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 II : 2024/2025

DCC20053 : MECHANICS OF CIVIL ENGINEERING STRUCTURES

TARIKH : 14 MEI 2025
MASA : 2.30 PETANG - 4.30 PETANG (2 JAM)

Kertas ini mengandungi **DUA BELAS (12)** 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) Explain the meaning of mechanic and mechanic of structures in Civil Engineering.

Terangkan maksud mengenai mekanik dan mekanik struktur dalam Kejuruteraan Awam.

[5 marks]

[*5 markah*]

CLO1 (b) A simply supported beam is loaded as shown in Figure A1(b). With the aid of free body diagram (FBD), calculate the reaction force at support A and D.

Rasuk sokong mudah dibebankan seperti dalam Rajah A1(b). Dengan bantuan gambarajah jasad bebas, kirakan daya tindakbalas pada penyokong A dan D.

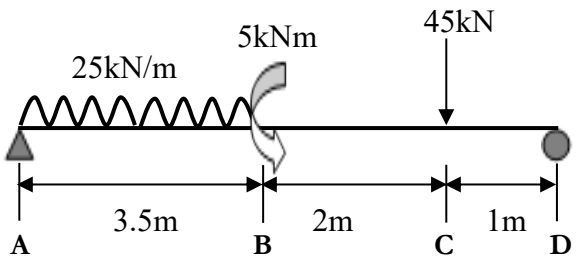


Figure A1(b) */ Rajah A1(b)*

[10 marks]

[*10 markah*]

CLO1

(c) A steel rod has 2.5mm of diameter with 3m of length. If this bar is imposed by 100kN and elongation occur is 0.8mm. Calculate modulus of elasticity in the rod, E.

Satu rod keluli mempunyai diameter 2.5mm dengan panjang 3m. Sekiranya bar tersebut dikenakan daya sebanyak 100kN dan mengalami pemanjangan 0.8mm. Kirakan modulus keanjalan di dalam rod, E.

[10 marks]

[*10 markah*]

QUESTION 2

SOALAN 2

CLO1

(a) i. Figure A2(a) shows a T-section beam. Identify the centroid of the section at y-axis and x-axis.

Rajah A2(a) menunjukkan satu rasuk keratan T. Kenal pasti sentroid keratan pada paksi-y dan paksi-x.

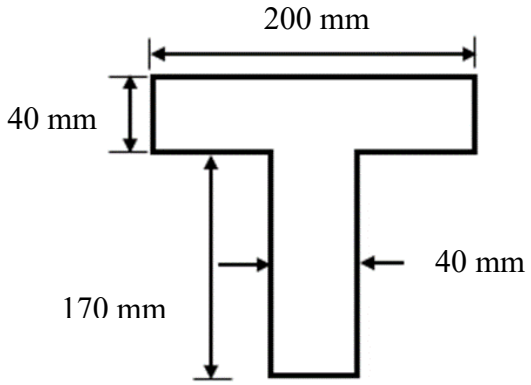


Figure A2(a) */ Rajah A2(a)*

[5 marks]

[*5 markah*]

ii. Calculate the second moment of area for T section beam.

Kirakan momen luas kedua bagi rasuk berkeratan T.

[8 marks]

[*8 markah*]

CLO1 (b) Two pieces of iron plate fasten the wooden board by using bolts of 10mm diameter as shown in Figure A2(b). Wooden board was then pulled by a shear force of 100kN. Determine the shear stress that occurs in each bolt.

Dua keping plat besi mengikat papan kayu dengan menggunakan bolt berdiameter 10mm seperti yang ditunjukkan dalam Rajah A2(b). Papan kayu kemudiannya ditarik dengan daya ricih 100kN. Tentukan tegasan ricih yang berlaku dalam setiap bolt.

