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

DCC20053 : MECHANIC OF CIVIL ENGINEERING STRUCTURES

TARIKH : 25 NOVEMBER 2025
MASA : 8.30 PAGI – 10.30 PAGI (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)

SULIT

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) With the aid of a diagram, explain pinned support.

Dengan bantuan lakaran gambarajah, terangkan sokongan pin.

[5 marks]

[*5 markah*]

CLO1 (b) A simply supported beam AB 9m long carries a point load, uniformly distributed load and moment as shown in Figure A1(b). With the aid of a free body diagram, find the reaction force at each support.

Rasuk disokong mudah AB mempunyai jarak rentang sepanjang 9m membawa beban tumpu, beban teragih seragam dan momen seperti Rajah A1(b). Dengan bantuan gambarajah jasad bebas, dapatkan nilai daya tindakbalas pada setiap penyokong.

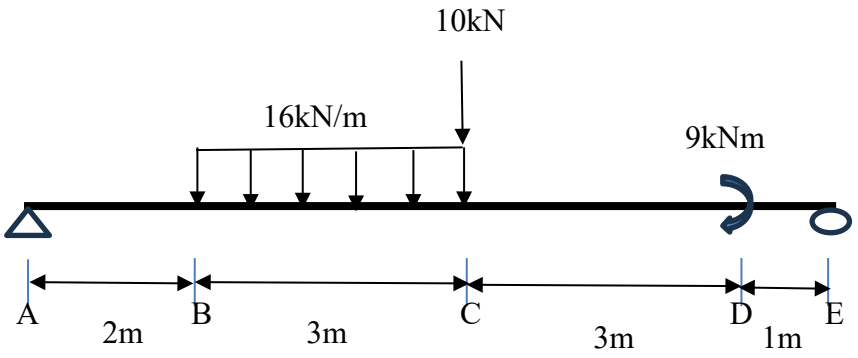


Figure A1(b) / *Rajah A1(b)*

[10 marks]

[*10 markah*]

CLO1 (c) An automobile component shown in Figure A1(c) is subjected to a tensile load of 180kN. Determine the total elongation of the component if its Modulus of Elasticity is 200GPa.

Komponen kereta seperti yang ditunjukkan dalam Rajah A1(c) dikenakan daya tegangan sebanyak 180kN. Tentukan jumlah pemanjangan komponen jika Modulus Keanjalannya ialah 200GPa.

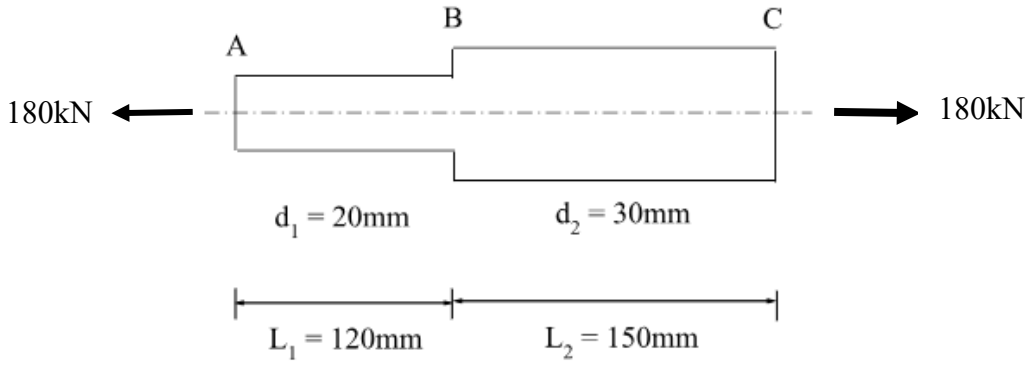


Figure A1(c) / *Rajah A1(c)*

[10 marks]

[*10 markah*]

QUESTION 2

SOALAN 2

CLO1 (a) Figure A2(a) shows a T-section beam.

