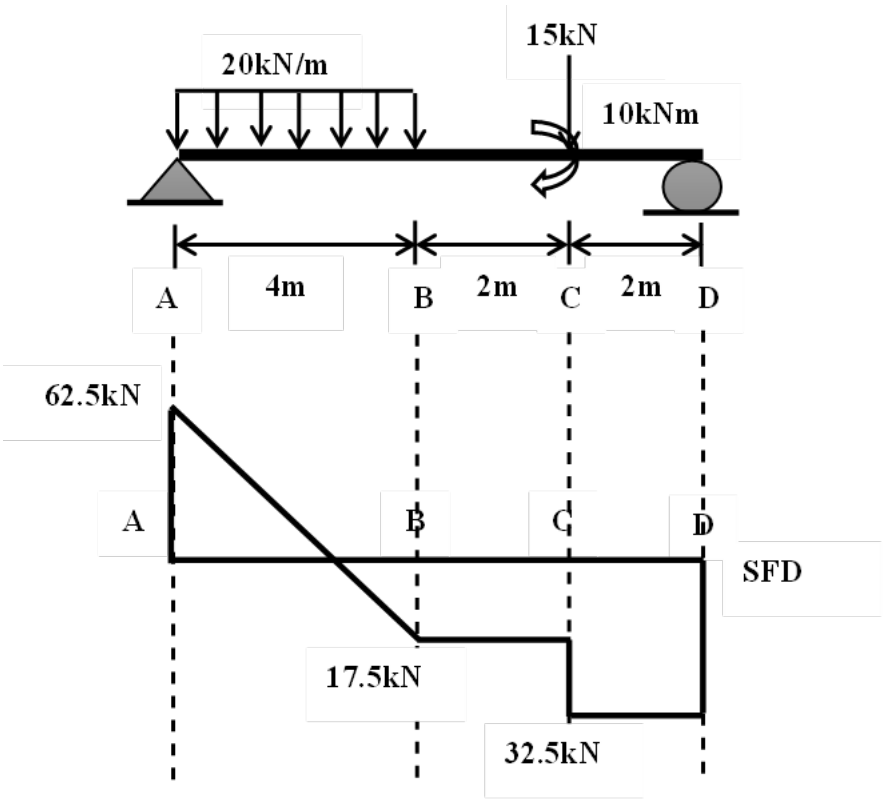


Figure 2(c) / *Rajah 2(c)*

[10 marks]

[*10 markah*]

QUESTION 3

SOALAN 3

CLO2 (a) Two rivets are used to connect three steel plates as shown in Figure 3(a). The rivets used can withstand a force of 70kN and the shear stress in the rivet is 160MN/m^2. Determine the diameter of the rivet.

Dua rivet digunakan untuk menyambung tiga plat keluli seperti yang ditunjukkan Rajah 3(a). Rivet yang digunakan boleh menahan daya sebanyak 70kN dan tegasan ricih dalam rivet ialah 160MN/m^2. Tentukan diameter rivet.

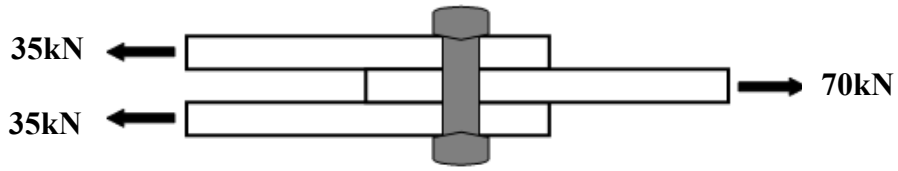


Figure 3(a) / *Rajah 3(a)*

[5 marks]

[*5 markah*]

CLO2 (b) A Figure 3(b) shows a beam of L section. Calculate the second moment of area with the horizontal axis passing through the centroid of the section.

Rajah 3(b) menunjukkan satu rasuk keratan L. Kirakan momen luas kedua dengan paksi mengufuk melalui sentroid bahagian keratan berkenaan.

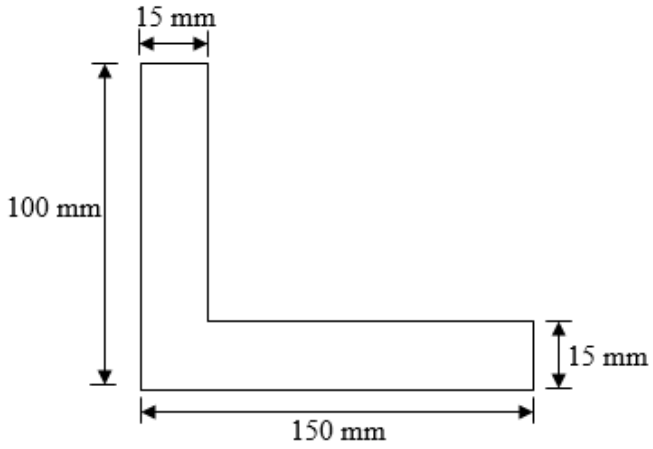


Figure 3(b) / *Rajah 3(b)*

[8 marks]

[*8 markah*]

CLO2 (c) A T-section simply supported beam is subjected to a point load and a uniformly distributed load as shown Figure 3(c). Given neutral axis, read from the bottom is 75.38mm and second moment of area is 3.57×10^6 mm^4. Illustrate the bending stress distribution diagram and its value for the beam.

