

SULIT



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

JABATAN KEJURUTERAAN AWAM

PEPERIKSAAN AKHIR

SESI JUN 2017

DCC2063 : MECHANICS OF CIVIL ENGINEERING STRUCTURES

TARIKH : 23 OKTOBER 2017

MASA : 2.30 PETANG - 4.30 PETANG (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** questions.

ARAHAN:

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

QUESTION 1**SOALAN 1**CLO1
C1

- (a) Define direct stress and direct strain in civil engineering.

Takrifkan tegasan terus dan terikan terus dalam kejuruteraan awam.

[5 marks]

[5 markah]

CLO1
C2

- (b) Solid circular steel rod forming part of a framed structure, is subjected to a tensile force of 750kN. If the permissible stress in steel is 460N/mm^2 , calculate the minimum diameter of the rod in millimeters.

Satu silinder rod besi dipasang pada satu struktur kerangka dikenakan daya tegangan sebanyak 750kN. Jika jumlah tegasan yang dibenarkan pada keluli adalah 460N/mm^2 , kirakan diameter minima rod keluli tersebut dalam milimeter.

[8 marks]

[8 markah]

CLO1
C2

- (c) A metal rod is 2.5mm diameter and 2m long. A force of 12N is applied to it and it stretches by 0.3mm. Determine the:
- Satu rod besi mempunyai diameter 2.5mm dan panjang 2m. Satu daya 12N dikenakan ke atasnya dan rod tersebut mengalami pemanjangan sebanyak 0.3mm. Tentukan:*
- Shear stress in the rod, σ . [6 marks]
Tegasan tegangan di dalam rod, σ . [6 markah]
 - Strain in the rod, ϵ . [3 marks]
Keterikan di dalam rod, ϵ . [3 markah]
 - Modulus of elasticity, E. [3 marks]
Modulus Keanjalan, E. [3 markah]

QUESTION 2
SOALAN 2

- CLO2 C1 (a) Define the mechanics of structures. [5 marks]
Berikan definisi mekanik struktur. [5 markah]
- CLO2 C2 (b) Explain the Equilibrium Principle of Forces. [5 marks]
Terangkan Prinsip Keseimbangan Daya. [5 markah]
- CLO2 C3 (c) A simply supported beam is loaded as shown in Figure A2(c). Sketch the shear force and bending moment diagrams of the beam [15 marks]
Satu rasuk terletak mudah dikenakan beban seperti Rajah A2(c). Lakarkan gambarajah daya ricih dan momen lentur bagi rasuk tersebut. [15 markah]

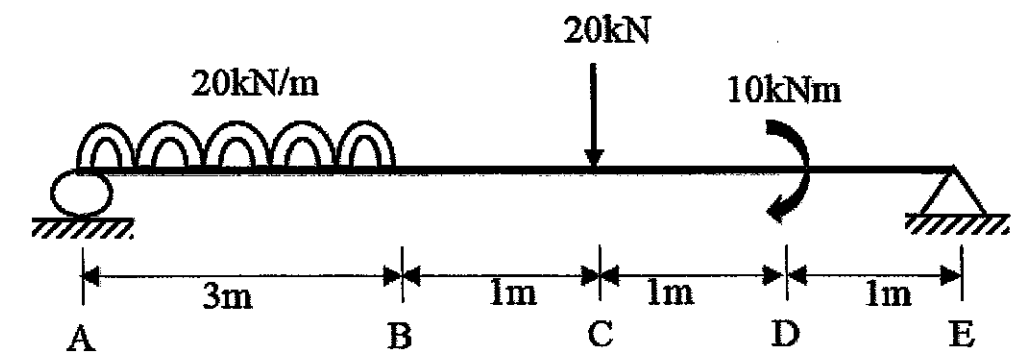


Figure A2(c) / Rajah A2(c)

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

A symmetrical I-section beam as shown in **Figure B1** is carrying a uniformly distributed load of 20 N/m along the span.

Satu rasuk simetri berkeratan I seperti **Rajah B1** dikenakan beban teragih seragam 20N/m di sepanjang rasuk.

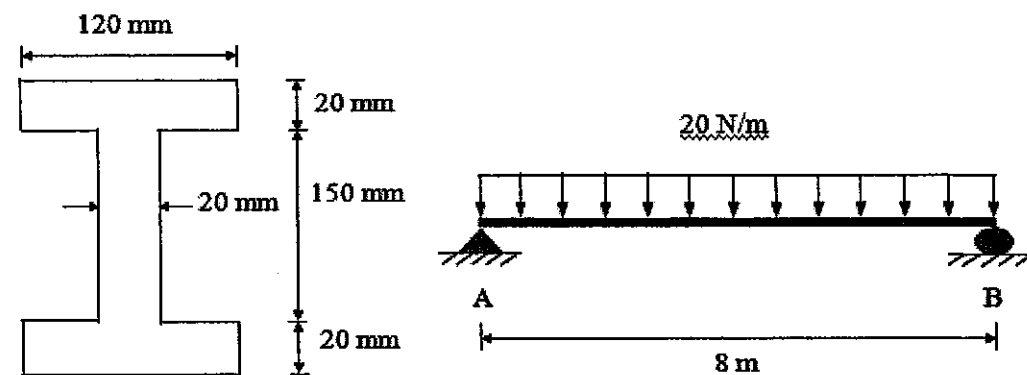


Figure B1/ Rajah B1

- CLO2
C1 (a) Identify the value of the centroid position for x axis.
Kenal pasti nilai kedudukan sentroid pada paksi x.

[5 marks]

[5 markah]

- CLO2
C2 (b) Determine the maximum bending moment for the beam.
Tentukan momen lentur maksimum bagi rasuk.