Rajah A2(a) menunjukkan rasuk berkeratan T.

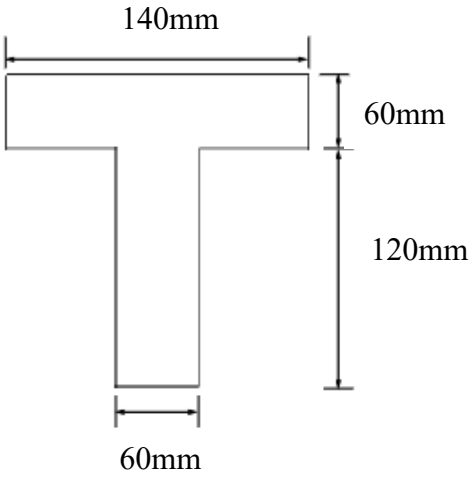


Figure A2(a) / *Rajah A2(a)*

From Figure A2(a);

Daripada Rajah A2(a),

i. Identify the centre of gravity for the T-section beam.

Kenalpasti pusat graviti bagi rasuk berkeratan T.

[5 marks]

[*5 markah*]

ii. Calculate the moment of inertia T-section beam.

Kirakan momen luas kedua bagi rasuk berkeratan T.

[8 marks]

[*8 markah*]

CLO1 (b) Figure A2(b) shows three steel plates are connected by a rivet of 25mm diameter. Calculate the shear stress in the rivet if the tensile load is 90kN.

Rajah A2(b) menunjukkan tiga keping plat keluli yang disambung dengan menggunakan rivet bergarispusat 25mm. Kirakan tegasan ricih yang berlaku dalam rivet jika daya tegangan ialah 90kN.

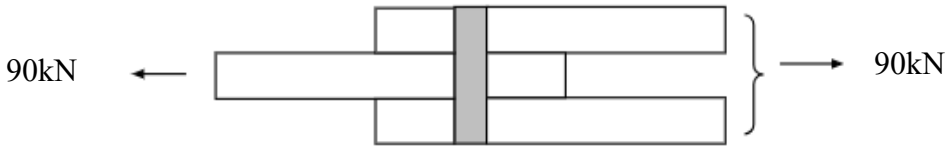


Figure A2(b) / *Rajah A2(b)*

[6 marks]

[*6 markah*]

CLO1 (c) Figure A2(c) shows a simply supported beam subjected to a point load, a uniformly distributed load and a moment. Given R_{Ay} = 32.5kN and R_{By} = 35.5kN. By using Macaulay Method, construct the equations for bending moment, slope and deflection.

Rajah A2(c) menunjukkan rasuk disokong mudah dikenakan beban tumpu, beban teragih seragam dan momen. Diberi R_{Ay} = 32.5kN dan R_{By} = 35.5kN Dengan menggunakan Kaedah Macaulay, binakan persamaan momen lentur, persamaan kecerunan dan persamaan pesongan.

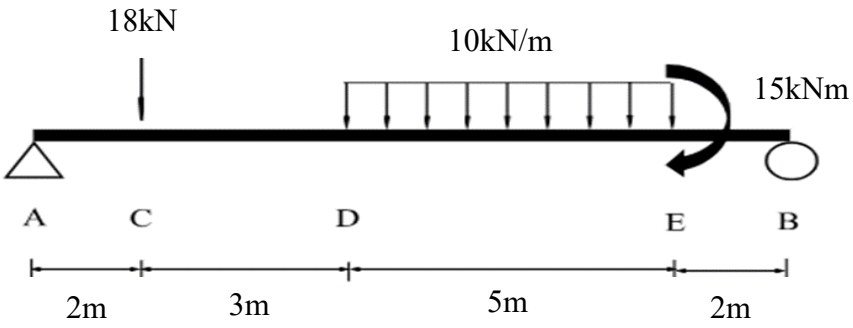


Figure A2(c) / *Rajah A2(c)*

[6 marks]

[*6 markah*]

SECTION B: 50 MARKS

BAHAGIAN B: 50 MARKAH

INSTRUCTION:

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

ARAHAN:

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

QUESTION 1

SOALAN 1

A cantilever beam is loaded as shown in Figure B1(a).