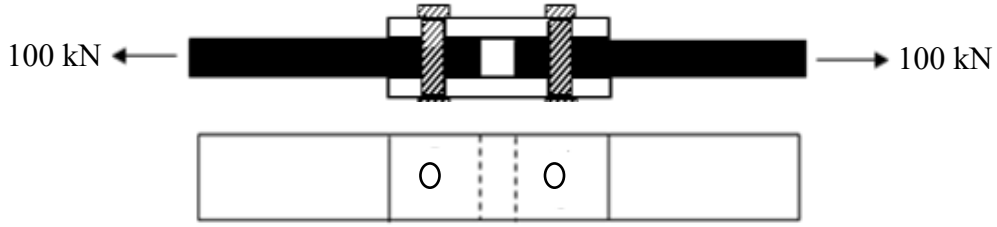


Figure A2(b) / *Rajah A2(b)*

[6 marks]

[*6 markah*]

CLO1 (c) By using Moment Area Method and with the aid of moment area diagram for each load, calculate the value of moment area for the beam in Figure A2(c). Given the reaction force, Ay = 35.35kN.

Dengan menggunakan Kaedah Momen Luas dan bantuan gambarajah momen luas bagi setiap beban, kirakan nilai-nilai momen luas untuk rasuk dalam Rajah A2(c). Diberi nilai daya tindakbalas, Ay = 35.35kN.

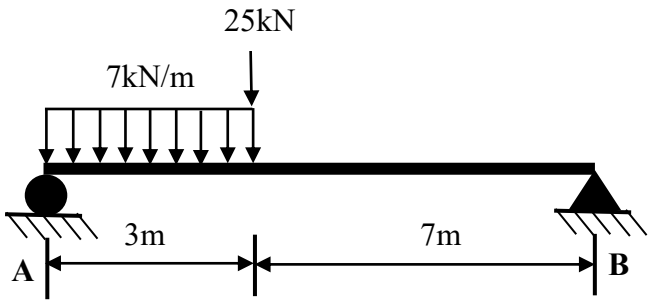


Figure A2(c) / *Rajah A2(c)*

[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

CLO2

(a) An overhanging beam is loaded as shown in Figure B1(a). Identify the rection force at each support B and D.

Sebuah rasuk juntai dikenakan tindakan daya seperti ditunjukkan dalam Rajah B1(a). Kenal pasti daya tindakbalas pada setiap penyokong di B dan D.

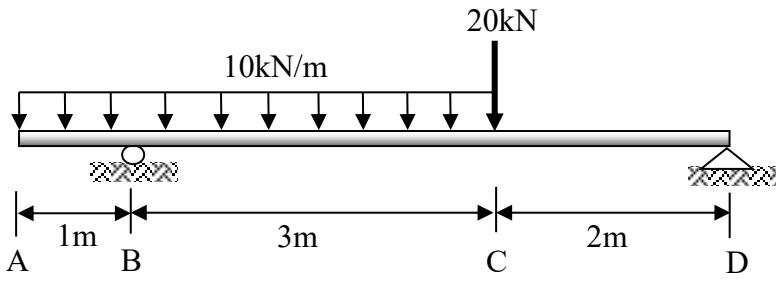


Figure B1(a)/ *Rajah B1(a)*

[5 marks]

[*5 markah*]

CLO2 (b) By using answers from the question 1(a), calculate the shear force and bending moment value at each point.
Berpandukan jawapan dari soalan 1(a), kirakan nilai daya ricih dan momen lentur pada setiap titik.

[10 marks]
[*10 markah*]

CLO2 (c) Illustrate shear force diagram (SFD) and bending moment diagram (BMD) of the beam based on the answer from the question 1(b) above.
Lakarkan gambarajah daya ricih (GDR) dan gambar rajah momen lentur (GML) rasuk berdasarkan jawapan daripada soalan 1(b) di atas.

[10 marks]
[*10 markah*]

QUESTION 2

SOALAN 2

A simply supported beam with an unsymmetrical I- section as shown in Figure B2 is subjected to a point load 20kN.

Sebuah rasuk ditupang mudah dengan keratan I tidak simetri seperti yang ditunjukkan dalam Rajah B2 dikenakan dengan beban tumpu 20kN.

