

SULIT



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

JABATAN KEJURUTERAAN AWAM

PEPERIKSAAN AKHIR

SESI JUN 2016

DCC2063: MECHANICS OF CIVIL ENGINEERING STRUCTURES

TARIKH : 03 NOVEMBER 2016

MASA : 2.30 PM - 4.30 PM (2 JAM)

Kertas ini mengandungi **SEBELAS (11)** 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 the questions.

ARAHAN:

Bahagian ini mengandungi DUA (2) soalan berstruktur. Jawab SEMUA soalan.

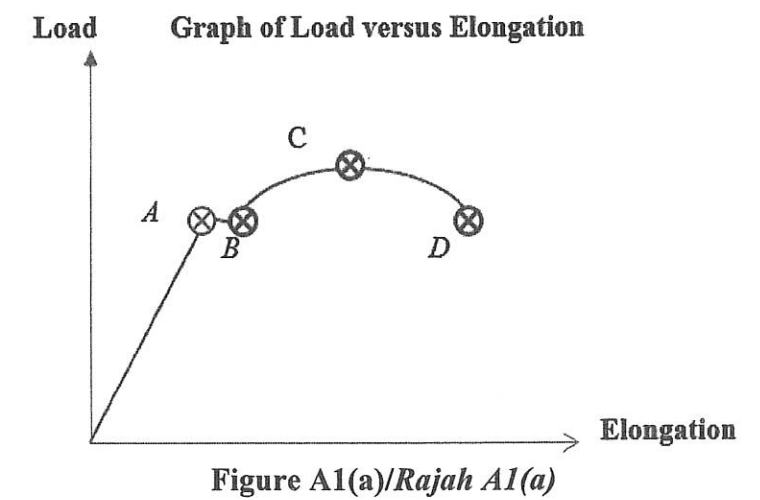
QUESTION 1

SOALAN 1

CLO1
C1

(a) **Figure A1(a)** shows a graph of Load Versus Elongation for steel specimen when subjected to a tensile test. Identify the characteristics of material at point A, B, C and D.

Rajah A1(a) menunjukkan graf Beban lawan pemanjangan bagi satu specimen keluli yang dikenakan ujian tegangan. Kenalpasti ciri-ciri bahan bagi kedudukan A, B, C dan D.



[5 marks]

[5 markah]

CLO1
C2

(b) Figure A1(b) shows circular cross section of a bar with the length of 0.5 m, diameter of 25 mm and 80 kN tensile force is put on the bar.

Rajah A1 (b) menunjukkan keratan rentas bar berbentuk bulat mempunyai 0.5m panjang, dan berdiameter 25 mm telah dikenakan daya tegangan 80 kN.

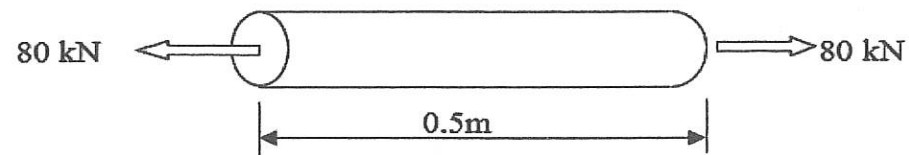


Figure A1(b)/Rajah A (b)

i. Calculate the stress and strain of bar if the elongation occur is 0.01m.

Kirakan nilai tegangan dan terikan bar jika berlaku pemanjangan sebanyak 0.01m.

[6 marks]

[6 markah]

ii. Determine the value of Modulus of Young.

Tentukan nilai Modulus Young.

[2 marks]

[2 markah]

CLO1
C2

(c) Steel bars in Figure A1(c) is under compressive load of 20 kN. Determine the stress and strain in every section of the bar. Given E for steel is 206 kN/mm².