Satu rasuk sokong mudah berkeratan T dikenakan beban tumpu dan beban teragih seragam seperti ditunjukkan dalam Rajah 3(c). Diberi paksi neutral dibaca dari bawah adalah 75.38mm dan momen luas kedua 3.57×10^6 mm^4. Lakarkan rajah taburan tegasan lentur berserta nilainya bagi rasuk berkenaan.

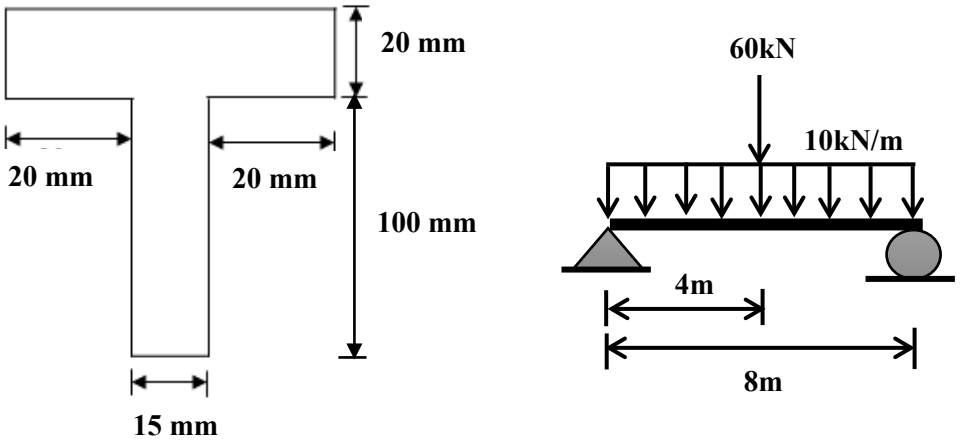


Figure 3(c) / *Rajah 3(c)*

[12 marks]

[*12 markah*]

QUESTION 4

SOALAN 4

CLO2 (a) A rectangular beam 200mm wide and 300mm depth as shown in Figure 4(a) are subjected to a maximum shear force of 100kN. Determine shear stress at a distance of 100mm above the neutral axis.

Rasuk segiempat tepat 200mm lebar dan 300mm tinggi seperti dalam Rajah 4(a) dikenakan tegasan ricih maksimum 100kN. Tentukan daya ricih pada jarak 100mm di atas paksi neutral.

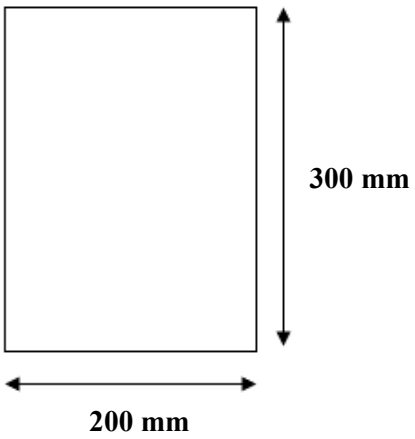


Figure 4(a) / *Rajah 4(a)*

[5 marks]

[*5 markah*]

CLO2 (b) A symmetrical I-section beam as shown in Figure 4(b) is subjected to a shear force of 60kN. Given neutral axis is 75mm and second moment of area is $2.387\times 10^7 mm^4$. Calculate the shear stress at the flange, junction of the web and neutral axis.

Satu rasuk simetri berkeratan I seperti dalam Rajah 4(b) dikenakan daya ricih 60kN. Diberi paksi neutral adalah 75mm dan momen luas kedua adalah $2.387\times 10^7 mm^4$. *Kirakan tegasan ricih pada bebibir, persimpangan web dan paksi neutral.*

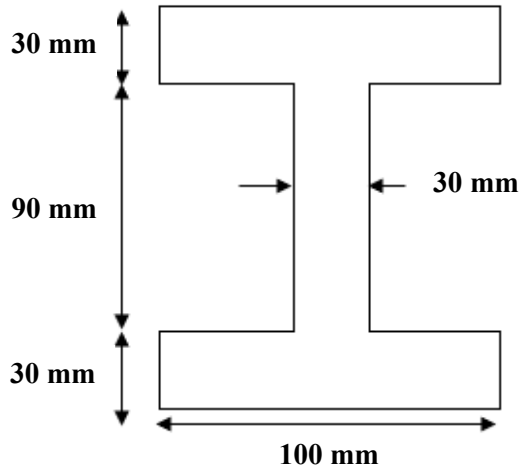


Figure 4(b) / *Rajah 4(b)*

[8 marks]

[*8 markah*]

CLO2

(c) A simply supported beam is subjected to a point load and a uniformly distributed load as shown Figure 4(c). Calculate the slope and the deflection at point C by using Macaulay Method in term of EI.

