SULIT

BAHAGIAN PEPERIKSAAN DAN PENILAIAN
JABATAN PENDIDIKAN POLITEKNIK DAN KOLEJ KOMUNITI
KEMENTERIAN PENDIDIKAN MALAYSIA

JABATAN KEJURUTERAAN AWAM

PEPERIKSAAN AKHIR

SESI DISEMBER 2018

DCC2063 : MECHANICS OF CIVIL ENGINEERING STRUCTURES

TARIKH : 20 APRIL 2019
MASA : 11.15 PAGI – 1.15 PETANG (2 JAM)

Kertas ini mengandungi **DUA BELAS (12)** halaman bercetak.

Bahagian A: Struktur (2 soalan)
Bahagian B: Struktur (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)** structured questions. Answer **ALL** questions.

ARAHAN :

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

QUESTION 1

SOALAN 1

CLO1
C1

(a) State **THREE (3)** types of supports with appropriate diagram.

*Nyatakan **TIGA (3)** jenis penyokong berserta gambarajah yang sesuaian.*

[5 marks]

[*5 markah*]

CLO1
C2

(b) Explain direct stress and strain with the formula and correct unit.

Terangkan tegasan dan terikan terus berserta formula dan unit yang betul.

[8 marks]

[*8 markah*]

CLO1
C2

(c) A steel wire has been subjected with the load of 40kN. Calculate the maximum diameter of the steel wire, if the stress is not exceeding 100 N/mm^2.

Dawai keluli telah dikenakan beban sebanyak 40kN. Kirakan diameter maksimum dawai keluli, jika tegasan tidak melebihi 100 N/mm^2.

[12 marks]

[*12 markah*]

QUESTION 2

SOALAN 2

CLO1
C1

(a) List **FIVE (5)** types of structures in Civil Engineering.

*Senaraikan **LIMA (5)** jenis struktur dalam Kejuruteraan Awam.*

[5 marks]

[*5 markah*]

CLO2
C5

(b) A cantilever beam is loaded as shown in **Figure A2(b)**.

*Sebuah rasuk julur telah dikenakan beban seperti dalam **Rajah A2(b)**.*

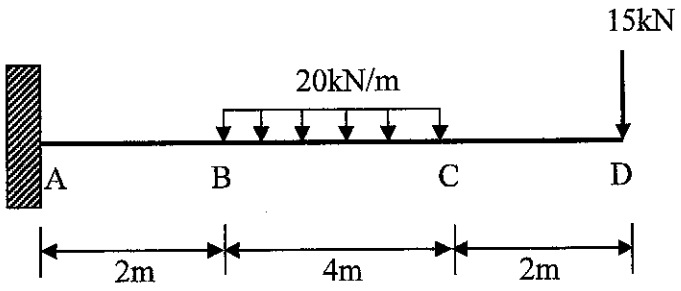


Figure A2(b) / *Rajah A2(b)*

i. Show free body diagram for the beam.

Tunjukkan gambarajah jasad bebas bagi rasuk.

[3 marks]

[*3 markah*]

ii. Evaluate reaction at the support A.

Nilaikan tindakbalas pada penyokong A.

[9 marks]

[*9 markah*]

CLO2
C6

(c) A simply supported beam is loaded as shown in **Figure A2(c)**. Given the reaction at support A and D are 54kN and 57kN respectively. Produce Shear Force Diagram (SFD) and Bending Moment Diagram (BMD) by showing the important values.
*Satu rasuk disokong mudah dibebankan seperti dalam **Rajah A2(c)**. Diberi tindakbalas pada penyokong A dan D masing-masing ialah 54kN dan 57kN. Hasilkan gambarajah daya ricih (GDR) dan momen lentur (GML) dengan menunjukkan nilai-nilai penting.*

