

SULIT



**BAHAGIAN PEPERIKSAAN DAN PENILAIAN
JABATAN PENDIDIKAN POLITEKNIK DAN KOLEJ KOMUNITI
KEMENTERIAN PENGAJIAN TINGGI**

JABATAN KEJURUTERAAN AWAM

PEPERIKSAAN AKHIR

SESI I : 2022/2023

DCC20053: MECHANICS OF CIVIL ENGINEERING STRUCTURES

TARIKH : 14 DISEMBER 2022

MASA : 8.30 AM - 10.30 AM (2 JAM)

Kertas ini mengandungi **SEBELAS (11)** halaman bercetak.

Bahagian A: Struktur (2 soalan)

Bahagian B: Esei (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
C2

- (a) i) Differentiate between External Force and Internal Force.
Bezakan antara Daya Luaran dan Daya Dalaman.

[2 marks]

[2 markah]

CLO1
C3

- ii) Explain the types of support and force reaction direction with the aid of diagram.

Terangkan jenis-jenis sokongan dan arah daya tindakbalas dengan bantuan gambar rajah.

[3 marks]

[3 markah]

CLO1
C2

- (b) i) There are a few types of beams that are commonly used in construction. Explain **FOUR (4)** types of beams.
Terdapat beberapa jenis rasuk yang biasa digunakan dalam pembinaan. Huraikan EMPAT (4) jenis rasuk.

[4 marks]

[4 markah]

CLO1
C3

- ii) A simply supported beam is loaded as shown in **Figure A1 (b) (ii)**. Calculate the reaction force of beam using static equilibrium principle.

*Sebatang rasuk yang disokong mudah dikenakan beban seperti **Rajah A1(b) (ii)**. Kirakan daya tindakbalas bagi rasuk menggunakan prinsip Keseimbangan daya.*

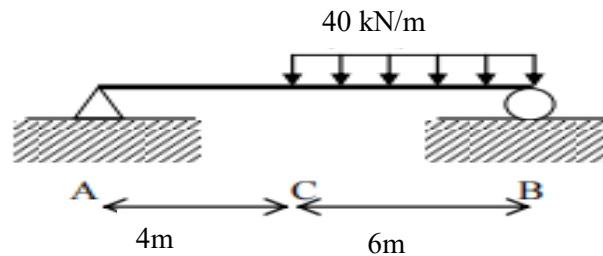


Figure A1 (b) (ii) /Rajah A1 (b)(ii)

[6 marks]

[6 markah]

- (c) A steel rod that has two different cross section bar is imposed with pressure of 40 N as shown in the **Figure A1 (c)** below.

*Satu rod keluli mempunyai dua bahagian keratan rentas yang berbeza dikenakan beban mampatan 40N seperti **Rajah A1 (c)** dibawah.*

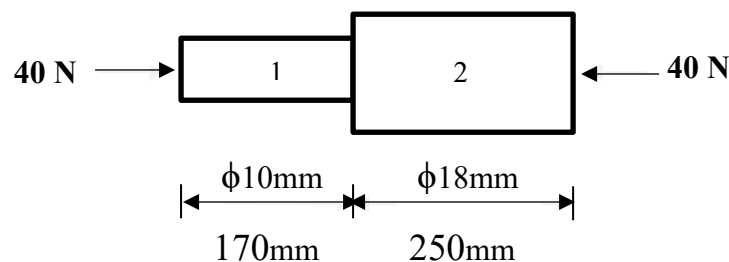


Figure A1 (c)/Rajah A1 (c)

CLO1
C2

- i) Identify stress for section 1
Kenalpasti tegasan pada bahagian 1

[4 marks]

[4 markah]

CLO1
C3

- ii) Calculate total elongation
Jumlah pemendekan yang berlaku

[6 marks]

[6 markah]

QUESTION 2

SOALAN 2

CLO1
C2

- (a) i) Explain the meaning of centre of gravity.

Huraikan maksud pusat graviti.

[2 marks]

[2 markah]

CLO1
C3

- ii) Determine the centroid of rectangular section with 60mm width and 120 mm height.

Tentukan kedudukan pusat bagi keratan segiempat tepat yang mempunyai ukuran 60mm lebar dan 120mm dalam.

[3 marks]

[3 markah]

CLO1
C2

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

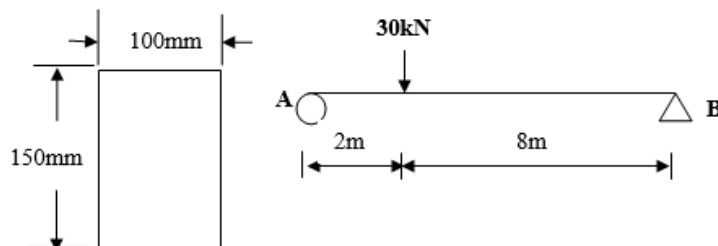
Terangkan tegasan dan terikan terus beserta formula dan unit yang betul.

