

SULIT



**BAHAGIAN PEPERIKSAAN DAN PENILAIAN
JABATAN PENDIDIKAN POLITEKNIK DAN KOLEJ KOMUNITI
KEMENTERIAN PENDIDIKAN MALAYSIA**

JABATAN KEJURUTERAAN AWAM

**PEPERIKSAAN AKHIR
SESI DISEMBER 2018**

DCC5163 : THEORY OF STRUCTURES

**TARIKH : 13 APRIL 2019
MASA : 2.30 PETANG – 4.30 PETANG (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**

A statically determinate truss is subjected to the external loads as shown in **Figure A1**. Given the cross sectional area, $A = 400 \text{ mm}^2$ and modulus of elasticity, $E = 200 \text{ kN/mm}^2$.

*Sebuah kekuda boleh tentu statik dikenakan beban luaran seperti ditunjukkan dalam **Rajah A1**. Diberi luas keratan, $A = 400 \text{ mm}^2$ dan modulus keanjalan, $E = 200 \text{ kN/mm}^2$.*

CLO2
C1

- (a) Identify the truss as shown in **Figure A1** is statically determinate.

*Kenalpasti kekuda yang ditunjukkan dalam **Rajah A1** adalah boleh tentu statik.*

[4 marks]

[4 markah]

CLO2
C2

- (b) Determine the internal forces in each member of the truss due to the external load and a vertical unit load at joint B.

Tentukan daya dalaman setiap anggota kekuda yang disebabkan oleh daya luaran dan beban unit pugak pada sendi B.

[6 marks]

[6 markah]

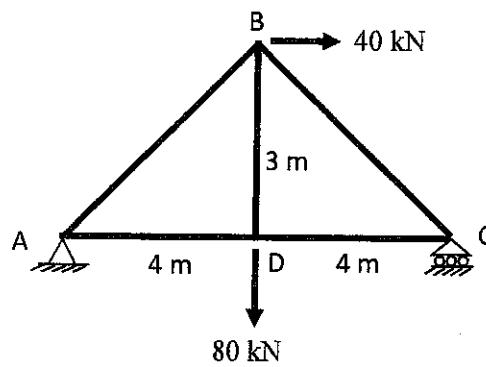
CLO2
C3

(c) Calculate the vertical displacement of joint B.

Kirakan anjakan pugak pada sendi B.

[15 marks]

[15 markah]

**Figure A1 / Rajah A1**

QUESTION 2

SOALAN 2

CLO3
C3

- (a) An overhang beam is subjected to the external loads as shown in **Figure A2(a)**. Using the Influence Line Diagram:

*Sebuah rasuk jantai dikenakan daya luaran seperti ditunjukkan dalam **Rajah A2(a)**.*

Dengan menggunakan Gambarajah Garis Imbas:

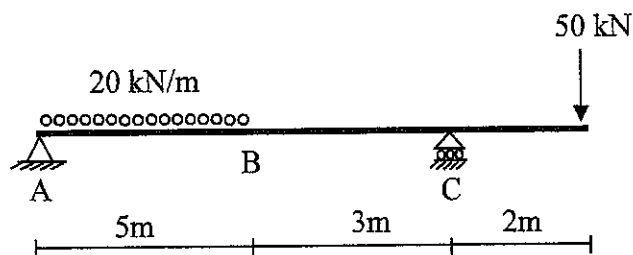


Figure A2(a) / Rajah A2(a)

- i. Calculate the vertical reaction at A and C.

Kirakan daya tindakbalas di A dan C.

[4 marks]

[4 markah]

- ii. Calculate the shear force at B.

Kirakan daya ricih di B.

[3 marks]

[3 markah]

- iii. Calculate the bending moment at B.

Kirakan momen lentur di B.

[3 marks]

[3 markah]

- (b) A simply supported beam of 14 m span is subjected to a series of concentrated loads as shown in **Figure A2(b)**. By using Influence Line Diagram;

*Sebuah rasuk disokong mudah sepanjang 14m dikenakan satu siri beban tumpu seperti ditunjukkan dalam **Rajah A2(b)**. Dengan menggunakan Gambarajah Garis Imbas;*

CLO3
C4

- i) Determine the maximum positive shear force at point B when a series of point load move from A to C.