Rasuk julur dikenakan beban seperti yang ditunjukkan dalam Rajah B1(a).

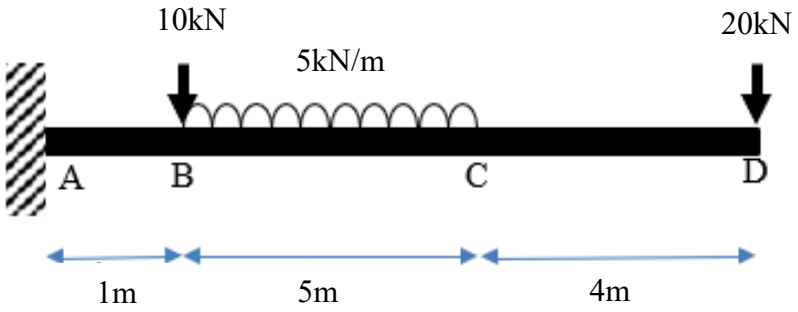


Figure B1 / *Rajah B1*

CLO2 (a) Identify the reaction force for support A.

Kenal pasti daya tindak balas untuk sokongan A.

[5 marks]

[*5 markah*]

CLO2 (b) Calculate the shear force and bending moment at all points.

Kirakan daya ricih dan momen lentur pada semua titik.

[10 marks]

[*10 markah*]

CLO2

(c) Illustrate the shear force diagram and the bending moment diagram with their values.

Lakarkan gambarajah daya ricih dan momen lentur beserta dengan nilainya.

[10 marks]

[*10 markah*]

QUESTION 2

SOALAN 2

CLO2 (a) Explain bending stress with the formula and unit.

Terangkan tegasan lentur dengan formula dan unit.

[5 marks]

[*5 markah*]

CLO2 (b) A simply supported beam with unsymmetrical T-section as shown in Figure B2(b) is subjected to a uniformly distributed load. The bending moment maximum, M_{max} is given as 300kNm. Calculate the second moment area of T-section beam.

Satu rasuk disokong mudah berkeratan T yang tidak simetri seperti ditunjukkan di dalam Rajah B2(b) dikenakan beban teragih seragam. Diberi nilai momen maksima, M_{max} ialah 300kNm. Kirakan momen luas kedua bagi rasuk berkeratan T.

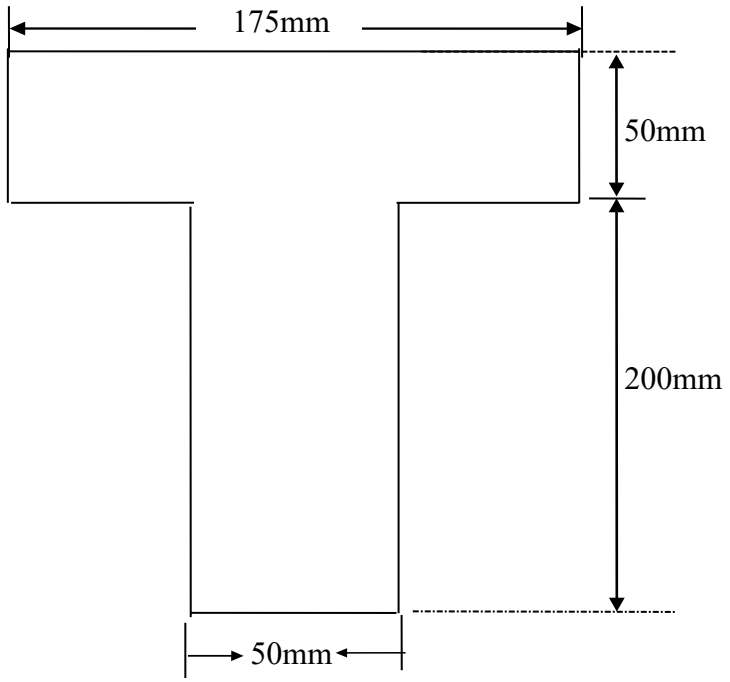


Figure B2(b)/ *Rajah B2(b)*

[10 marks]