Rajah A1(c) menunjukkan bar keluli dikenakan beban mampatan sebanyak 20 kN. Tentukan nilai tegangan dan terikan bagi setiap bahagian bar. Diberi nilai E untuk keluli ialah 206 kN/mm²

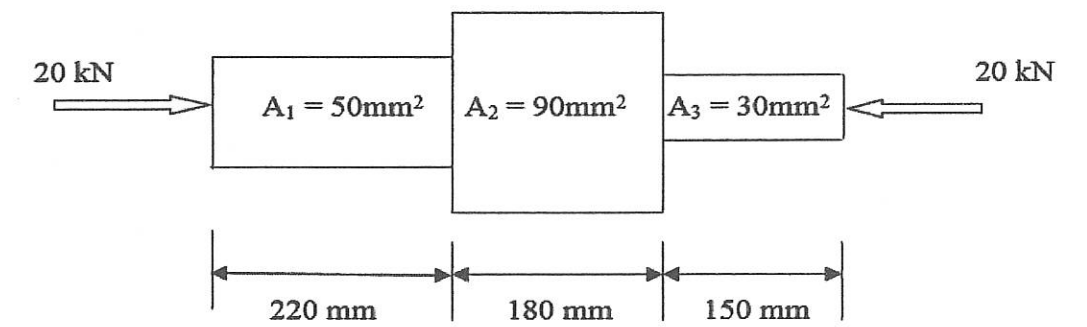


Figure A1 (c)/Rajah A1 (c)

[12 marks]

[12 markah]

QUESTION 2

SOALAN 2

CLO2
C1

(a) Loads are classified by the way they are distributed on a structure. Define the following terms together with S.I unit.

Beban dikelaskan dengan cara bagaimana ianya diagihkan pada sesuatu struktur.

Takrifkan istilah berikut beserta S.I unit berikut.

i. Uniformly distributed load.

Beban agihan seragam.

[2.5 marks]

[2.5 markah]

ii. Moment.

Momen

[2.5 marks]

[2.5 markah]

- CLO2
C2 (b) Determine the value of W and R_c if the beam structure as in Figure A2 (b) is in equilibrium.

Tentukan nilai W dan R_c jika struktur rasuk seperti Rajah A2 (b) berada dalam keseimbangan.

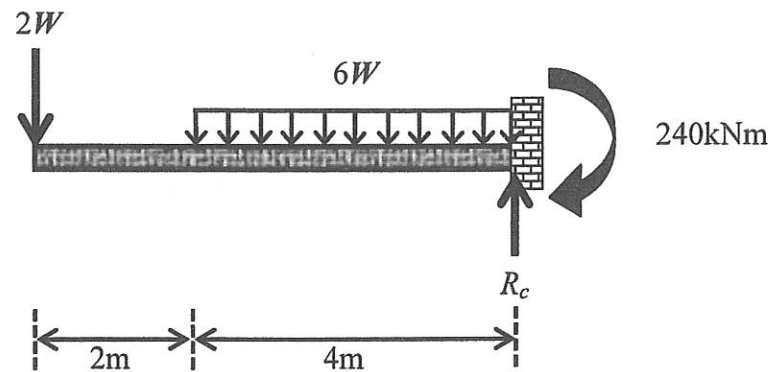


Figure A2 (b) / Rajah A2 (b)

[5 marks]

[5 markah]

- CLO2
C3 (c) A simply supported 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 support A and E are 21.25 kN and 18.75 kN respectively.

Satu rasuk disokong mudah 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 E masing-masing ialah 21.25kN dan 18.7kN.

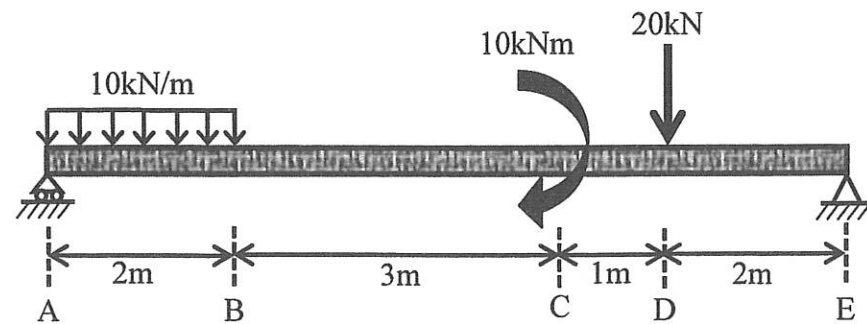


Figure A2(c) / Rajah A2(c)

[15 marks]

[15 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
C1 (a) i. Define Bending stress.
Takrifkan tegasan lentur.

