

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 : 31 MARCH 2018

MASA : 2.30PTG – 4.30PTG (2 JAM)

Kertas ini mengandungi **TIGA 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 direct stress and Hooke's law.

Takrifkan Tegasan Terus dan hukum Hooke.

[5 marks]

[5 markah]

CLO1
C2

- (b) A hollow rod with 600mm length has outside and inside diameters of 30mm and 20mm respectively. If the rod is carrying a load of 50kN, determine the stress in the rod.

Satu rod berongga dengan panjang 600mm mempunyai diameter luaran dan dalaman masing-masing ialah 30mm dan 20mm. Jika rod itu menanggung beban 50kN, tentukan tegasan di dalam rod tersebut.

[8 marks]

[8 markah]

CLO1
C2

- (c) A copper bar as shown in **Figure A1(c)**, has been imposed to 17kN tensile load. If the Modulus of Elasticity of copper is 150MPa, calculate:

Satu bar tembaga seperti Rajah A1(c) telah dikenakan daya tegangan 17kN. Jika Modulus Keanjalan bagi tembaga ialah 150MPa, kirakan:

- i. Stress in every part of the bar.

Tegasan di dalam setiap bahagian bar.

[9 marks]

[9 markah]

- ii. Total deformation of the bar.

Jumlah perubahan panjang pada bar.

[3 marks]

[3 markah]

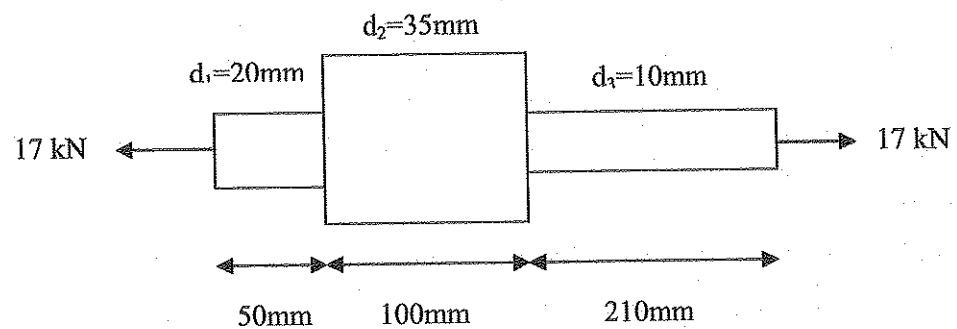


Figure A1(c) / Rajah A1(c)

QUESTION 2

SOALAN 2

CLO1
C1

- (a) Define principles and concepts of equilibrium forces.

Berikan definisi prinsip dan konsep keseimbangan daya.

[5 marks]

[5 markah]

CLO2
C2

- (b) Calculate the reaction force at the support of cantilever beam when subjected to loads as shown in Figure A2(b).

Kirakan daya tindakbalas pada penyokong bagi rasuk julus apabila dikenakan beban seperti ditunjukkan dalam Rajah A2(b).

[5 marks]

[5 markah]

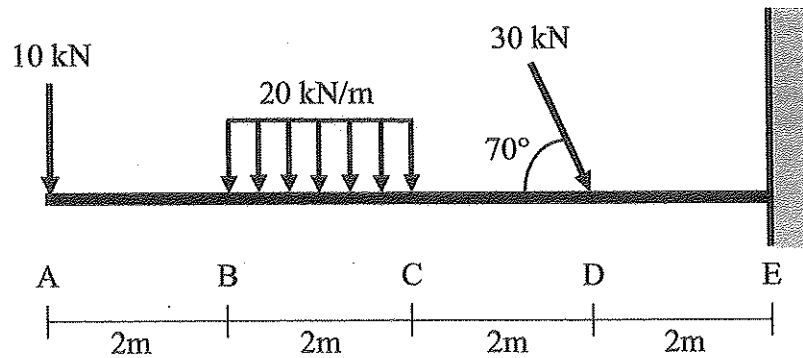


Figure A2(b) / Rajah A2(b)

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 C are -3.75 kN and 63.75 kN respectively.

Satu rasuk jantai dikenakan beban seperti 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 C masing-masing ialah -3.75 kN dan 63.75 kN.