[*10 markah*]

CLO2

(c) Based on the answer from question 2(b), illustrate the bending stress distribution diagram by providing the bending stress value.

Berdasarkan jawapan dari soalan 2(b), lakarkan rajah taburan tegasan lentur dengan memberikan nilai tegasan lentur.

[10 marks]

[*10 markah*]

QUESTION 3

SOALAN 3

CLO2 (a) Explain shear stress and shear strain with their formulas.

Terangkan tegasan ricih dan terikan ricih dengan formula.

[5 marks]

[*5 markah*]

CLO2 (b) A simply supported beam of a rectangular section as shown in Figure B3(b) experienced a maximum shear force of 70kN. Calculate the shear stress at 120mm from the top.

Sebuah rasuk tupang mudah berkeratan segiempat tepat seperti dalam Rajah B3(b) mengalami daya ricih maksimum sebanyak 70kN. Kirakan tegasan ricih pada jarak 120mm dari atas.

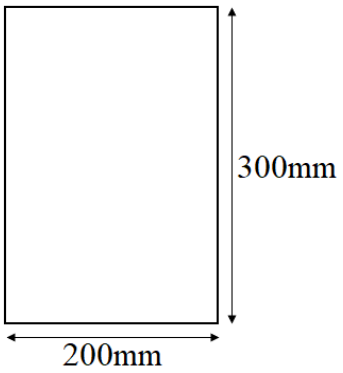


Figure B3(b) / *Rajah B3(b)*

[10 marks]

[*10 markah*]

CLO2 (c) An unsymmetrical I-section beam as shown in Figure B3(c) is subjected to a shear force of 30kN. Given the neutral axis from the bottom is 66.25mm and the second moment area about the neutral axis is 16.7 x 10^6 mm^4. Based on the data given, calculate the maximum shear stress.

Rasuk keratan I tidak simetri seperti yang ditunjukkan dalam Rajah B3(c) dikenakan daya ricih sebanyak 30kN. Diberi paksi neural dari bawah ialah 66.25mm dan luas momen kedua mengenai paksi neutral ialah 16.7 x 10^6 mm^4. Berdasarkan data yang diberikan, kirakan tegasan ricih maksima.

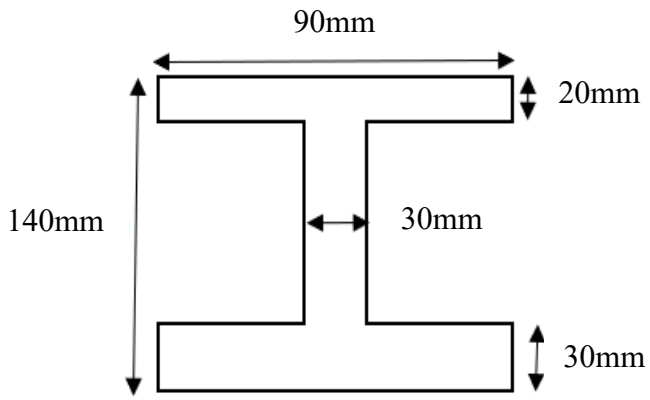


Figure B3(c) / *Rajah B3(c)*

[10 marks]

[*10 markah*]

QUESTION 4

SOALAN 4

CLO2 (a) Show the bending moment equation for the beam shown in Figure B4(a) below using Macaulay's method. Given the vertical reaction at A is 84kN.

