

SULIT



**BAHAGIAN PEPERIKSAAN DAN PENILAIAN
JABATAN PENDIDIKAN POLITEKNIK
KEMENTERIAN PENDIDIKAN TINGGI**

JABATAN KEJURUTERAAN AWAM

**PEPERIKSAAN AKHIR
SESI DISEMBER 2017**

DCC2063 : MECHANICS OF CIVIL ENGINEERING STRUCTURES

**TARIKH : 15 NOVEMBER 2018
MASA : 8.30AM – 10.30AM (2JAM)**

Kertas ini mengandungi **LIMA BELAS (13)** 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)

SULIT

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 berstruktur. Jawab SEMUA soalan.

QUESTION 1
SOALAN 1

CLO1
C1

- a) Describe the term of direct stress and direct strain with the correct unit.

Huraikan maksud tegasan terus dan terikan terus beserta unit yang betul.

[5 marks]
[5 markah]

CLO1
C2

- b) A rectangular bar of 2m length with dimensions of 6mm width and 25mm depth, supports a load of 2500N. The bar is extended by 0.14cm when acted upon by a tensile stress. Determine the stress and strain in the bar.

Satu bar segiempat tepat 2m panjang dengan dimensi 6mm lebar dan 25mm dalam dikenakan beban 2500N. Bar tersebut mengalami pemanjangan sebanyak 0.14cm akibat tindakan tegasan tegangan. Tentukan nilai tegasan dan terikan di dalam bar tersebut.

[8 marks]
[8 markah]

CLO1
C2

- c) A hollow bar 450mm long has an external and internal dimension of 20mm and 12.5mm diameter respectively. It is subjected to a tensile force of 30 kN and was elongated to 0.22mm. Determine ;

Satu bar berongga 450mm panjang mempunyai ukuran diameter luar dan dalam masing-masing 20mm dan 12.5mm. Ia dikenakan beban tegangan sebanyak 30kN dan mengalami pemanjangan sebanyak 0.22mm. Tentukan;

- i. Tensile Stress

Tegasan tegangan

[4 marks]

[4 markah]

- ii. Strain

Terikan

[4 marks]

[4 markah]

- iii. Modulus of elasticity

Modulus keanjalan

[4 marks]

[4 markah]

QUESTION 2
SOALAN 2

- a) A simply supported beam with a span of 9 m is subjected to a uniformly distributed load and point load as shown in Figure A2(a).

Sebuah rasuk disokong mudah 9m panjang dikenakan beban teragih seragam dan beban tumpu seperti yang ditunjukkan dalam Rajah A2(a).

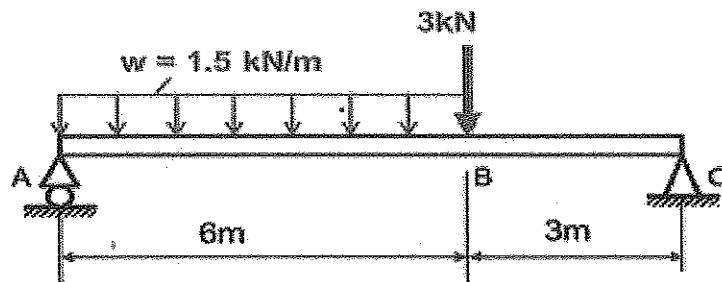


Figure A2(a) / Rajah A2(a)

CLO1
C1

Sketch the free body diagram (FBD) of beam.

Lakarkan gambarajah jasad bebas bagi rasuk.

[5 marks]
[5 markah]

CLO2
C2

- b) Calculate the reaction force at each support for the beam in Figure A2(a).

Kirakan daya tindakbalas pada setiap penyokong bagi rasuk dalam Rajah A2(a).

[5 marks]
[5 markah]

CLO2
C3

- c) An overhanging beam is loaded as shown in Figure A2(c). Sketch a shear force diagram (SFD) and bending moment diagram (BMD) of the beam if the reaction force at A and B are 24.38kN and 81.62kN respectively.

Satu rasuk jantai dibebankan seperti ditunjukkan dalam Rajah A2(c). Lakarkan gambarajah daya ricih (GDR) dan gambarajah momen lentur (GML) bagi rasuk tersebut jika daya tindak balas pada penyokong A dan B masing-masing ialah 24.38kN dan 81.62kN.