[4 marks]

[4 markah]

CLO1
C3

- ii) Beam of rectangular cross-section as shown in
- Figure A2 (b) (ii)**
- below is subjected to a maximum shear force of 30 kN. Determine the shear stress at a distance of 50mm from the neutral axis.

*Sebuah rasuk berkeratan rentas segiempat seperti ditunjukkan dalam **Rajah A2 (b) (ii)** dibawah dikenakan tegasan ricih maksimum 30kN. Tentukan daya ricih pada jarak 50mm dari paksi neutral.***Figure A2 (b) (ii) /Rajah A2 (b) (ii)**

[6 marks]

[6 markah]

- (c) A cantilever beam is subjected to a load as shown in **Figure A2 (c)** by using area moment method. Given: $A_y = 35 \text{ kN}$; $M_A = 185 \text{ kNm}$
*Sebuah rasuk julur dikenakan beban seperti ditunjukkan dalam **Rajah A2 (c)**. Menggunakan kaedah momen luas. Diberikan: $A_y = 35 \text{ kN}$; $M_A = 185 \text{ kNm}$*

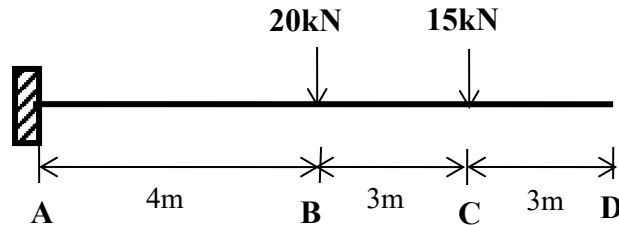


Figure A2 (c) / Rajah A2 (c)

CLO1
C2

- i) Illustrate the bending moment diagram (BMD).
Gambarkan gambar rajah momen lentur (GML).

[4 marks]

[4 markah]

CLO1
C3

- ii) Determine slope at free end of the cantilever beam.
Tentukan kecerunan pada hujung bebas bagi rasuk julur tersebut.

[6 marks]

[6 markah]

SECTION B : 50 MARKS**BAHAGIAN B : 50 MARKAH****INSTRUCTION:**

This section consists of **FOUR (4)** essay questions. Answer **TWO (2)** questions only.

ARAHAN :

Bahagian ini mengandungi **EMPAT (4)** soalan esei. Jawab **DUA (2)** soalan sahaja.

QUESTION 1**SOALAN 1**

A cantilever beam is subjected to a set of loads as shown in **Figure B1**.

*Sebuah rasuk jujur dikenakan beban-beban seperti dalam **Rajah B1**.*

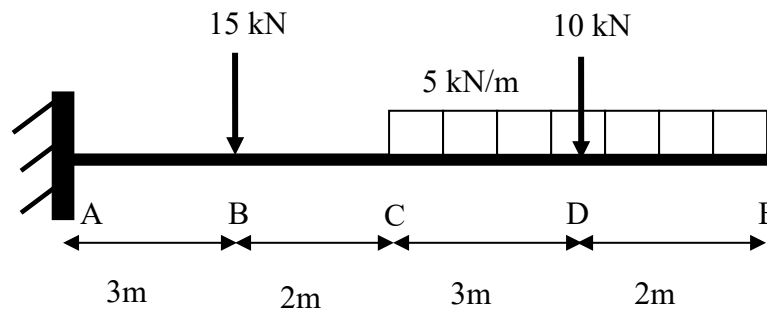


Figure B1/ Rajah B1

CLO2
C3

- (a) Calculate reaction force at the support of the beam.

Kirakan daya tindakbalas pada penyokong bagi rasuk ini.

[5 marks]

[5 markah]

CLO2
C4

- (b) Illustrate the shear force diagram (SFD) of the beam.

Gambarkan gambar rajah daya ricih (GDR) bagi rasuk.

[8 marks]

[8 markah]

CLO2
C4

- (c) Illustrate bending moment diagram (BMD) and select the value of maximum moment.

Gambarkan gambar rajah momen lentur (GML) dan pilih nilai momen maksima.

[12 marks]

[12 markah]

QUESTION 2**SOALAN 2**CLO2
C3

- (a) A T- section of beam given as shown in **Figure B2 (a)**. Based on the basic geometrical shape, determine the centroid of T-Section.

*Keratan rasuk -T diberikan seperti yang ditunjukkan dalam **Rajah B2 (a)**.*

Berdasarkan bentuk asas geometri, tentukan pusat bagi keratan-T tersebut.