Tentukan daya ricih positif maksima pada titik B apabila satu siri beban tumpu bergerak dari A ke C.

[7 marks]

[7 markah]

CLO3
C5

- ii) Show the absolute maximum moment occurring under the 35 kN load.

Tunjukkan momen maksimum mutlak berlaku di bawah beban 35 kN.

[8 marks]

[8 markah]

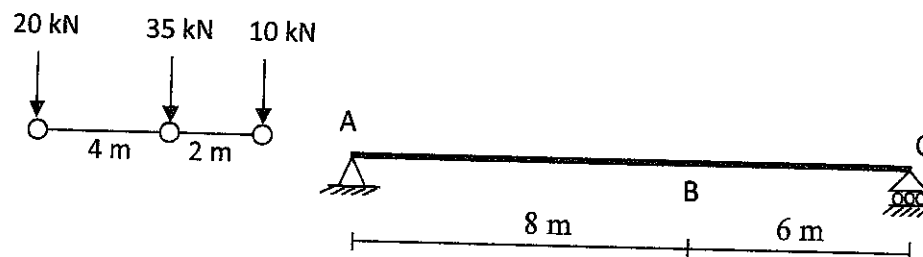


Figure A2(b) / Rajah A2(b)

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 continuous beam is subjected to point load and uniformly distributed load as shown in

Figure B1. EI is constant for each member.

*Sebuah rasuk selanjur dikenakan beban tumpu dan beban teragih seragam seperti ditunjukkan dalam **Rajah B1**. EI adalah malar bagi setiap anggota.*

CLO1
C1

- (a) Identify the values of Fixed End Moment for each span.

Kenalpasti nilai-nilai Momen Hujung Terikat pada setiap rentang.

[4 marks]

[4 markah]

CLO1
C2

- (b) Determine Slope Deflection Equation by using the Slope Deflection Method.

Tentukan Persamaan Cerun Pesongan dengan menggunakan Kaedah Cerun Pesongan.

[6 marks]

[6 markah]

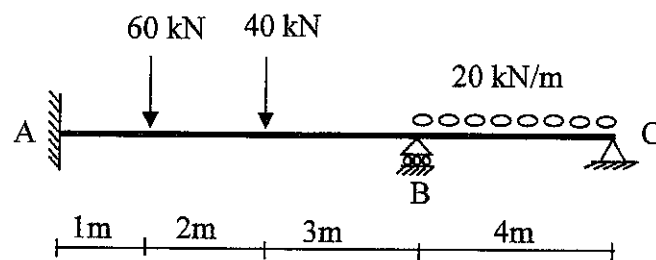
CLO1
C3

(c) Calculate the Final Moment for each span by using the Slope Deflection Method.

Kirakan Momen Akhir pada setiap rentang dengan menggunakan Kaedah Cerun Pesongan.

[15 marks]

[15 markah]

**Figure B1 / Rajah B1**

QUESTION 2

SOALAN 2

Figure B2 shows a frame that is subjected to point load and uniformly distributed load. EI is constant for each member.

Rajah B2 menunjukkan sebuah kerangka yang dikenakan beban tumpu dan beban teragih seragam. EI adalah malar bagi setiap anggota.

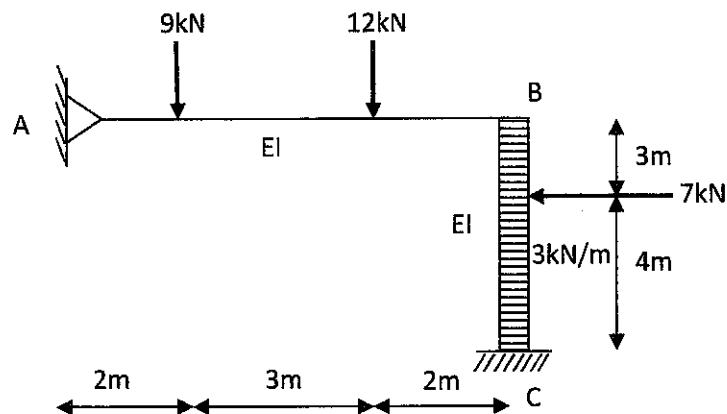


Figure B2 / Rajah B2

CLO1
C1

- (a) Identify the fixed-end moment value.

