



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

DCC20053 : MECHANICS OF CIVIL ENGINEERING STRUCTURE

TARIKH : 05 MEI 2026

MASA : 2.30 PETANG - 4.30 PETANG (2 JAM)

Kertas soalan ini mengandungi **TIGA BELAS (13)** halaman bercetak.

Bahagian A: Subjektif (2 soalan)

Bahagian B: Subjektif (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)** subjective questions. Answer **ALL** questions.

ARAHAN:

Bahagian ini mengandungi **DUA (2)** soalan subjektif. Jawab **SEMUA** soalan.

QUESTION 1**SOALAN 1**

- CLO1 (a) Supports are constructions that incorporate beams, columns, and other components to sustain a load. Identify **THREE (3)** types of support and their internal reactions direction using appropriate diagrams.

*Penupang ialah binaan yang menggabungkan rasuk, tiang dan komponen lain untuk menanggung beban. Kenal pasti **TIGA (3)** jenis penupang dan arah tindak balas dalamannya dengan menggunakan gambar rajah yang bersesuaian.*

[5 marks]

[5 markah]

- CLO1 (b) Based on the loaded cantilever beam as shown in Figure A1(b). Calculate all the reaction forces at support A.

Berdasarkan kepada rasuk julur yang dikenakan beban seperti dalam Rajah A1(b). Kirakan semua semua daya tindak balas pada penyokong A.

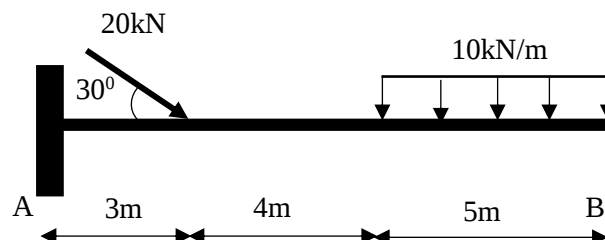


Figure A1(b) / Rajah A1(b)

[10 marks]

[10 markah]

- CLO1 (c) A composite bar with three material components is applied a tensile load of 30kN. The first component is a copper bar, the second component is a steel bar, and the third component is an aluminum bar. Copper bar has a rectangular cross section area of 20mm x 20mm. Steel bar is a rounded bar with 17mm in diameter while aluminium bar is rectangular cross section area of 30mm x 40mm. Determine the elongation of the complex bar as shown in Figure A1(c).

Given, $E_{\text{copper}} = 110\text{kN/mm}^2$; $E_{\text{steel}} = 210\text{kN/mm}^2$; $E_{\text{aluminium}} = 90\text{kN/mm}^2$.

Bar kompleks dengan tiga komponen bahan dikenakan beban tegangan 30kN. Komponen pertama ialah bar tembaga, komponen kedua ialah bar keluli dan komponen ketiga ialah bar aluminium. Bar tembaga mempunyai luas keratan rentas segi empat tepat 20mm x 20mm. Bar keluli ialah bar bulat dengan diameter 17mm manakala bar aluminium ialah luas keratan rentas segi empat tepat 30mm x 40mm. Tentukan pemanjangan bar kompleks seperti yang ditunjukkan pada Rajah A1(c).
Diberi, $E_{\text{tembaga}} = 110\text{kN/mm}^2$; $E_{\text{keluli}} = 210\text{kN/mm}^2$; $E_{\text{aluminium}} = 90\text{kN/mm}^2$.

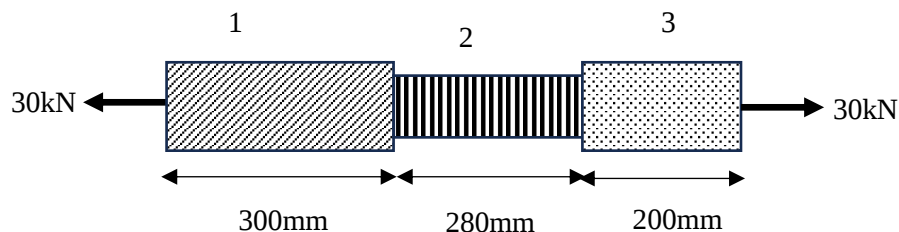


Figure A1(c) / Rajah A1(c)

[10 marks]

[10 markah]

QUESTION 2

SOALAN 2

- CLO1 (a) (i) Explain **FIVE (5)** the simple bending theory in bending stress.