[15 marks]

[15 markah]

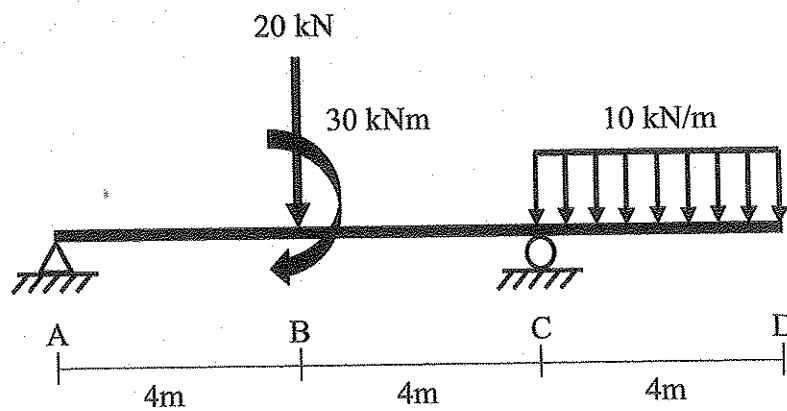


Figure A2(c) / Rajah A2(c)

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 bending stress and second moment of area.

Takrifkan tegasan lentur dan momen luas kedua.

[5 marks]

[5 markah]

CLO2
C2

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

Rajah B1(b) menunjukkan sebuah rasuk berkeratan L. Kirakan sentroid keratan L tersebut pada paksi-x.

[5 marks]

[5 markah]

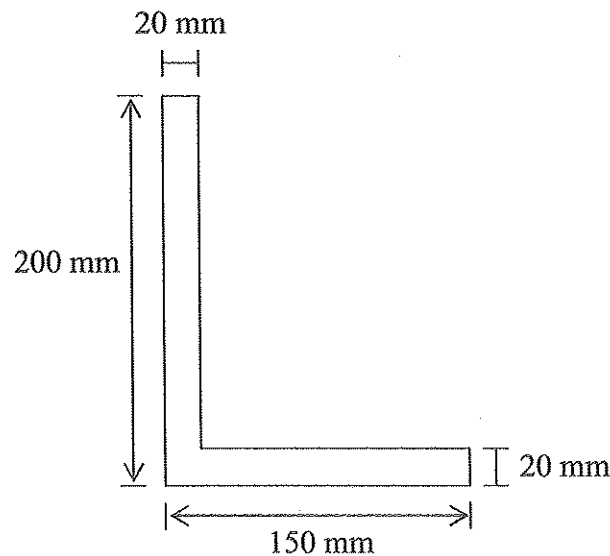


Figure B1(b) / Rajah B1(b)

CLO2
C3

(c) A simply supported beam with unsymmetrical I-section as shown in Figure B1(c) is subjected to a uniformly distributed load. The bending moment maximum, M_{max} is given as 150 kNm. Based on Figure B1(c) :

Rajah B1(c) menunjukkan rasuk disokong mudah berkeratan I yang tidak simetri dikenakan dengan beban teragih seragam. Diberi nilai momen maksima, M_{max} bersamaan 150 kNm. Berpandukan Rajah B1(c) :

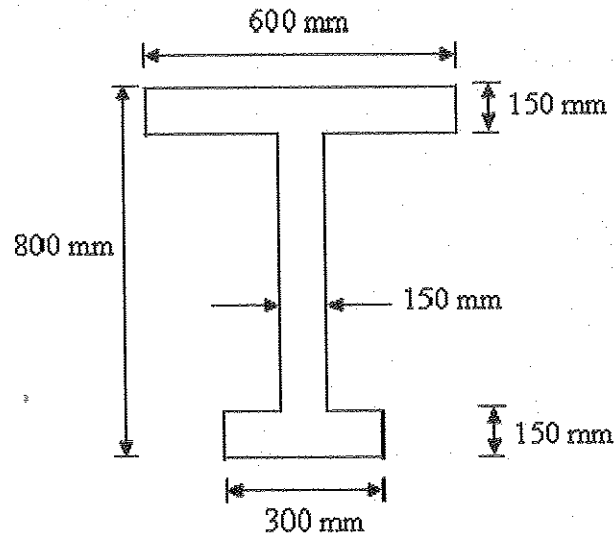


Figure B1(c) / Rajah B1(c)

- i. Calculate the neutral axis of the section.

Kirakan nilai paksi neutral bagi keratan tersebut.

[4 marks]

[4 markah]

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

Kirakan momen luas kedua bagi keratan rasuk tersebut.

[4 marks]

[4 markah]

- iii. Calculate maximum bending stress for the beam cross section.

Kirakan tegasan lentur maksimum untuk keratan rentas rasuk.

[4 marks]

[4 markah]

- iv. Sketch the bending stress distribution.