Satu rasuk sokong mudah dikenakan satu beban tumpu dan satu beban teragih seragam seperti dalam Rajah 4(c). Kirakan kecerunan dan pesongan rasuk pada titik C dengan menggunakan kaedah Macaulay dalam sebutan EI.

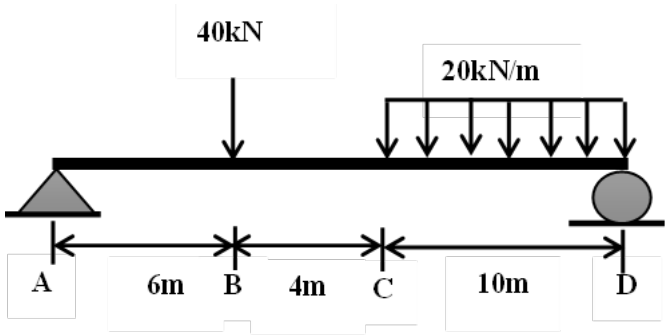


Figure 4(c) / *Rajah 4(c)*

[12 marks]

[*12 markah*]

SOALAN TAMAT

LIST OF FORMULA FOR DCC30373 STRUCTURAL MECHANICS

1.	$\sigma = \frac{P}{A}$	6.	$I_{yy} = \frac{hb^3}{12} + Ad^2$
2.	$\varepsilon = \frac{\delta l}{l}$	7.	$\sigma = \frac{M}{I} x\, y$
3.	$E = \frac{\sigma}{\varepsilon}$	8.	$\tau = \frac{V}{A}$
4.	$E = \frac{PL}{A\delta l}$	9.	$\tau = \frac{V}{2nA}$
5.	$I_{xx} = \frac{bh^3}{12} + Ad^2$	10.	$\tau = \frac{VA\bar{y}}{I_x b}$

Table 1: MAXIMUM BENDING MOMENT FORMULA

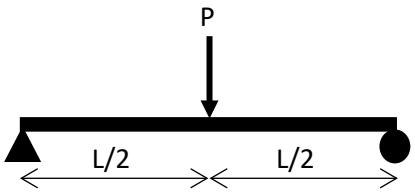
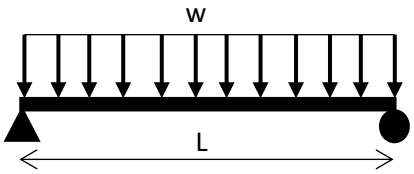
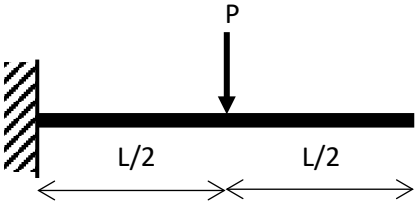
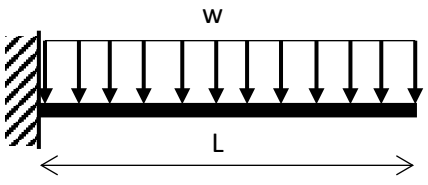
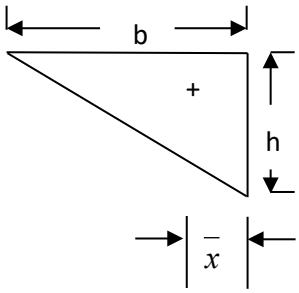
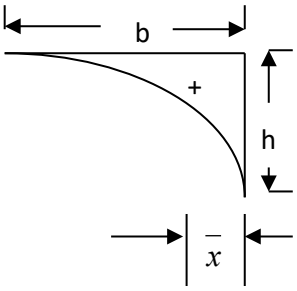
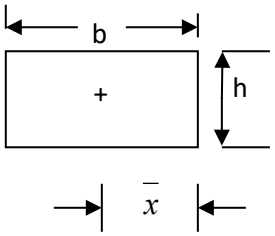
Beam with Specific Load	Maximum Moment
	$\frac{PL}{4}$
	$\frac{wL^2}{8}$
	$\frac{PL}{2}$
	$\frac{wL^2}{2}$

Table 2: GEOMETRIC PROPERTIES OF AREA

Shape	Triangle	Parabola	Rectangle
			
Area, A	$\frac{1}{2}bh$	$\frac{1}{3}bh$	bh
Centroid, $\bar{x}$	$\frac{1}{3}b$	$\frac{1}{4}b$	$\frac{1}{2}b$