*Terangkan **LIMA (5)** teori lenturan mudah dalam tegasan lentur.*

[5 marks]

[5 markah]

- CLO1 (ii) Figure A2(a)ii shows a T sectional beam. Calculate the centroid of the section at y-axis and x-axis.

Rajah A2(a)ii menunjukkan rasuk berkeratan T. Kirakan sentroid keratan pada paksi-y dan paksi-x.

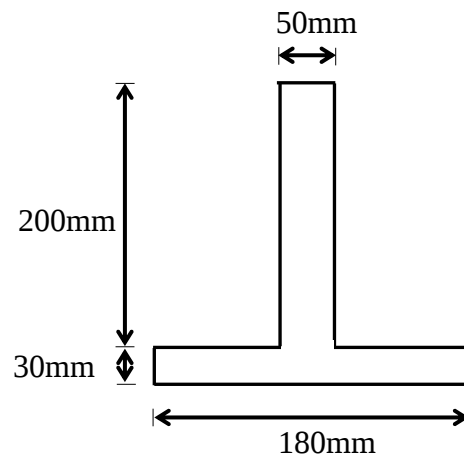


Figure A2(a)ii / Rajah A2(a)ii

[8 marks]

[8 markah]

- CLO1 (b) Two pieces of iron plate fasten the wooden board by using bolts of 12mm diameter as shown in Figure A2(b). Wooden board was then pulled by a shear force of 200kN. Determine the shear stress that occur in each bolt.

Dua keping plat besi mengikatkan papan kayu dengan menggunakan bolt berdiameter 12mm seperti yang ditunjukkan dalam Rajah A2(b). Papan kayu kemudiannya ditarik dengan daya ricih 200kN. Tentukan tegasan ricih yang berlaku dalam setiap bolt.

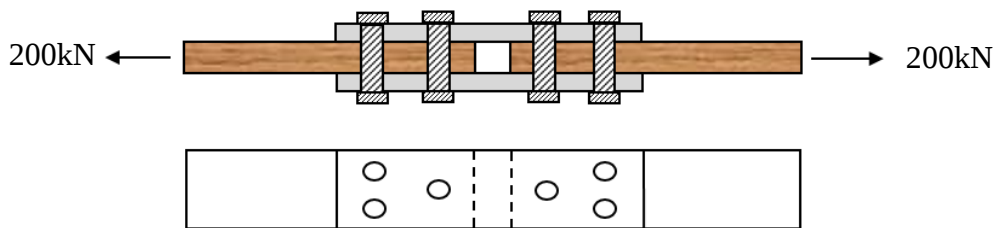


Figure A2(b) / Rajah A2(b)

[6 marks]

[6 markah]

- CLO1 (c) By using Macaulay's method, Construct the deflection equation for a simply supported beam subjected to a point load and uniformly distributed load as shown in Figure A2(c). Given value of reaction, $A_y = 95.625\text{kN}$.

Dengan menggunakan kaedah Macaulay, bina persamaan pesongan bagi rasuk sokong mudah yang dikenakan beban titik dan beban teragih seragam seperti yang ditunjukkan dalam Rajah A2(c). Diberi nilai daya tindakbalas $A_y = 95.625\text{kN}$.

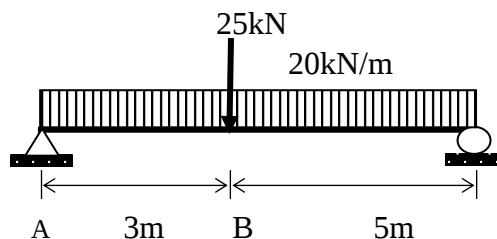


Figure A2(c) / Rajah A2(c)

[6 marks]

[6 markah]

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 struktur. Jawab **DUA (2)** soalan sahaja.

QUESTION 1**SOALAN 1**

- CLO2 (a) Describe the difference between statically determinate beam and statically indeterminate beam with the aid of a diagram.