Tunjukkan persamaan momen lentur untuk rasuk yang ditunjukkan dalam Rajah B4(a) di bawah dengan menggunakan kaedah Macaulay. Diberi nilai daya tindak balas pugak di penyokong A adalah 84kN.

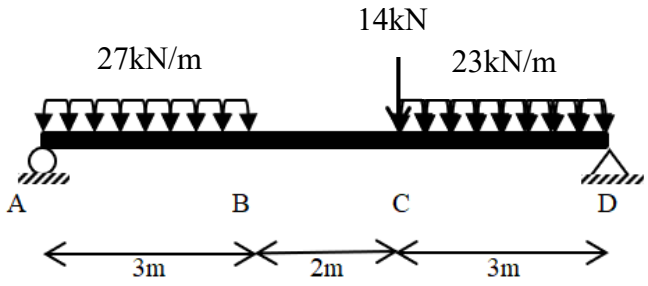


Figure B4(a) / Rajah B4(a)

[5 marks]

[*5 markah*]

CLO2 (b) A simply supported beam is loaded as shown in Figure B4(b). Using the Macaulay's method, calculate the slope at point C if given EI = 110 x 10^3 kNm^2 and the bending moment equation is:

Sebuah rasuk disokong mudah kenakan beban seperti yang ditunjukkan dalam Rajah B4(b). Dengan menggunakan kaedah Macaulay, kirakan pesongan pada titik C jika diberi EI = 110 x 10^3 kNm^2 dan persamaan moment lentur adalah:

$$\text{EI}\frac{d^2y}{dx^2} = M_x = 39(x) - 12(x-2) - 5(x-5)^0 - \frac{14(x-5)^2}{2}$$

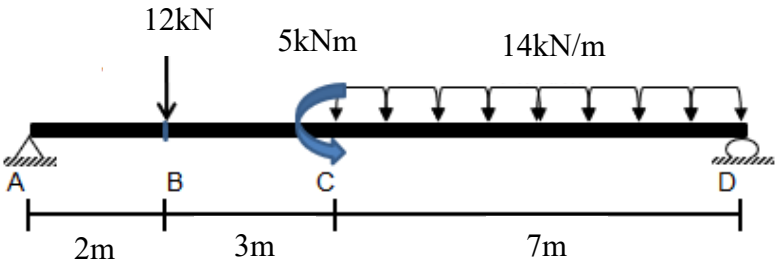


Figure B4(b) / *Rajah B4(b)*

[10 marks]

[*10 markah*]

CLO2 (c) A cantilever beam with 8m span as shown in Figure B4(c) has a constant EI. Given the moment it is -94kNm and the vertical reaction is 25kN at point A. By using the Moment Area method, calculate the slope at the free end of the beam.

Sebuah rasuk julur sepanjang 8m seperti dalam Rajah B4(c) mempunyai nilai EI yang seragam. Diberi nilai moment adalah -94kNm dan tindak balas pugak adalah 25kN pada titik A. Dengan menggunakan kaedah Momen Luas, kirakan kecerunan pada hujung rasuk.

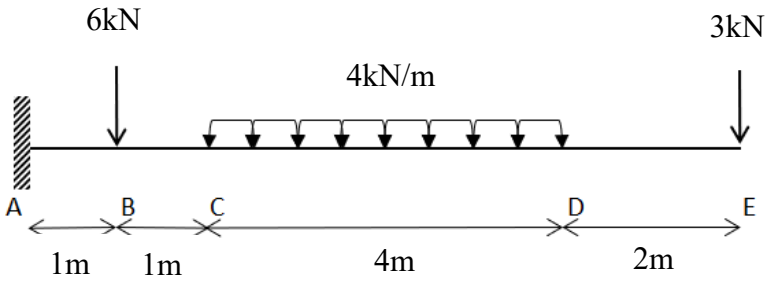


Figure B4(c) / *Rajah B4(c)*

[10 marks]