[2 marks]

[2 markah]

- ii. Define section modulus with the formula.
Takrifkan modulus keratan beserta formula.

[3 marks]

[3 markah]

CLO2
C2

(b) A rectangular beam is subjected to load as shown in **Figure B1(b)**. Calculate the maximum bending stress on the section

*Sebuah rasuk berkeratan segiempat tepat menanggung beban seperti yang ditunjukkan pada **Rajah B1(b)**. Kirakan maksimum tegasan lentur pada keratan tersebut.*

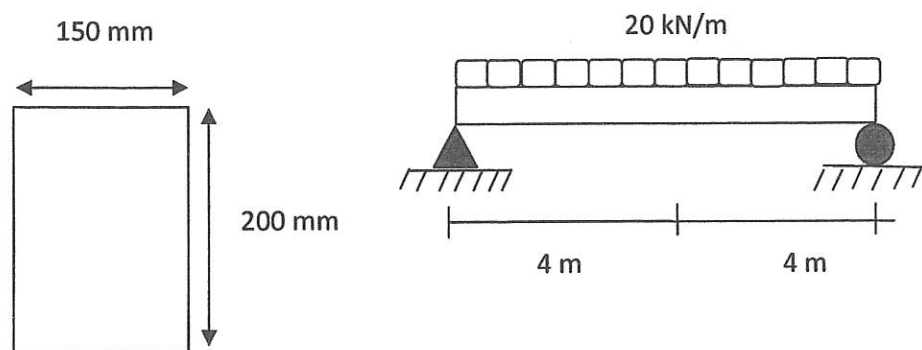


Figure B1(b) / Rajah B1(b)

[5 marks]

[5 markah]

CLO2
C3

(c) A cantilever beam with a symmetrical I – section is subjected to a uniformly distributed load and point load as shown in **Figure B1(c)**.

*Sebuah rasuk julur berkeratan simetri berbentuk I menanggung beban teragih seragam dan beban tumpu seperti yang ditunjukkan dalam **Rajah B1(c)**.*

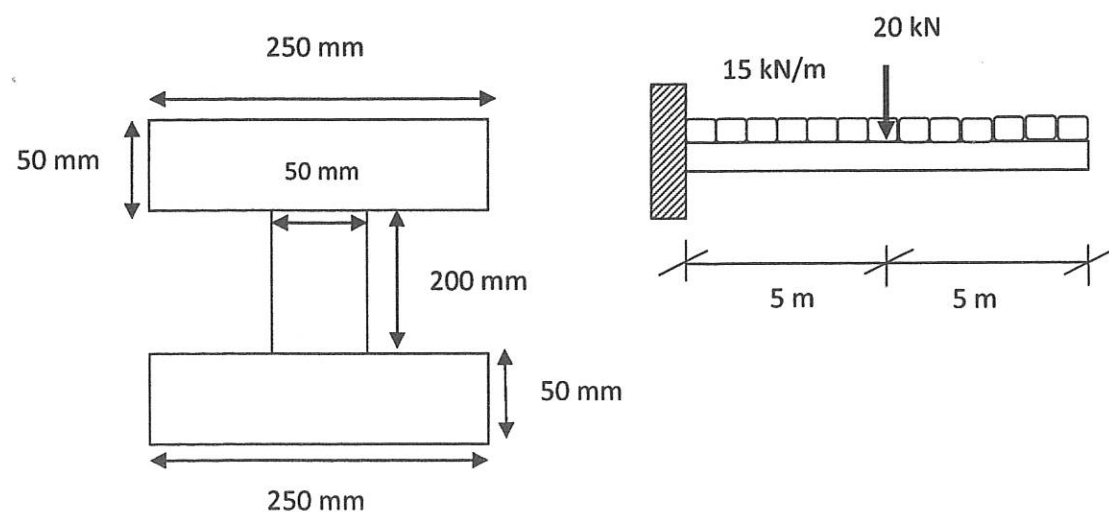


Figure B1(c) / Rajah B1(c)

i. Calculate the position of neutral axis x , of cross section.