Lakarkan gambarajah taburan tegasan lentur.

[3 marks]

[3 markah]

QUESTION 2

SOALAN 2

CLO2
C1

- (a) Three steel plates as shown in **Figure B2(a)** are connected together by a bolt of 16mm diameter. Identify the shear stress in bolt.

Tiga kepingan keluli seperti ditunjukkan dalam Rajah B2(a) disambungkan dengan menggunakan bolt berdiameter 16mm. Kenalpasti tegasan ricih di dalam bolt.

[5 marks]

[5 markah]

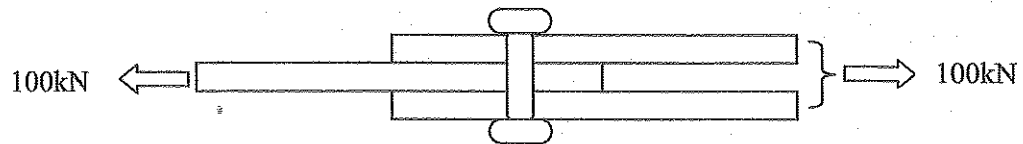


Figure B2(a) / Rajah B2(a)

CLO2
C2

- (b) A rectangular beam with 150mm wide and 200mm height as shown in **Figure B2(b)** is subjected to a maximum shear force of 50kN. Determine shear stress at a distance of 25mm above the neutral axis.

Satu rasuk segiempat dengan 150mm lebar dan 200mm tinggi seperti ditunjukkan dalam Rajah B2(b) dikenakan tegasan ricih maksimum 50kN. Tentukan daya ricih pada jarak 25mm dari paksi neutral.

[5 marks]

[5 markah]

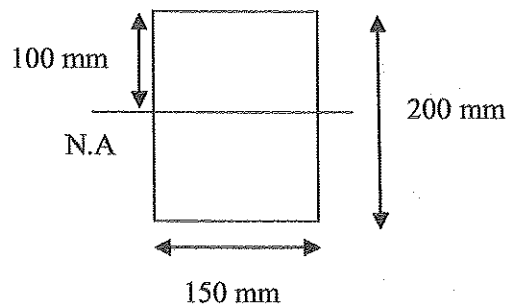


Figure B2(b) / Rajah B2(b)

CLO2
C3

- (c) A symmetrical I-section beam as shown in Figure B2(c) is subjected to a shear force of 75kN.

Satu rasuk simetri berkeratan I seperti ditunjukkan dalam Rajah B2(c) dikenakan daya ricih sebanyak 75kN.

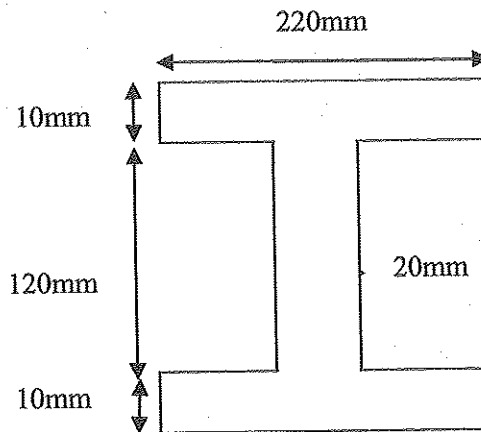


Figure B2(c) / Rajah B2(c)

- i. Calculate the second moment area for the section.

Kirakan momen luas kedua bagi keratan rentas tersebut.

[3 marks]

[3 markah]

- ii. Calculate the shear stress at the 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 seluruh bahagian.

[3 marks]

[3 markah]

QUESTION 3

SOALAN 3

A 6m length of simply supported beam is subjected to a uniformly distributed load and point load as shown in **Figure B3**.

Satu rasuk disokong mudah sepanjang 6m dikenakan beban teragih seragam dan beban tumpu seperti ditunjukkan dalam **Rajah B3**.

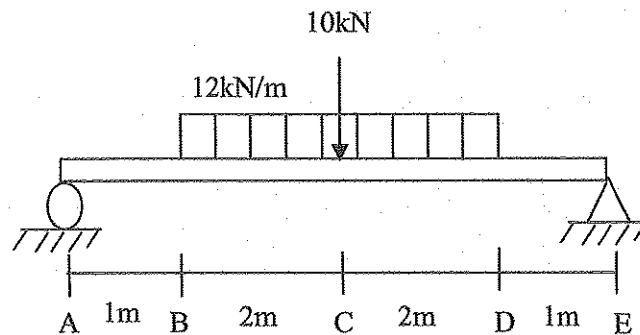


Figure B3 / Rajah B3

CLO2
C1

(a) As shown in on **Figure B3**:

*Sepertimana yang ditunjukkan dalam **Rajah B3**:*

- i. Draw the free body diagram of the beam.
Lukis gambarajah jasad bebas bagi rasuk tersebut.