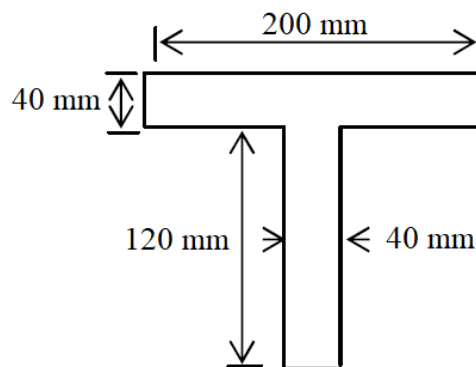


Figure B2 (a) / Rajah B2 (a)

[5 marks]

[5 markah]

CLO2
C4

- (b) Illustrate the stress distribution over the cross section in beam as shown in the **Figure B2 (b)** below.

*Gambarkan taburan tegasan yang berlaku ke atas keratan rentas bagi rasuk AB seperti yang ditunjukkan dalam **Rajah B2 (b)** di bawah.*

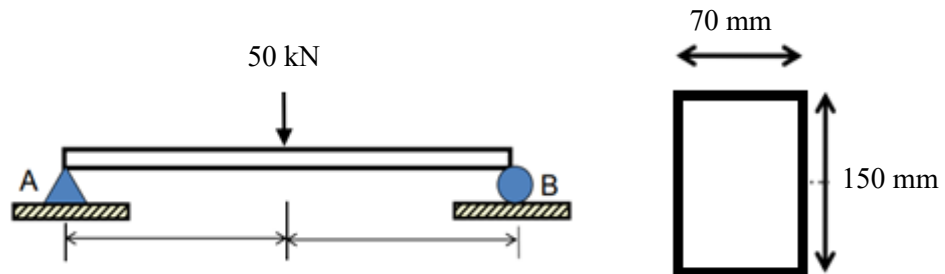


Figure B2(b)/ Rajah B2 (b)

[8 marks]

[8 markah]

CLO2
C4

- (c) Based on the shear force value in question 2(b), illustrate the stress distribution over the cross section at every 25 mm interval.

Berdasarkan nilai daya ricih yang diperolehi dalam soalan 2(b), gambarkan taburan tegasan ke atas keratan rentas pada setiap sela 25mm

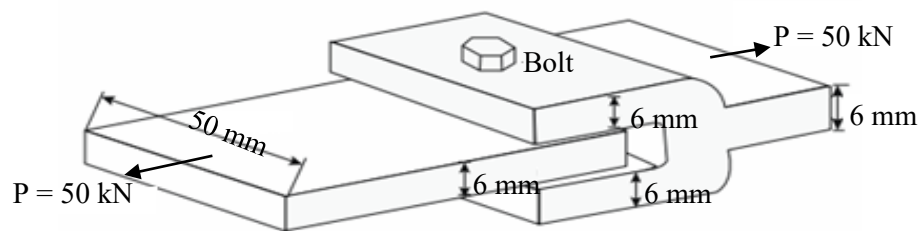
[12 marks]

[12 markah]

QUESTION 3**SOALAN 3**

The types of joints that are commonly used in building construction are bolts and nuts, rivets, and weldings. **Figure B3** show that the coupling type of steel connection is designed to carry 50 kN. If the bolt diameter is 15 mm, calculate

*Jenis sambungan yang biasa digunakan dalam sesuatu pembinaan bangunan ialah bolt dan nat, rivet, dan kimpalan. **Rajah B3** menunjukkan bahawa jenis keluli sambungan berpasang mampu membawa beban sebanyak 50 kN. Jika diameter bolt ialah 15 mm, hitung;*

CLO2
C3

- (a) Average shear stress in bolt
Purata tegasan ricih dalam bolt

[5 marks]

[5 markah]

CLO2
C4

- (b) The diameter of bolt, if the value of shear stress given $\sigma = 0.175 \text{ kN/mm}^2$.
Diameter bolt, jika nilai tegasan ricih diberi $\sigma = 0.175 \text{ kN/mm}^2$.

[8 marks]

[8 markah]

CLO2
C4

- (c) Maximum tensile stress in plate and coupling
Tegasan tegangan maksimum dalam plat dan plat berpasang

[12 marks]

[12 markah]

QUESTION 4**SOALAN 4**

A simply supported beam 10 m long is subjected to a uniformly distributed load, point load and moment as shown in **Figure B4**.