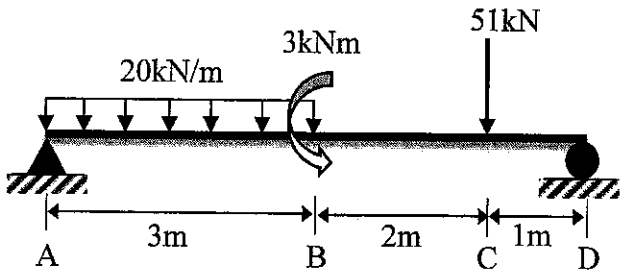


Figure A2(c) / *Rajah A2(c)*

[8 marks]
[*8 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 berstruktur. Jawab **DUA (2)** soalan sahaja.*

QUESTION 1

SOALAN 1

CLO2
C3

(a) A cross section of cantilever beam is shown in **Figure B1(a)**. Calculate bending stress for this beam. Given the neutral axis from bottom section, $\bar{y}$ for the section is 75.4 mm and maximum moment is 562.5 x 10^6 Nmm.

*Satu keratan rentas rasuk julur ditunjukkan dalam **Rajah B1(a)**. Kira tegasan lentur untuk rasuk tersebut. Diberi kedudukan paksi neutral daripada aras bawah keratan, $\bar{y}$ adalah 75.4 mm dan momen maksima ialah 562.5 x 10^6 Nmm.*

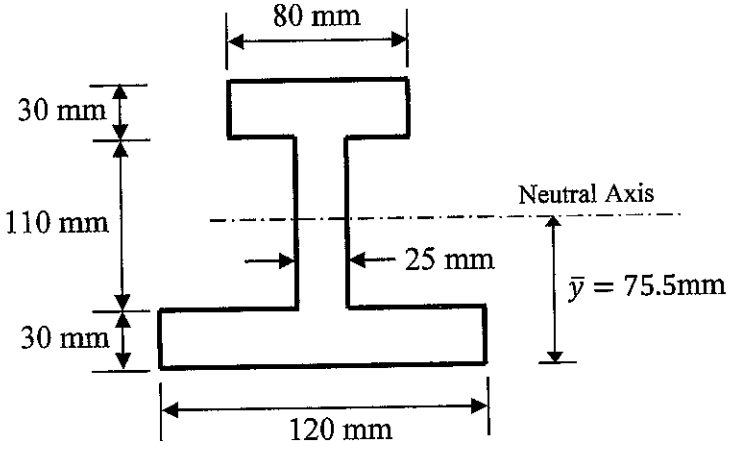


Figure B1(a) / *Rajah B1(a)*

[12 marks]

[12 *markah*]

CLO2 C4

(b) A simply supported beam with cross section as shown in **Figure B1(b)** carries uniformly distributed load of 30kN/m along the span. Calculate the maximum bending stress of the beam.

*Sebuah rasuk disokong mudah mempunyai keratan rentas seperti ditunjukkan dalam **Rajah B1(b)** membawa beban teragih seragam sebanyak 30kN/m sepanjang rentang. Kirakan tegasan lentur maksimum rasuk tersebut.*

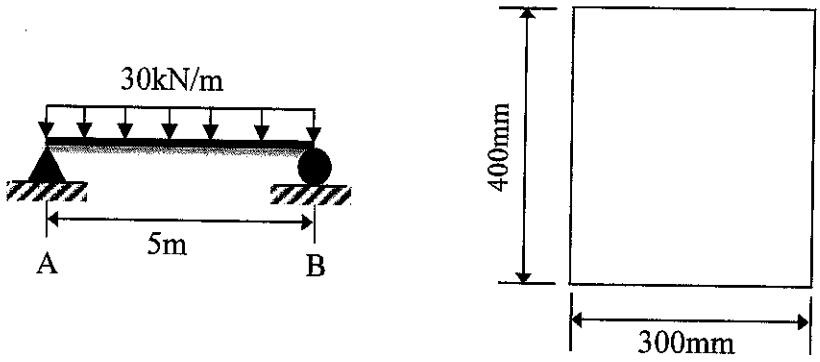


Figure B1(b) / *Rajah B1(b)*

[8 marks]

[*8 markah*]

CLO2 C6

(c) Based on **Question B1(b)**, construct bending stress distribution diagram for the beam section by showing the value of bending stress in compression and tension.