[15 marks]

[15 markah]

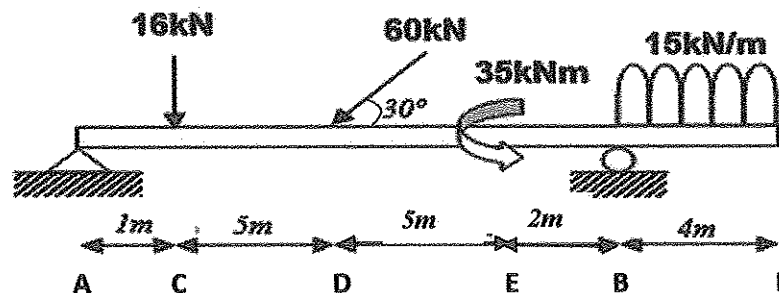


Figure A2(c) / Rajah A2(c)

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
C1

- a) Define compression stress and tensile stress in beam.

Takrifkan tegasan mampatan dan tegasan tegangan dalam rasuk.

[5 marks]
[5 markah]

CLO2
C2

- b) Figure B1(b) shows a section of beam. Calculate the centroid of the section at x-axis.

Rajah B1(b) menunjukkan satu keratan rentas rasuk. Kirakan sentroid bagi keratan rasuk tersebut terhadap paksi x.

[5 marks]
[5 markah]

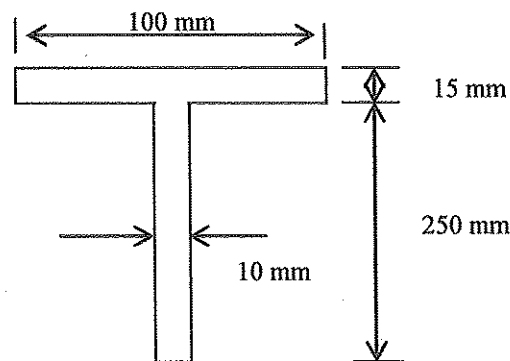


Figure B1(b) / Rajah B1(b)

CLO2
C3

c) A cross section of simply supported beam is shown in Figure B1(c).

Satu keratan rentas bagi rasuk di sokong mudah ditunjukkan dalam Rajah B1(c).

Given Maximum Moment = 18.75 kNm

Diberi Momen Maksima = 18.75 kNm

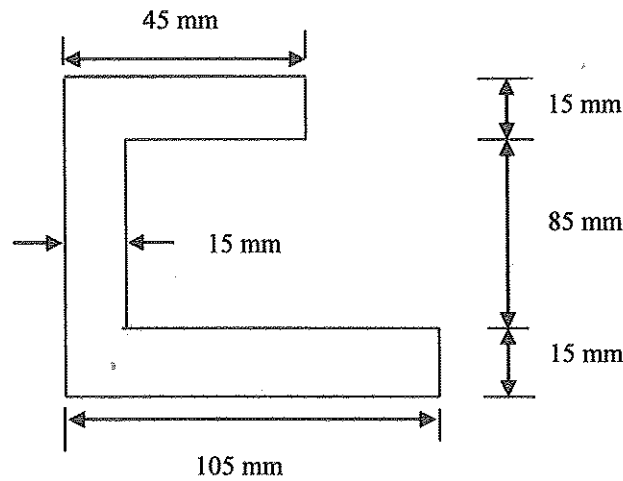


Figure B1(c) / Rajah B1(c)

i. Calculate the centroid at x-axis of cross section.

Kirakan kedudukan sentroid terhadap keratan rentas pada paksi-x.

[4 marks]
[4 markah]

ii. Calculate second moment area of the cross section of the beam.

Kirakan momen luas kedua bagi keratan rentas rasuk.

[7 marks]
[7 markah]

iii. Calculate the maximum tensile stress and bending stress of the beam cross section.

Kirakan nilai tegasan tegangan dan tegasan mampatan maksima bagi keratan rentas rasuk.

[4 marks]
[4 markah]

QUESTION 2
SOALAN 2CLO2
C1

- a) Define single shear and double shear in bolt connection with appropriate diagram.

Takrifkan sambungan ricih tunggal dan ricih berkembar dalam bolt beserta gambarajah yang sesuai.