Huraikan perbezaan antara rasuk boleh tentu statik dan rasuk tidak boleh tentu statik dengan bantuan gambarajah.

[5 marks]

[5 markah]

- CLO2 (b) A cantilever beam is subjected to a load as shown in Figure B1(b). With the aid of free body diagram, calculate the reaction forces in each support.

Sebuah rasuk julur dikenakan beban seperti dalam Rajah B1(b). Dengan bantuan gambarajah jasad bebas, kirakan daya tindakbalas pada setiap penyokong.

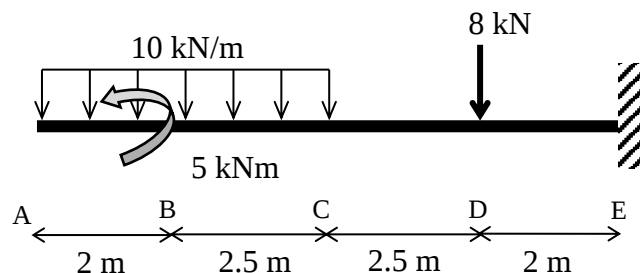


Figure B1(b) / Rajah B1(b)

[10 marks]

[10 markah]

- CLO2 (c) An overhanging beam is loaded as shown in Figure B1(c). Given the reaction forces at support A and C are 76.07kN and 118.93kN respectively. Calculate the shear force and bending moment value with shear force diagram (SFD) and bending moment diagram (BMD).

Sebuah rasuk jantai dikenakan beban seperti dalam Rajah B1(c). Diberi daya tindak balas di penyokong A dan C adalah masing-masing 76.07kN dan 118.93kN. Kirakan nilai daya ricih dan momen lentur berserta dengan gambarajah daya ricih (GDR) dan gambarajah moment lentur (GML).

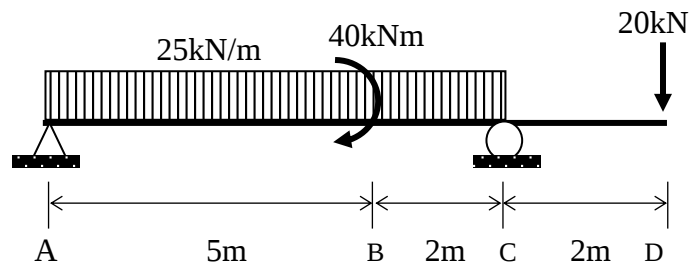


Figure B1(c) / Rajah B1(c)

[10 marks]

[10 markah]

QUESTION 2

SOALAN 2

- CLO2 (a) Table B2(a) show the dimension of the T beam section to the x -axis. Identify the position of the neutral axis from the bottom section of the beam.

Jadual B2(a) menunjukkan dimensi sebuah rasuk berkeratan rentas T terhadap paksi-x. Kenal pasti kedudukan paksi neutral dari bahagian keratan bawah rasuk.

Table B2(a) / *Jadual B2(a)*

Component <i>Komponen</i>	Size <i>Saiz</i>
Top flange <i>Bebibir atas</i>	300 mm x 40 mm
Web <i>Web</i>	50 mm x 200 mm

[5 marks]

[5 markah]

- CLO2 (b) A simply supported steel beam with 4m length is subjected to uniformly distributed load of 25kN/mm as shown in Figure B2(b). Calculate the second moment area of the beam.

Satu rasuk keluli disokong mudah dengan panjang 4m menanggung beban teragih seragam sebanyak 25kN/mm seperti yang ditunjukkan dalam Rajah B2(b). Kirakan luas momen kedua bagi rasuk tersebut.