*Berdasarkan **Soalan B1(b)**, bina rajah taburan tegasan lentur bagi keratan rasuk tersebut dengan menunjukkan nilai tegasan lentur mampatan dan tegangan.*

[5 marks]

[*5 markah*]

QUESTION 2

SOALAN 2

CLO2
C3

(a) A simply supported beam with symmetrical-I section as shown in **Figure B2(a)** is subjected to a shear force of 50kN. If the second moment of area of the section is 12.96 x10^6 mm^4, calculate the shear stress distribution for the beam section.

*Rasuk disokong mudah berkeratan rentas I-simetri seperti **Rajah B2(a)** dikenakan daya ricih sebanyak 50kN. Jika momen luas kedua keratan ialah 12.96 x 10^6 mm^4, kirakan agihan tegasan ricih pada keratan rasuk tersebut.*

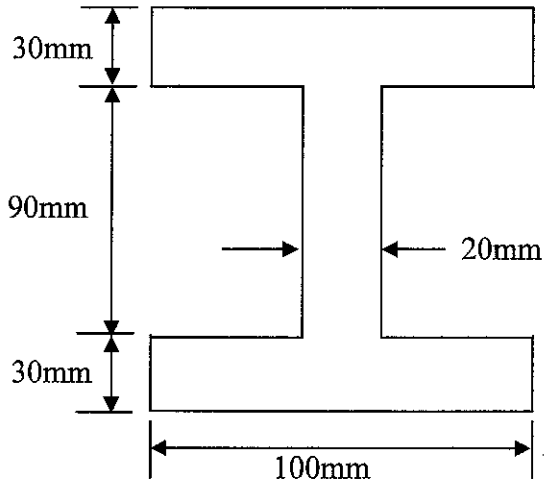


Figure B2(a) / *Rajah B2(a)*

[12 marks]

[*12 markah*]

CLO2 C4 (b) Two steel plates are connected by using a bolt imposed by shear force of 35kN. If the ultimate shear stress in bolt is 150MN/m^2, calculate diameter of the bolt.
Dua plat keluli disambungkan dengan menggunakan sebatang bolt dikenakan daya ricih sebanyak 35kN. Jika tegasan ricih muktamad dalam bolt ialah 150MN/m^2, kirakan diameter bolt tersebut.

[8 marks]
[*8 markah*]

CLO2 C6 (c) **Figure B2(c)** shows a rectangular beam section carry a shear force of 80kN. Given the second moment of area for the beam section is 450 x10^6 mm^4:
Rajah B2(c) *menunjukkan sebuah rasuk berkeratan rentas segiempat membawa beban ricih sebanyak 80kN. Diberi momen luas kedua keratan rasuk tersebut ialah 450 x10^6 mm^4:*

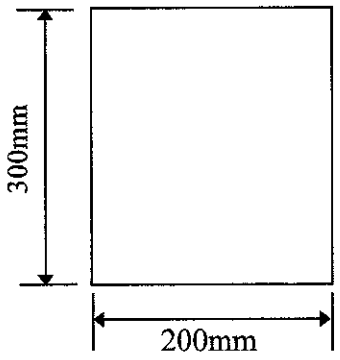


Figure B2(c) / *Rajah B2(c)*

i. Determine maximum shear stress in the beam section.
Tentukan tegasan ricih maksimum dalam keratan rasuk.

[3 marks]
[*3 markah*]

ii. Construct shear stress distribution diagram for the beam.
Bina rajah taburan tegasan ricih rasuk tersebut.

[2 marks]
[*2 markah*]

QUESTION 3

SOALAN 3

CLO2
C3

(a) A simply supported beam as shown in **Figure B3** is subjected to a uniformly distributed load and point load.