Kenalpasti nilai momen hujung terikat.

[4marks]

[4markah]

CLO1
C2

- (b) Determine the Slope Deflection Equation using the Slope Deflection Method.

Tentukan Persamaan Cerun Pesongan dengan menggunakan Kaedah Cerun Pesongan.

[6marks]

[6markah]

CLO1
C3

- (c) Calculate the Final Moment for each span using the Slope Deflection Method.

Kirakan Momen Akhir pada setiap rentang dengan menggunakan Kaedah Cerun Pesongan.

[15 marks]

[15 markah]

QUESTION 3

SOALAN 3

Figure B3 shows a continuous beam that is subjected to point load and uniformly distributed load. EI is constant for each member.

Rajah B3 menunjukkan sebuah rasuk selanjur yang dikenakan beban tumpu dan beban teragih seragam. EI adalah malar bagi setiap anggota.

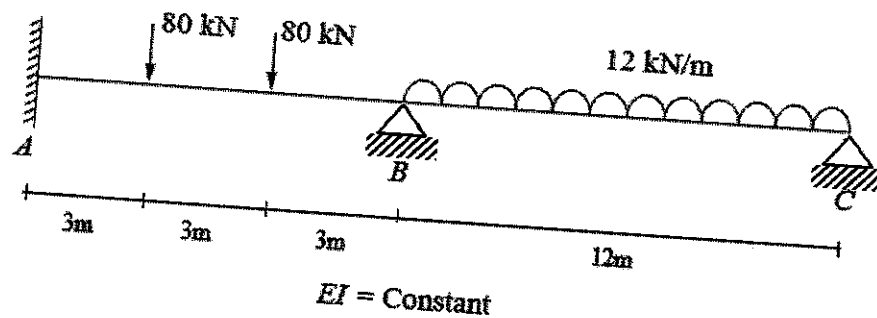


Figure B3/ Rajah B3

CLO1
C1

- (a) Identify the values of Fixed End Moment for each span.
Kenalpasti nilai Momen Hujung Terikat pada setiap rentang.

[4 marks]

[4 markah]

CLO1
C2

- (b) Determine the Stiffness Factor and the Distribution Factor for each span.
Tentukan faktor Kekukuhan dan Faktor Agihan pada setiap rentang.

[6 marks]

[6 markah]

CLO1
C3

- (c) Calculate the Final Moment for each span by using the Moment Distribution Method.
Kirakan Momen Akhir pada setiap rentang dengan menggunakan Kaedah Agihan Momen.

[15 marks]

[15 markah]

SULIT

QUESTION 4

SOALAN 4

A non-sway frame is subjected to uniformly distributed load along the members as shown in Figure B4. The value of EI is constant for each span and the value of Fixed End Moment are shown in below.

Satu kerangka tidak huyung dikenakan beban teragih seragam seperti ditunjukkan dalam Rajah B4. Diberi nilai EI adalah malar bagi setiap rentang dan nilai momen hujung terikat adalah seperti di bawah.

$$FEM_{AB} = -30\text{kNm} \quad FEM_{BA} = 30\text{kNm} \quad FEM_{BC} = -40\text{kNm} \quad FEM_{CB} = 40\text{kNm}$$