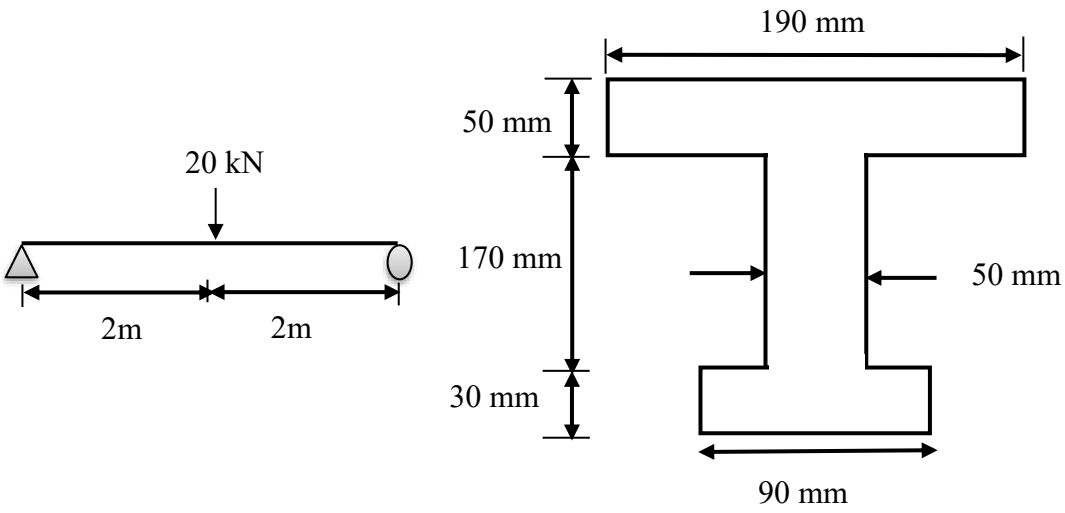


Figure B2/ *Rajah B2*

CLO2 (a) Identify the center of gravity (compression and tensile) for beam.
Kenal pasti pusat graviti (mampatan dan tegangan) untuk rasuk.

[5 marks]
[*5 markah*]

CLO2 (b) Calculate the second moment area of the unsymmetrical I-section.
Kirakan luas momen kedua bagi keratan I tak simetri.

[10 marks]
[*10 markah*]

CLO2 (c) Illustrate the bending stress distribution diagram across the section with the value of maximum bending stress (compression and tensile).
Lakarkan gambarajah taburan tegasan lentur merentasi bahagian dengan nilai tegasan lentur maksimum (mampatan dan tegangan).

[10 marks]
[*10 markah*]

QUESTION 3

SOALAN 3

CLO2 (a) Explain single and double shear stress with formula.

Terangkan tegasan ricih tunggal dan tegasan ricih berganda dengan formula.

[5 marks]

[*5 markah*]

CLO2 (b) Calculate the shear stress at 30mm distance from neutral axis at rectangular beam in Figure B3(b) below. Given shear force is 45kN.

Kirakan tegasan ricih pada jarak 30mm dari paksi neutral pada rasuk segi empat tepat dalam Rajah B3(b) di bawah. Daya ricih diberi ialah 45kN.

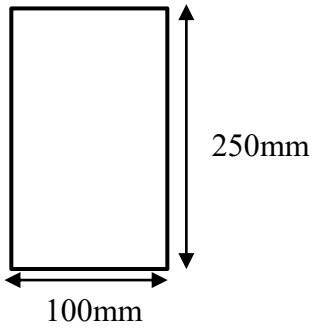


Figure B3(b) / *Rajah B3(b)*

[10 marks]

[*10 markah*]

CLO2

(c) A simply supported beam as shown in Figure B3(c) is subjected to a shear force of 45kN. If the second moment of area of the section is 13.45 x10^6mm^4, calculate the value of shear stress at flange, junction of the web and neutral axis for the beam section.