[*10 markah*]

SOALAN TAMAT

LIST OF FORMULA FOR DCC20053 MECHANICS OF CIVIL ENGINEERING STRUCTURES

1. $\sigma = \frac{P}{A}$	5. $Z = \frac{I}{\bar{y}}$
2. $\varepsilon = \frac{\delta L}{L}$	6. $\sigma = \frac{M}{I} \times \bar{y}$
3. $E = \frac{\sigma}{\varepsilon}$ @ $E = \frac{PL}{A\delta L}$	7. $\tau = \frac{F}{nA}$ & $\tau = \frac{F}{2 \, x \, n \, x \, A}$
4. $I_{xx} = \frac{bd^3}{12} + Ad^2$	8. $\tau = \frac{VAy}{I_x b}$

TABLE 1 MAXIMUM MOMENT FORMULA FOR SPECIFIC BEAM AND LOAD

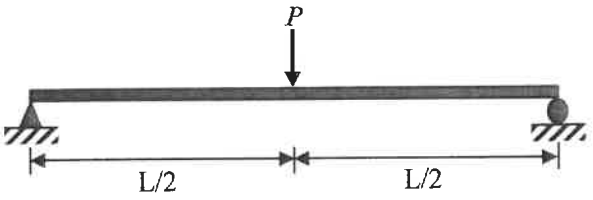
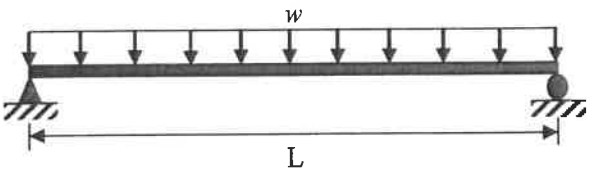
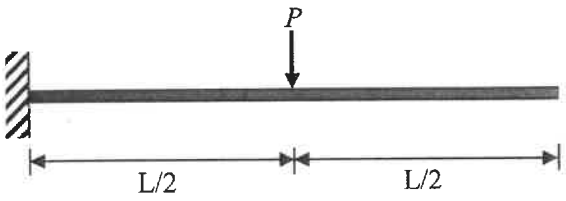
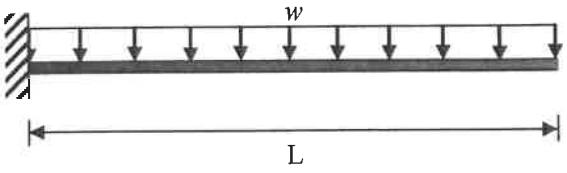
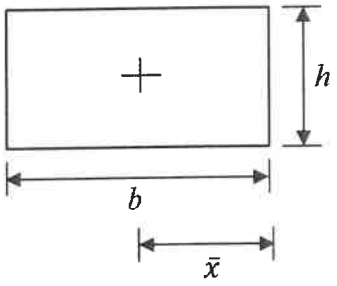
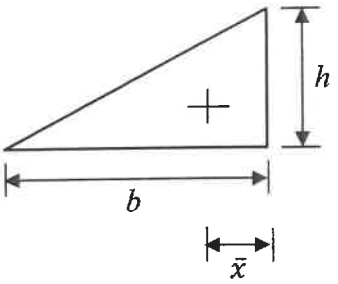
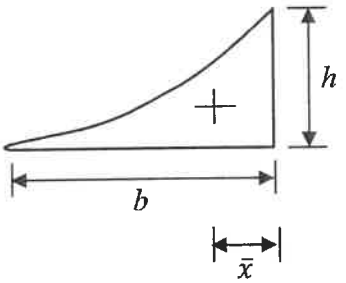
Beam with specific load	Maximum moment
	$\frac{PL}{4}$
	$\frac{wL^2}{8}$
	$\frac{-PL}{2}$
	$\frac{-wL^2}{2}$

TABLE 2 GEOMETRIC PROPERTIES OF AREA

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