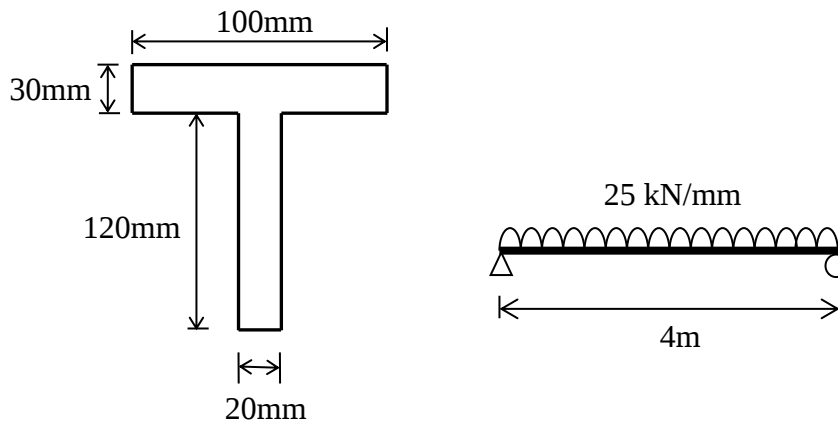


Figure B2(b) / Rajah B2(b)

[10 marks]

[10 markah]

- CLO2 (c) Using the answer from question 2(b), illustrate the maximum bending stress distribution diagram across the section with the value of maximum bending stress (tensile and compression).

Dengan menggunakan jawapan dari soalan 2(b), lakarkan taburan tegasan lentur maksimum merentasi keratan dengan nilai tegasan lentur maksimum (tegangan dan mampatan).

[10 marks]

[10 markah]

QUESTION 3

SOALAN 3

CLO2

- (a) Three steel plates are joined by four rivets as shown in Figure B3(a). Identify the minimum diameter of the rivet if the shear stress in the rivet does not exceed 200MPa.

*Tiga plat besi dihubungkan oleh empat rivet seperti ditunjukkan dalam Rajah B3(a).
Kenal pasti diameter minimum rivet jika tegasan ricih dalam rivet tidak melebihi 200MPa.*

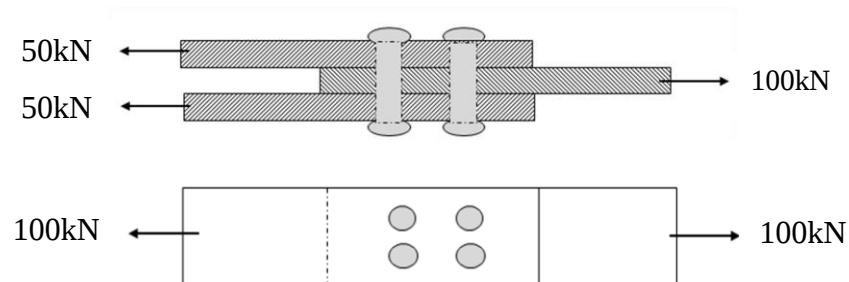


Figure B3(a) / Rajah B3(a)

[5 marks]

[5 markah]

CLO2

- (b) A T section beam 100mm x 160mm has a web thickness of 10mm and a flange thickness of 10mm as shown in Figure B3(b) is subjected to a shear force of 25kN. Calculate the shear stress at point A, B, C, D and E. Given $\bar{y} = 107\text{mm}$ and $I_{xx} = 6.66 \times 10^6 \text{ mm}^4$.

Satu keratan rasuk T 100mm x 160mm mempunyai ketebalan web 10mm dan ketebalan berbibir 10mm seperti yang ditunjukkan dalam Rajah B3(b) dikenakan daya ricih sebanyak 25kN. Kirakan tegasan ricih pada titik A, B, C, D dan E. Diberi $\bar{y} = 107\text{mm}$ and $I_{xx} = 6.66 \times 10^6 \text{ mm}^4$.

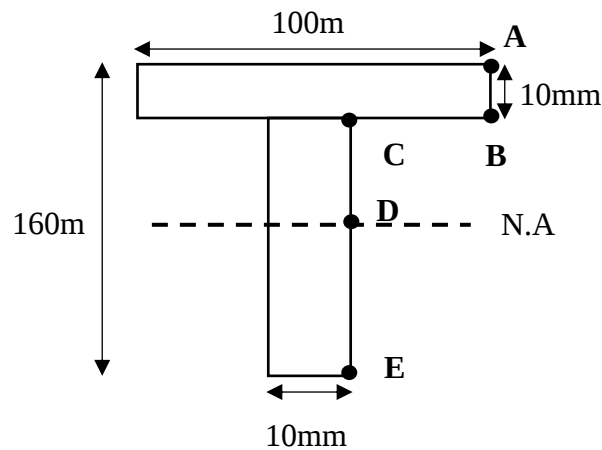


Figure B3(b) / Rajah B3(b)

[10 marks]

[10 markah]

CLO2

- (c) Using the answer from question 3(b), illustrate the shear stress distribution diagram for the T section beam.