Rasuk disokong mudah seperti Rajah B3(c) dikenakan daya ricih sebanyak 45kN. Jika momen luas kedua keratan ialah 13.45x10^6mm^4, kirakan tegasan ricih pada bebibir, persimpangan web dan paksi neutral pada keratan rasuk tersebut.

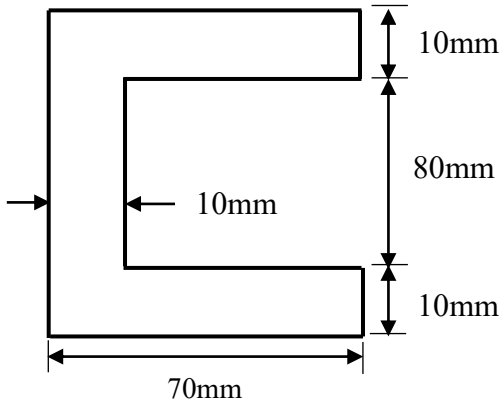


Figure B3(c) / *Rajah B3(c)*

[10 marks]

[*10 markah*]

QUESTION 4

SOALAN 4

CLO2 (a) Express bending moment equation for beam shown in Figure B4(a) below by using the Macaulay's Method.

Nyatakan persamaan momen lentur untuk rasuk yang ditunjukkan dalam Rajah B4(a) di bawah dengan menggunakan Kaedah Macaulay.

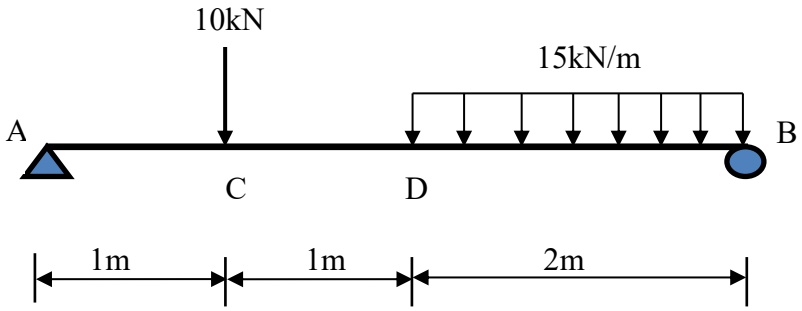


Figure B4(a) / *Rajah B4(a)*

[5 marks]

[*5 markah*]

CLO2 (b) A simply supported beam is loaded as shown in Figure B4(b). If reaction given at point A is 30.62kN and at point B is 19.38kN, calculate slope equation and deflection equation by using Macaulay's Method.

Rasuk disokong mudah dibebani seperti dalam Rajah B4(b). Jika tindak balas diberikan pada titik A ialah 30.62kN dan pada titik B ialah 19.38kN, kirakan persamaan cerun dan persamaan pesongan dengan menggunakan Kaedah Macaulay.

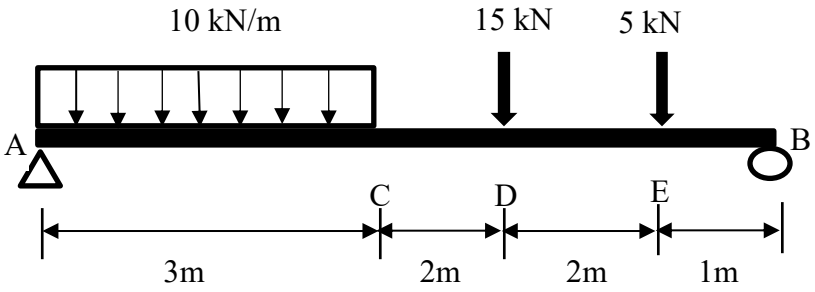


Figure B4(b) / *Rajah B4(b)*

[10 marks]

[*10 markah*]

CLO2

(c) A cantilever beam is shown in Figure B4(c) below. Given moment is -309kNm and reaction is 57kN at point A. By using Moment Area Method, calculate the slope at free end of the beam in term of EI.