[5 marks]

[5 markah]

CLO2
C3

- (c) Based on **Figure B1**:

Berdasarkan Rajah B1:

- i. Calculate the bending stress for the beam cross section. [10 marks]
Kirakan nilai tegasan lentur untuk keratan rentas rasuk. [10 markah]
- ii. Sketch the bending stress distribution diagram. [5 marks]
Lakarkan gambarajah taburan tegasan lentur. [5 markah]

QUESTION 2

SOALAN 2

A T-beam with cross-section as shown in **Figure B2** is carrying a shear force of 3000 N.

Satu rasuk keratan rentas rasuk-T seperti dalam **Rajah B2** dikenakan daya ricih 3000N.

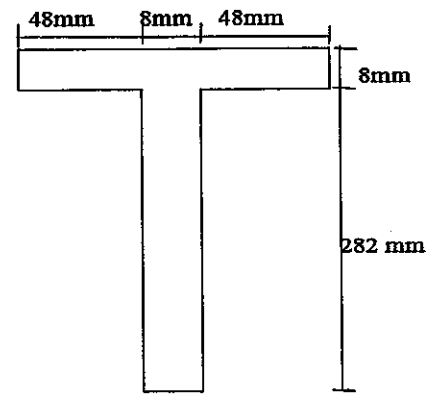


Figure B2/ Rajah B2

- CLO2 C1 (a) Locate the centroid of the section about X-X axis.
Tandakan kedudukan sentroid terhadap paksi X-X.
- [5 marks]
[5 markah]
- CLO2 C2 (b) Determine the moment of inertia for the beam.
Tentukan momen luas kedua bagi rasuk.
- [5 marks]
[5 markah]
- CLO2 C3 (c) Based on **Figure B2**:
Berdasarkan Rajah B2:
- i. Calculate shear stress for the beam.
Kirakan tegasan ricih bagi rasuk tersebut.
 - ii. Sketch the shear stress distribution for the beam cross section.
Lakarkan taburan tegasan ricih untuk keratan rasuk tersebut.
- [10 marks]
[10 markah]
- [5 marks]
[5 markah]

QUESTION 3

SOALAN 3

A simply supported beam is 4m long is subjected to a uniformly distributed load as shown in **Figure B3**.

Satu rasuk ditupang mudah sepanjang 4m dikenakan beban teragih seragam seperti ditunjukkan dalam **Rajah B3**.

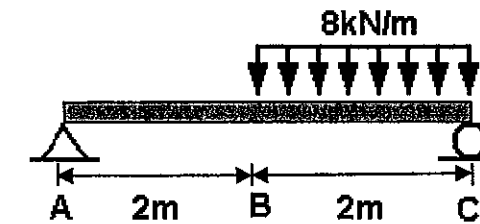


Figure B3/ Rajah B3

- CLO2 C1 (a) Identify the value of vertical reaction force at support A.
Kenal pasti nilai daya tindak balas pada penyokong A.
- [5 marks]
[5 markah]
- CLO2 C2 (b) Express the slope and deflection equations for this beam by using Macaulay Method.
Tunjukkan persamaan kecerunan dan pesongan bagi rasuk ini menggunakan Kaedah Macaulay.
- [5 marks]
[5 markah]
- CLO2 C3 (c) Calculate the slope and deflection at point B by using Macaulay Method in term of EI.
Kirakan kecerunan dan pesongan rasuk di titik B dengan menggunakan Kaedah Macaulay dalam sebutan EI.
- [15 marks]
[15 markah]

QUESTION 4

SOALAN 4

A simply supported beam is subjected to a uniformly distributed load as shown in Figure B4.

Satu rasuk sokong mudah, dikenakan beban teragih seragam seperti dalam Rajah B4.

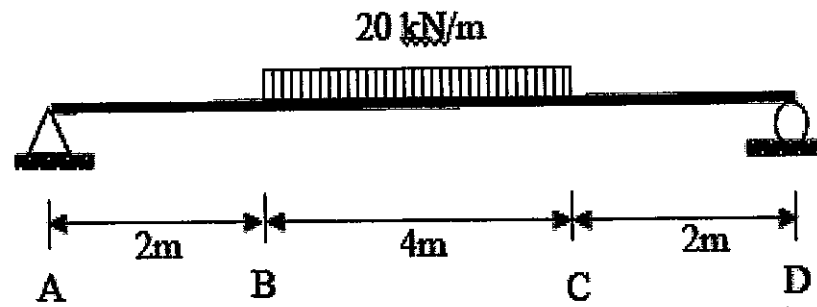


Figure B4 / Rajah B4

- CLO2
C1 (a) Draw the Free Body Diagram of the beam.
Lukiskan Gambarajah Jasad Bebas bagi rasuk berkenaan.
- [5 marks]
[5 markah]
- CLO2
C2 (b) Calculate the reaction of the beam.
Kirakan nilai daya tindak balas rasuk.
- [5 marks]
[5 markah]
- CLO2
C3 (c) Calculate the deflection and slope in term of EI at the middle of the beam by using the Moment Area Method.
Kirakan nilai pesongan dan kecerunan dalam sebutan EI pada pertengahan rasuk dengan menggunakan kaedah Momen Luas.
- [15 marks]
[15 markah]

SOALAN TAMAT

Table 1: Maximum Moment Formula for Specific Beam and Load

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

LIST OF FORMULA FOR DCC 2063MECHANICS OF CIVIL ENGINEERING STRUCTURES

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

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

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

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

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

6.
$$Z = \frac{I}{Y_{max}}$$

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

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

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