Berdasarkan jawapan soalan 3(b), lakarkan gambarajah taburan tegasan ricih bagi rasuk berkeratan T.

[10 marks]

[10 markah]

QUESTION 4

SOALAN 4

- CLO2 (a) A simply supported beam is subjected to a uniformly distributed load $W\text{ N/m}$ in the middle of the span as shown in Figure B4(a). By using Macaulay's method, show the moment equation, $EI \frac{d^2y}{dx^2}$ when the beam cut at $x-x$.

Rasuk disokong mudah dikenakan beban teragih seragam $W\text{ N/m}$ di tengah-tengah rentang seperti yang ditunjukkan pada Rajah B4(a). Menggunakan kaedah Macaulay, tunjukkan persamaan momen, $EI \frac{d^2y}{dx^2}$ apabila rasuk dikerat pada $x-x$.

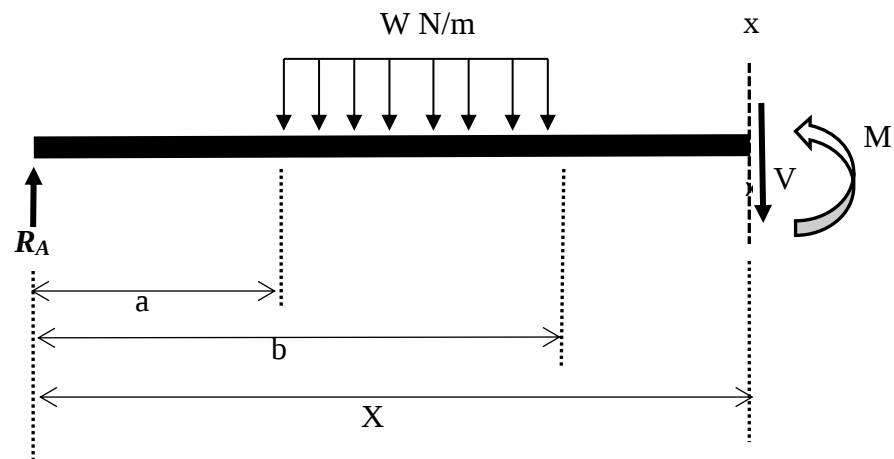


Figure B4(a) / Rajah B4(a)

[5 marks]

[5 markah]

- CLO2 (b) By using Macaulay's method, determine the slope and deflection equation for beam as shown in Figure B4(b). Given reaction forces $A_y = 18.125 \text{ kN}$.

Dengan menggunakan kaedah Macaulay, tentukan persamaan kecerunan dan pesongan rasuk seperti yang ditunjukkan dalam Rajah B4(b). Diberi daya tindak balas $A_y = 18.125 \text{ kN}$.

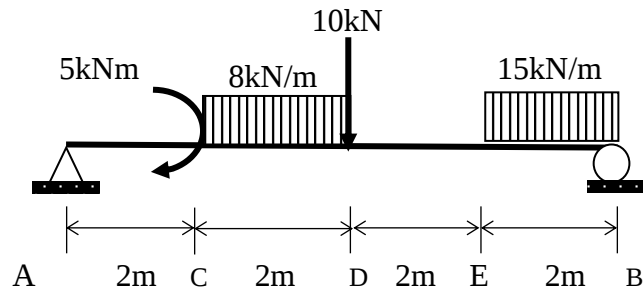


Figure B4(b) / Rajah B4(b)

[10 marks]

[10 markah]

- CLO2 (c) Using the answer from question 4(b), calculate the slope and deflection at 3m from point A. Given that $EI = 260 \times 10^7 \text{ kNmm}^2$.

Dengan menggunakan menggunakan jawapan dari Soalan 4(b), Kirakan nilai kecerunan dan pesongan pada 3m dari point A. Diberikan $EI = 260 \times 10^7 \text{ kNmm}^2$.

[10 marks]

[10 markah]

SOALAN TAMAT