*Satu rasuk disokong mudah seperti dalam **Rajah B3** menanggung beban teragih seragam dan beban tumpu.*

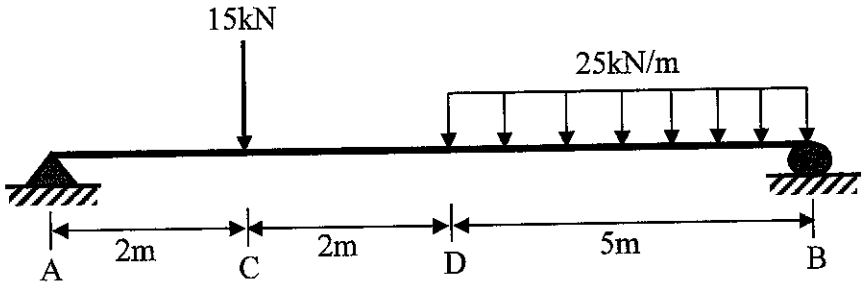


Figure B3 / *Rajah B3*

i) Calculate the vertical reaction force at support A.

Kirakan daya tindakbalas pugak pada penyokong A.

[3 marks]

[*3 markah*]

ii) Complete the moment, slope and deflection equation by using Macaulay Method.

Lengkapkan persamaan momen, kecerunan dan pesongan dengan menggunakan Kaedah Macaulay.

[9 marks]

[*9 markah*]

CLO2 C4

(b) Based on **Question B3(a)**, determine the slope and deflection at point D by using Macaulay Method in term of EI.

*Berdasarkan **Soalan B3(a)**, tentukan kecerunan dan pesongan pada titik D dengan menggunakan Kaedah Macaulay dalam sebutan EI.*

[8 marks]

[*8 markah*]

CLO2 C6

(c) Given the deflection at point C for a beam in **Figure B3** is $\frac{855.45}{EI}$ m and beam has a rectangular cross section with 0.25m width. If the actual deflection at point C is 0.003m and modulus elasticity is 200 x10^6 kN/m^2, determine the depth of the beam, d.

*Diberi pesongan rasuk di titik C bagi rasuk dalam **Rajah B3** ialah $\frac{855.45}{EI}$ m dan rasuk berkeratan rentas segiempat tepat dengan kelebaran 0.25m. Jika nilai pesongan sebenar rasuk pada titik C ialah 0.003m dan modulus keanjalan ialah 200 x10^6 kN/m^2, tentukan kedalaman bagi keratan rasuk, d.*

[5 marks]

[*5 markah*]

QUESTION 4

SOALAN 4

A cantilever beam is subjected to a load as shown in **Figure B4**.

*Sebuah rasuk julur dikenakan beban seperti ditunjukkan dalam **Rajah B4**.*

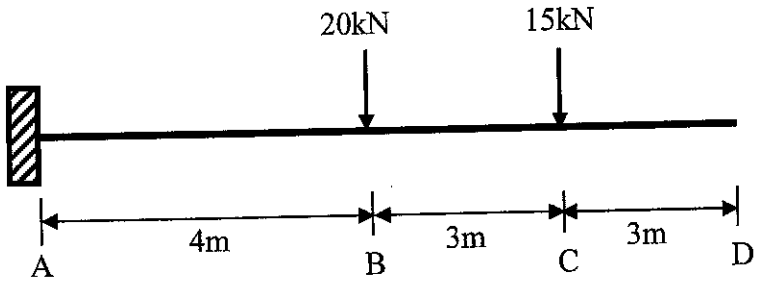


Figure B4 / *Rajah B4*

CLO2 C3 (a) Based on **Figure B4**:

*Berdasarkan **Rajah B4**:*

i. Sketch free body diagram of the beam.

Lukis gambarajah jasad bebas bagi rasuk.

[3 marks]

[*3 markah*]

ii. Calculate reaction force of the beam.

Kirakan daya tindakbalas bagi rasuk.

[5 marks]

[5 *markah*]

iii. Sketch moment area diagram for loaded beam

Lakarkan gambarajah momen luas bagi rasuk yang dibebankan.

[4 marks]

[*4 markah*]

CLO2 C4 (b) Calculate maximum deflection of the cantilever beam.