[3 marks]

[3 markah]

- ii. Identify the reaction force at support A.
Tentukan tindak balas pada penyokong A.

[2 marks]

[2 markah]

CLO2
C2

(b) Express the slope and deflection equations for this beam by using Macaulay Method.

Terbitkan persamaan kecerunan dan pesongan bagi rasuk ini dengan menggunakan Kaedah Macaulay.

[5 marks]

[5 markah]

CLO2
C3

(c) Calculate the slope and deflection at point D by using Macaulay Method.

Kirakan kecerunan dan pesongan pada titik D dengan menggunakan Kaedah Macaulay.

[15 marks]

[15 markah]

QUESTION 4

SOALAN 4

A cantilever beam in **Figure B4** has a constant EI . By using Moment Area Method :
Rasuk julus di Rajah B4 mempunyai nilai malar EI . Dengan menggunakan Kaedah Momen Luas :

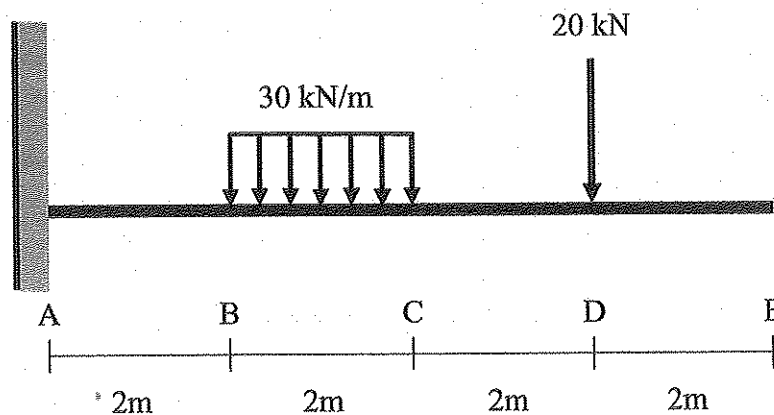


Figure B4 / Rajah B4

CLO2
C1

- (a) Draw the Free Body Diagram of the beam.

Lukiskan gambarajah jasad bebas rasuk.

[5 marks]

[5 markah]

CLO2
C2

- (b) Calculate the reaction force of the beam.

Kirakan nilai daya tindakbalas rasuk.

[5 marks]

[5 markah]

CLO2
C3

- (d) Calculate the deflection and slope at the free end of the beam.

Kirakan nilai pesongan dan kecerunan pada hujung bebas rasuk tersebut.

[15 marks]

[15 markah]

SOALAN TAMAT

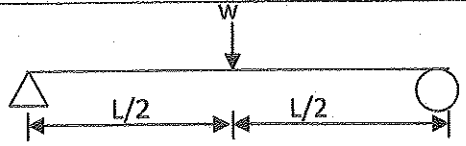
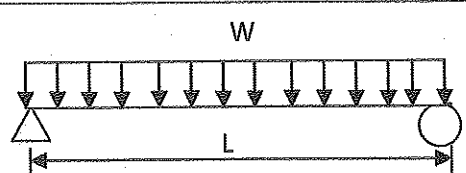
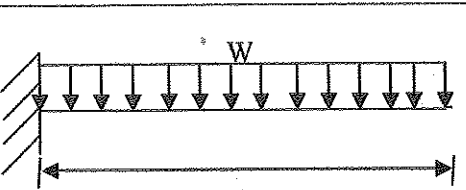
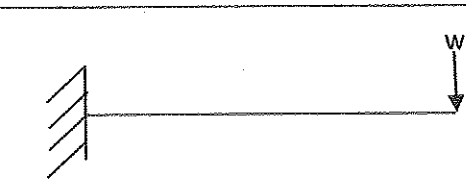
BEAM WITH SPECIFIC LOAD	MAXIMUM MOMENT
	$wL/4$
	$WL^2/8$
	$WL^2/2$
	wL

Table 1 : Maximum Moment Formula for Specific Beam and Load

LIST OF FORMULA FOR DCC2063
MECHANICS OF CIVIL ENGINEERING STRUCTURES

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

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

$$E = \frac{PL}{\delta LA}$$

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

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

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

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

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

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