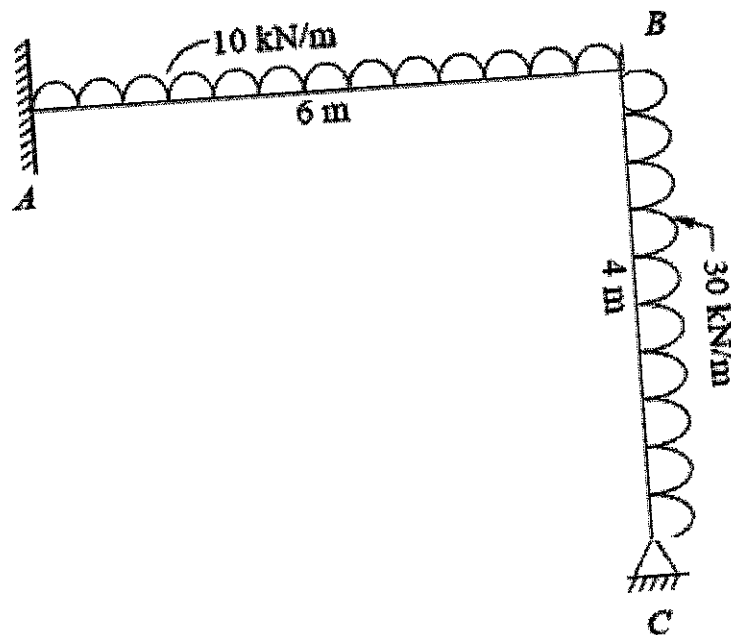


Figure B4/ Rajah B4

- | | | | |
|------------|-----|---|---------------------------|
| CLO1
C1 | (a) | Identify the Stiffness Factor and the Distribution Factor.
<i>Kenalpasti Faktor Kekukuhan dan Faktor Agihan.</i> | [4 marks]
[4 markah] |
| CLO1
C2 | (b) | Determine the Final Moment for each span using the Moment Distribution Method.
<i>Tentukan Momen Akhir pada setiap rentang dengan menggunakan Kaedah Agihan Momen.</i> | [6 marks]
[6 markah] |
| CLO1
C3 | (c) | Sketch the Shear Force Diagram and the Bending Moment Diagram.
<i>Lakarkan Gambarajah Daya Ricih dan Gambarajah Momen Lentur.</i> | [15 marks]
[15 markah] |

SOALAN TAMAT

DCC5163 – THEORY OF STRUCTURES

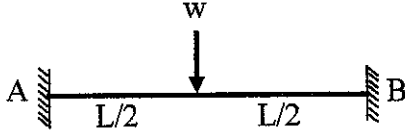
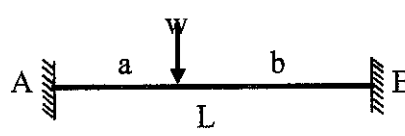
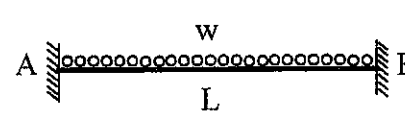
FORMULAE

1. Slope Deflection Method

$$M_{AB} = 2EI/L_{AB}(2\theta_A + \theta_B - 3\Delta/L_{AB}) + FEM_{AB}$$

$$M_{BA} = 2EI/L_{BA}(2\theta_B + \theta_A - 3\Delta/L_{BA}) + FEM_{BA}$$

Table 1 : Fixed End Moment

$FEM_{AB} = -\frac{wL}{8}$		$FEM_{BA} = \frac{wL}{8}$
$FEM_{AB} = -\frac{wab^2}{L^2}$		$FEM_{BA} = \frac{wa^2b}{L^2}$
$FEM_{AB} = -\frac{wL^2}{12}$		$FEM_{BA} = \frac{wL^2}{12}$

2. Moment Distribution Method

i. Stiffness Factor

$$K = 4EI/L \quad (\text{for Fixed or Continuous})$$

$$K = 3EI/L \quad (\text{for Pinned or Roller})$$

ii. Distribution Factor

$$DF = K / \Sigma K$$

$$DF = 0 \quad (\text{for Fixed})$$

$$DF = 1 \quad (\text{for Pinned or Roller})$$

3. Statically Indeterminate Truss

- i. Redundant Force, $R = -\frac{\Sigma P\mu L/AE}{\Sigma \mu^2 L/AE}$
- ii. Internal Force, $F_i = P_i + \mu_i R$

4. Displacement

Displacement caused due to external load, $\Delta = \Sigma P\mu L/AE$

5. Influence Lines

- i. $R_A = 1 - x/L$, $R_B = x/L$
- ii. $V_c = -x/L$, $V_c = 1 - x/L$
- iii. $M_c = bx/L$, $M_c = a(1 - x/L)$