*Sebuah rasuk disokong mudah menanggung beban teragih seragam, beban tumpu dan momen seperti yang ditunjukkan dalam **Rajah B4**.*

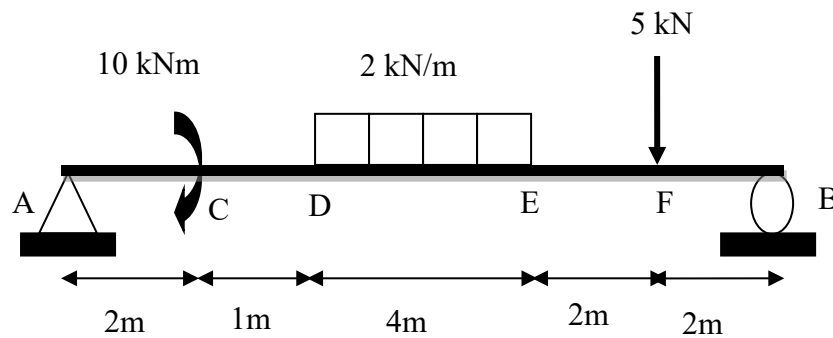


Figure B4 / Rajah B4

CLO2
C3

- (a) Identify the value of reaction force at support A and B.
Kenalpasti daya tindakbalas pada penyokong A dan B.

[5 marks]

[5 markah]

CLO2
C4

- (b) Specify the slope and deflection equations for this beam by using Macaulay's Method.

Tentukan persamaan kecerunan dan pesongan bagi rasuk ini menggunakan kaedah Macaulay.

[8 marks]

[8 markah]

CLO2
C4

- (c) Calculate the slope and deflection at point D by using Macaulay's Method in term of EI

Kirakan kecerunan dan pesongan pada titik D rasuk menggunakan kaedah Macaulay dalam sebutan EI

[12 marks]

[12 markah]

Notes

Assessment items for this course have covered elements of the Dublin Problem: DP1, DP2 and DP3 as mention in FEIST.

SOALAN TAMAT

**LIST OF FORMULA FOR DCC20053 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. $\sigma = \frac{M}{I} \times \bar{y}$

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

9. $\tau = \frac{VAy}{I_x b}$

TABLE 1 MAXIMUM MOMENT FORMULA FOR SPECIFIC BEAM AND LOAD

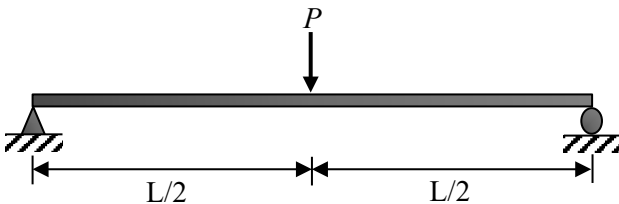
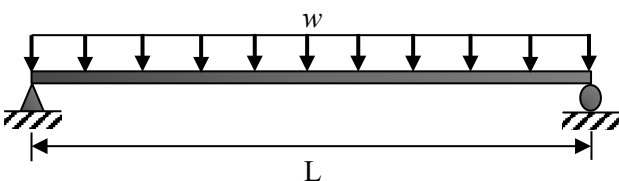
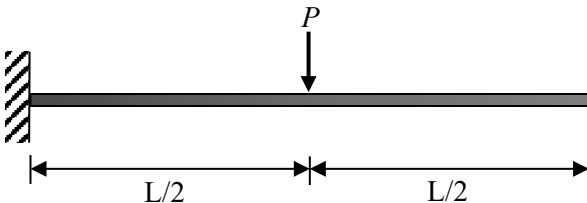
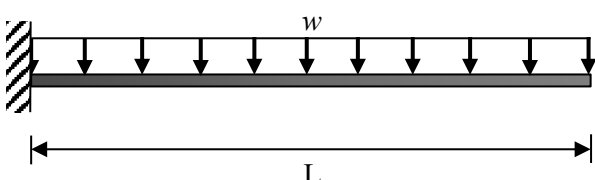
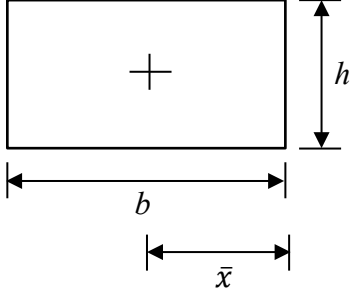
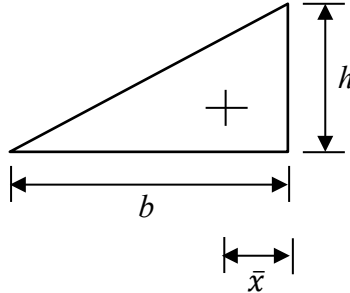
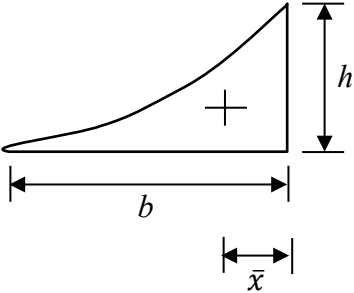
Beam with specific load	Maximum moment
	$\frac{PL}{4}$
	$\frac{wL^2}{8}$
	$\frac{-PL}{2}$
	$\frac{-wL^2}{2}$

TABLE 2 GEOMETRIC PROPERTIES OF AREA

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