[5 marks]
[5 markah]

CLO2
C2

- b) Figure B2(b) shows three steel plate joined by a rivet of 15mm diameter. If the tensile load is 50kN, calculate the shear stresses in the rivets.

Rajah B2(b) menunjukkan tiga keping plat besi yang di sambung menggunakan rivet bergaris pusat 15mm. Jika beban tegangan yang dikenakan ialah 50kN, kirakan tegasan ricih yang berlaku dalam rivet.

[5 marks]
[5 markah]

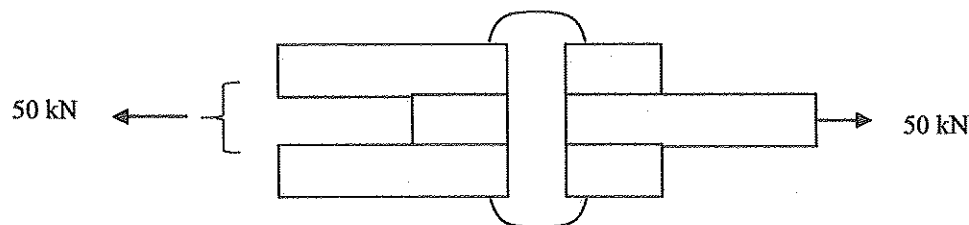


Figure B2(b) / Rajah B2(b)

CLO2
C3

- c) A T-section beam as shown in Figure B2(c) is subjected to a shear force of 30kN. The second moment area about the neutral axis is $255.224 \times 10^4 \text{ mm}^4$.

Satu rasuk berkeratan T seperti ditunjukkan dalam Rajah B2(c) telah dikenakan daya ricih sebanyak 30kN. Nilai momen luas kedua pada paksi neutral ialah $255.224 \times 10^4 \text{ mm}^4$.

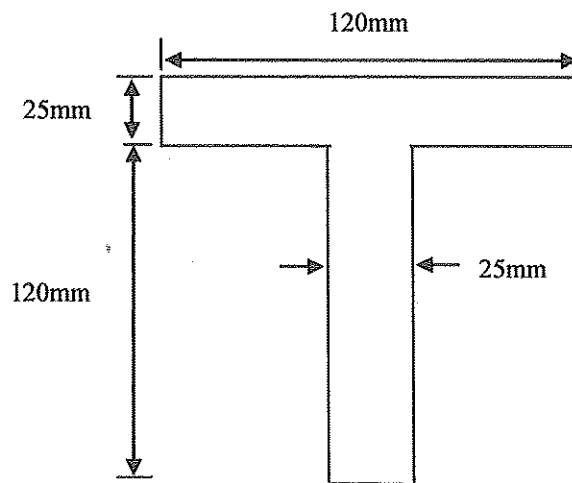


Figure B2(c)/ Rajah B2(c)

- i. Calculate the centroid position of section.

Kirakan kedudukan sentroid terhadap keratan.

[3 marks]
[3 markah]

- ii. Calculate shear stress at neutral axis, flange and junction of the web.

Kirakan tegasan ricih pada paksi neutral, bebibir dan persimpangan web.

[9 marks]
[9 markah]

- iii. Sketch the shear stress distribution for the whole section.

Lakarkan agihan tegasan ricih untuk keseluruhan bahagian.

[3 marks]
[3 markah]

QUESTION 3
SOALAN 3

A cantilever beam is subjected to a point load and uniformly distributed load as shown in Figure B3.

Satu rasuk julur dibebani dengan beban tumpu dan beban teragih seragam seperti ditunjukkan dalam Rajah B3.

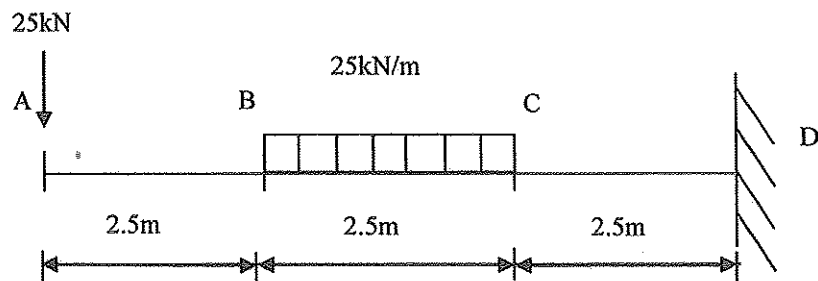


Figure B3 / Rajah B3

CLO2
C1

- a) Identify the value of reaction force at support D.
Kenalpasti nilai daya tindakbalas di penyokong D.