Rasuk julur ditunjukkan dalam Rajah B4(c) di bawah. Diberi momen adalah −309kNm dan tindakbalas adalah 57kN pada titik A. Dengan menggunakan Kaedah Momen Luas, kirakan nilai kecerunan pada hujung bebas rasuk dalam sebutan EI.

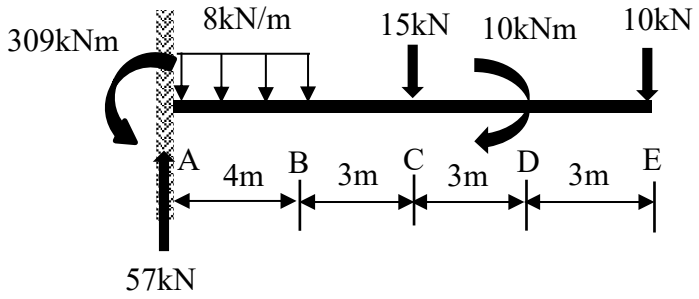


Figure B4(c) / *Rajah B4(c)*

[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

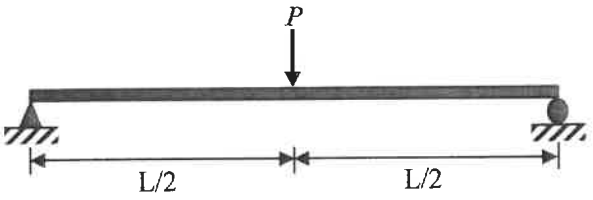
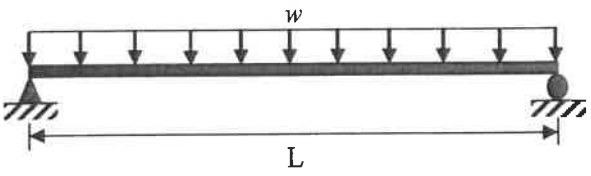
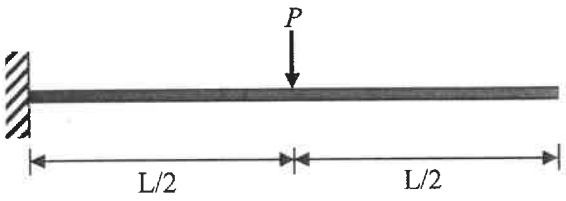
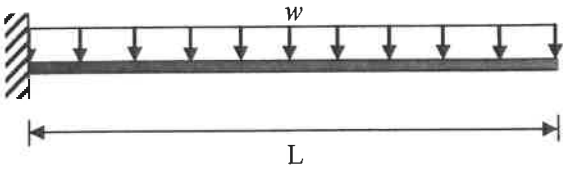
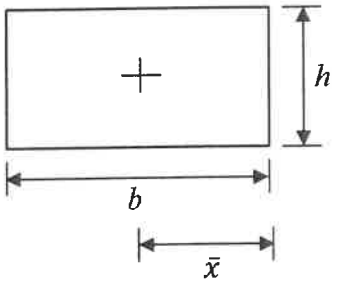
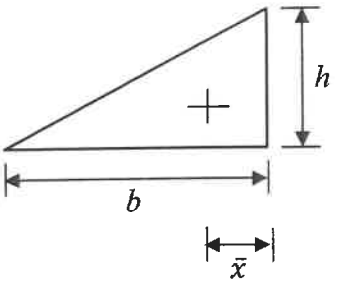
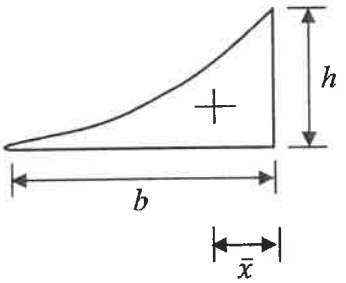
Beam with specific load	Maximum moment
	$\frac{PL}{4}$
	$\frac{wL^2}{8}$
	$\frac{-PL}{2}$
	$\frac{-wL^2}{2}$

TABLE 2 GEOMETRIC PROPERTIES OF AREA

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