Kirakan pesongan maksimum rasuk julur tersebut.

[8 marks]

[*8 markah*]

CLO2 C6 (c) Determine slope at free end of the cantilever beam.

Tentukan kecerunan pada hujung bebas bagi rasuk julur tersebut.

[5 marks]

[*5 markah*]

SOALAN TAMAT

LIST OF FORMULA FOR DCC2063 MECHANICS OF CIVIL ENGINEERING STRUCTURES

1. $\sigma = \frac{P}{A}$

2. $\varepsilon = \frac{\delta L}{L}$

3. $E = \frac{\sigma}{\varepsilon}$

4. $E = \frac{PL}{A\delta L}$

5. $I_{xx} = \frac{bd^3}{12} + Ah^2$

6. $Z = \frac{I}{\bar{y}}$

7. $\frac{M}{I} = \frac{\sigma}{\bar{y}}$

8. $\tau = \frac{F}{nA}$

9. $\tau = \frac{VAy}{Ib}$

TABLE 1 MAXIMUM MOMENT FORMULA FOR SPECIFIC BEAM AND LOAD

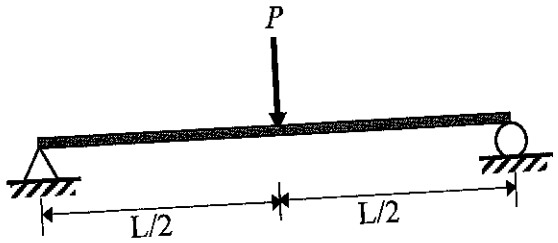
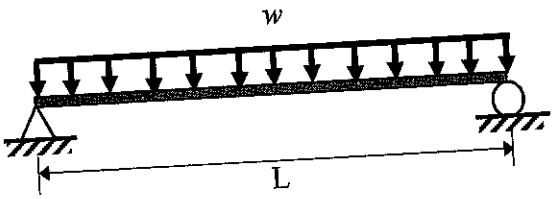
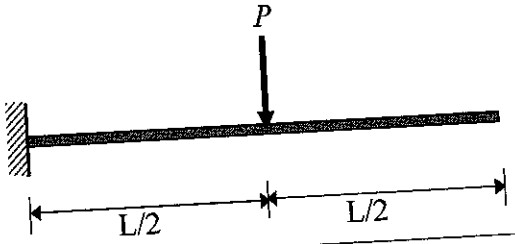
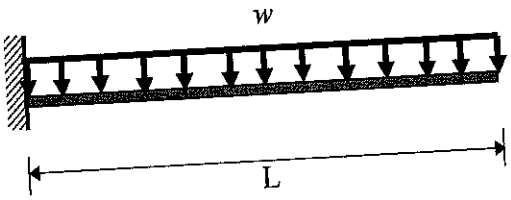
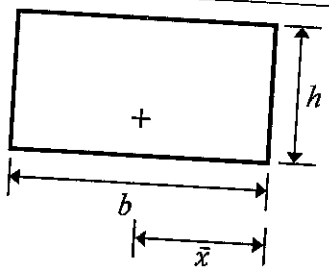
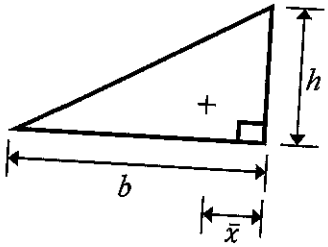
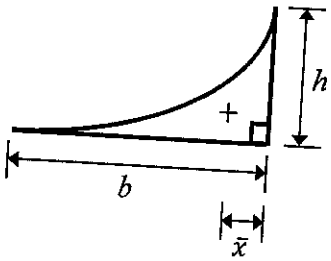
Beam With Specific Load	Maximum Moment
	$\frac{PL}{4}$
	$\frac{wL^2}{8}$
	$\frac{-PL}{2}$
	$\frac{-wL^2}{2}$

TABLE 2 GEOMETRIC PROPERTIES OF AREA

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