Kirakan kedudukan paksi neutral x , bagi keratan rasuk.

[3 marks]

[3 markah]

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

Kirakan momen luas kedua bagi keratan rentas rasuk.

[5 marks]

[5 markah]

iii. Calculate the bending stress for beam cross section.

Kirakan tegasan lentur untuk keratan rasuk.

[4 marks]

[4 markah]

iv. Sketch the bending stress distribution.

Lakarkan taburan tegasan lentur.

[3 marks]

[3 markah]

QUESTION 2

SOALAN 2

CLO 2
C2

(a) Explain shear stress together with the formula and unit.

Terangkan tegasan ricih beserta formula dan unit.

[5 marks]

[5markah]

CLO 2
C3

(b) Two steel plates are connected by using rivet with a diameter of 40 mm. If the imposed load is 100 kN, calculate the shear stress in rivet.

Dua plat keluli disambung dengan menggunakan rivet berdiameter 40 mm. Jika daya yang dikenakan adalah 100 kN, kirakan tegasan ricih dalam rivet.

[5 marks]

[5markah]

CLO 2
C3 (c) An I-section beam is subjected to a point load of 50 kN as shown in Figure B2(c).

- Calculate the magnitude of maximum shear stress.
- Sketch the shear stress distribution across the section.

Keratan rasuk berbentuk I dikenakan beban tumpu 50 kN seperti yang ditunjukkan dalam Rajah B2(c).

- Kirakan magnitud tegasan ricih maksimum.*
- Lakarkan agihan tegasan ricih di seluruh bahagian.*

[15 marks]

[15markah]

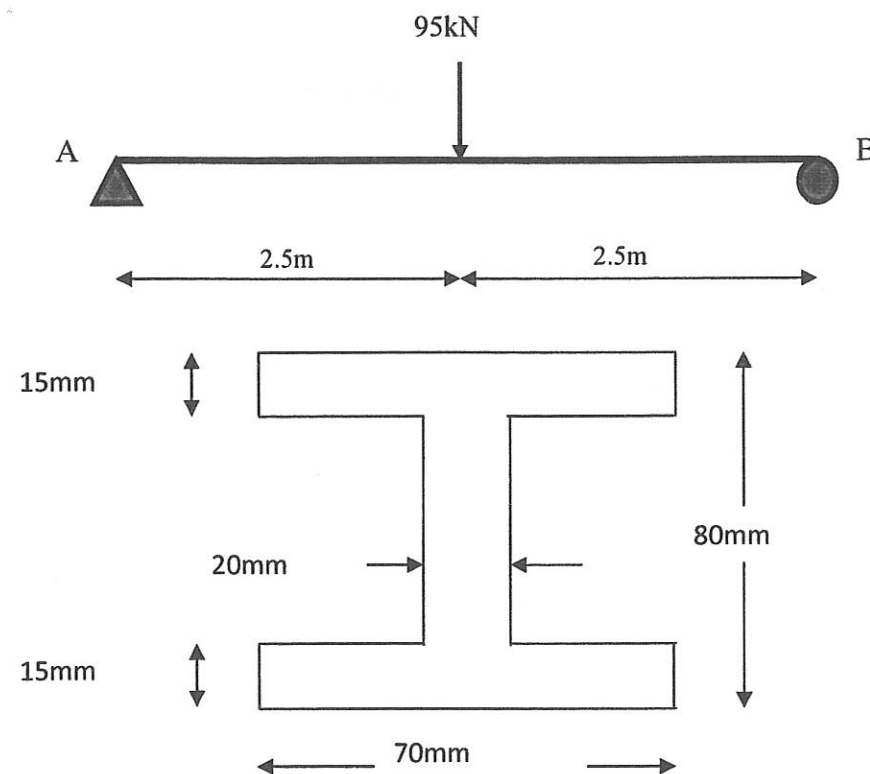


Figure B2(c) / Rajah B2(c)