[5 marks]
[5 markah]

CLO2
C2

- b) Express the moment equations for this beam by using Macaulay Method.
Nyatakan persamaan momen bagi rasuk ini dengan menggunakan kaedah Macaulay.

[5 marks]
[5 markah]

CLO2
C3

- c) Calculate the slope and deflection at free end by using Macaulay Method in terms of EI.
Kiraan nilai kecerunan dan pesongan pada hujung bebas dengan menggunakan Kaedah Macaulay dalam sebutan EI.

[15 marks]

[15 markah]

QUESTION 4
SOALAN 4

A simply supported beam with length 12.5m span is shown in Figure B4.

Satu rasuk disokong mudah sepanjang 12.5m dibebankan seperti dalam Rajah B4.

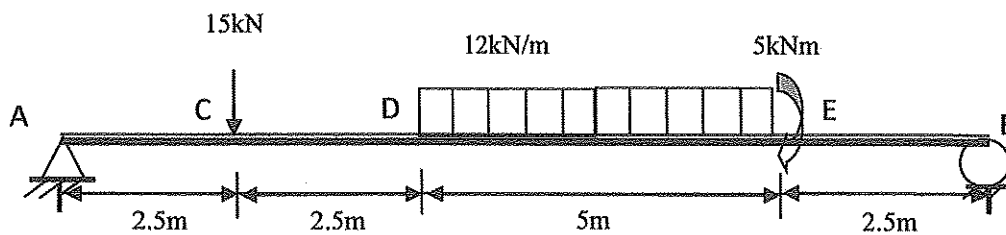


Figure B4 / Rajah B4

CLO2
C1

- a) Identify the value of vertical reaction force at support of beam.

Kenalpasti nilai tindakbalas pugak pada penyokong rasuk.

[5 marks]
[5 markah]

CLO2
C2

- b) Draw the bending moment diagram for each loads.

Lukiskan gambarajah moment lentur bagi setiap beban.

[5 marks]
[5 markah]

CLO2
C3

- c) Calculate deflection at point E by using Moment Area Method.

Kirakan nilai pesongan pada titik E dengan menggunakan Kaedah Momen Luas.

[15 marks]
[15 markah]

SOALAN TAMAT

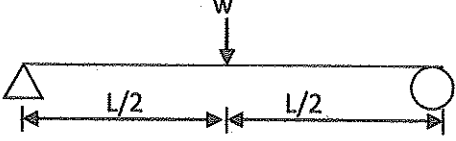
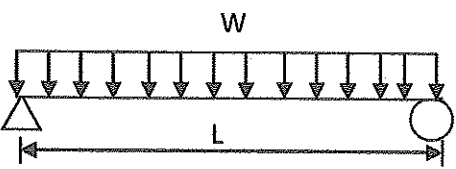
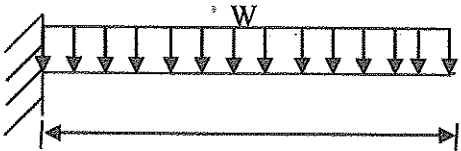
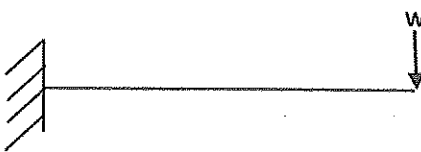
BEAM WITH SPECIFIC LOAD	MAXIMUM MOMENT
	$wL/4$
	$WL^2/8$
	$WL^2/2$
	wL

Table 1 : Maximum Moment Formula for Specific Beam and Load

LIST OF FORMULA FOR DCC2063
MECHANICS OF CIVIL ENGINEERING STRUCTURES

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

$$\epsilon = \frac{\delta L}{L}$$

$$E = \frac{PL}{\delta L \cdot A}$$

$$E = \frac{\sigma}{\epsilon}$$

$$I_{xx} = \frac{bd^3}{12} + Ad^2$$

$$Z = \frac{I}{y_{max}}$$

$$\frac{M}{I} = \frac{\sigma}{Y}$$

$$\tau = \frac{F}{A}$$

$$\tau = \frac{VAy}{I_{xx} \cdot b}$$