QUESTION 3

SOALAN 3

A Cantilever beam is subjected to a point load and a uniformly distributed load as shown in Figure B3. Based on Figure B3:

Satu Rasuk dikenakan satu beban tumpu dan satu beban teragih seragam seperti dalam Rajah B3. Berdasarkan kepada gambarajah:

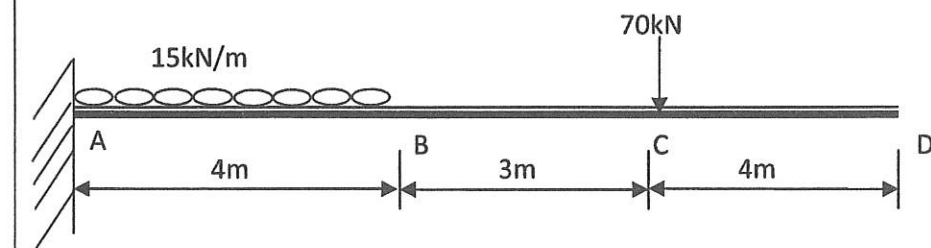


Figure B3 / Rajah B3

CLO 2 (a) Calculate the reaction forces at support A.

C2

Kirakan daya tindakbalas pada penyokong A.

[5 marks]

[5markah]

CLO 2 (b) Derive the moment equations for this beam by using Macaulay Method.

C3

Terbitkan persamaan momen bagi rasuk ini menggunakan Kaedah Macaulay.

[5 marks]

[5markah]

CLO 2 (c) Determine the slope and the deflection at point D by using Macaulay Method in term of EI.

C3

Tentukan kecerunan dan pesongan rasuk pada titik D dengan menggunakan Kaedah Macaulay dalam sebutan EI.

[15 marks]

[15 markah]

QUESTION 4

SOALAN 4

A cantilever beam in **Figure B4** has a constant EI. By using Moment Area Method:

Rajah B4 menunjukkan rasuk julus yang mempunyai nilai malar EI. Dengan menggunakan Kaedah Momen Luas:

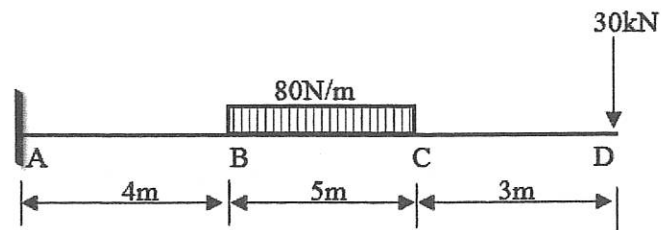


Figure B4 / Rajah B4

CLO1 (a) Draw Free Body Diagram (FBD) of beam.

C1

Lukiskan gambarajah jasad bebas rasuk.

[5 marks]

[5 markah]

CLO2 (b) Calculate the reaction of beam.

C2

Kirakan nilai daya tindakbalas rasuk.

[5 marks]

[5 markah]

CLO2 (c) Calculate the maximum deflection of cantilever beam.

C3

Kirakan nilai pesongan maksimum rasuk julus.

[15 marks]

[15 markah]

SOALAN TAMAT

FORMULA

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

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

$$3. \quad E = \frac{PL}{\delta l A}$$

$$4. \quad E = \frac{\sigma}{\varepsilon}$$

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

$$6. \quad z = \frac{I}{Y_{max}}$$

$$7. \quad \frac{M}{I} = \frac{\sigma}{Y}$$

$$8. \quad \tau = \frac{F}{A}$$

$$9. \quad \tau = \frac{VAy}{I_{xx} \cdot b}$$