

SULIT



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

JABATAN KEJURUTERAAN AWAM

PEPERIKSAAN AKHIR

SESI JUN 2016

DCC5163: THEORY OF STRUCTURES

TARIKH : 04 NOVEMBER 2016

MASA : 8.30 AM - 10.30 AM (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 plane truss is loaded as shown in **Figure A1**. All the members have the cross section area of 350 mm^2 and Young Modulus, E of 210 kN/mm^2 .

*Satu kerangka telah dibebankan seperti **Rajah A1**. Jika luas keratan rentas setiap anggota kerangka tersebut 350 mm^2 dan Modulus Keanjalan, E bersamaan 210 kN/mm^2 .*

CLO3
C3

- (a) Calculate the internal forces in the entire member of the truss due to the external loads and virtual unit loads.

Kirakan daya dalaman bagi semua anggota kerangka tersebut disebabkan oleh beban luar dan beban unit yang dikenakan.

[10 marks]

[10 markah]

- CLO3
C4 (b) Determine the horizontal displacement of joint C.
Tentukan anjakan mendatar pada sendi C.

[15 marks]
[15 markah]

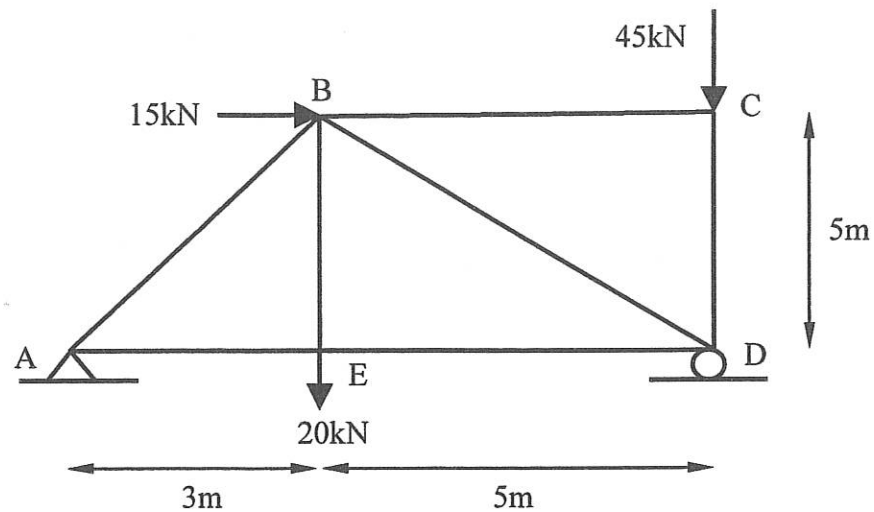


Figure A1
Rajah A1

QUESTION 2
SOALAN 2

- CLO3
C3 (a) Overhanging beam in Figure A2(a) is carrying static load. Using Influence Line Diagram (ILD) method, draw and determine:
Rasuk julus di dalam Rajah A2(a) menanggung beban statik. Dengan menggunakan kaedah Gambarajah Garis Imbas, lukis dan tentukan:

- i. Reaction at support A.
Daya tindakbalas di tupang A.

[5 marks]
[5 markah]

- ii. Shear force at point B.
Daya ricih di titik B.

[5 marks]
[5 markah]

- iii. Bending moment at point B.
Momen lentur di titik B.

[5 marks]
[5 markah]

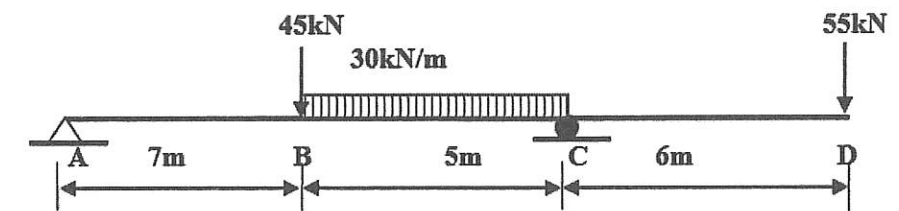


Figure A2(a)
Rajah A2(a)

- CLO3
C4 (b) Figure A2(b) shows a simply supported beam AB with a series of point load. Using Influence Line Diagram (ILD), determine the Absolute Maximum Moment of the beam.
Rajah A2(b) menunjukkan rasuk tupang mudah AB beserta beban tumpu sesiri. Dengan menggunakan kaedah Gambarajah Garis Imbas, tentukan nilai momen maksimum mutlak bagi rasuk tersebut.

[10 marks]
[10 markah]

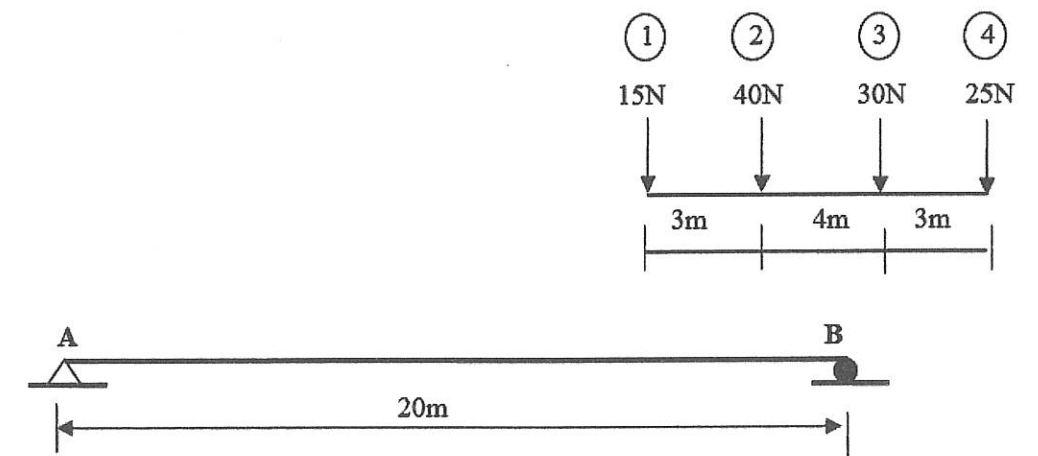


Figure A2(b)
Rajah A2(b)

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 fixed at A and C while supported by roller at B as shown in **Figure B1**. It carries a uniformly distributed load (UDL) of 10 kN/m over BC and point loads of 45 kN and 30 kN over AC. Use the Slope Deflection Method, if EI is constant for all members:

Satu rasuk selanjur diikat tegar pada titik A dan C manakala ditupang roda pada titik B seperti **Rajah B1**. Rasuk tersebut dikenakan beban teragih seragam 10kN/m pada rentang BC dan beban tumpu 45kN and 30kN pada rentang AC. Gunakan Kaedah Cerun Pesongan, sekiranya nilai EI adalah malar untuk setiap rentang:

- CLO1
C1 (a) Identify the value of fixed end moment for each span.

Kenalpasti nilai momen hujung terikat pada setiap rentang.

[4 marks]

[4 markah]

- CLO1
C2 (b) Calculate the final moment for each member.

Kirakan momen akhir bagi setiap anggota.

[8 marks]

[8 markah]

- CLO1
C3 (c) i. Calculate the reaction force at each joint.

Kirakan daya tindakbalas pada setiap penyokong.

[6 marks]

[6 markah]

- ii. Draw the shear force and bending moment diagram.

Lukiskan gambarajah daya ricih dan momen lentur.

[7 marks]

[7 markah]

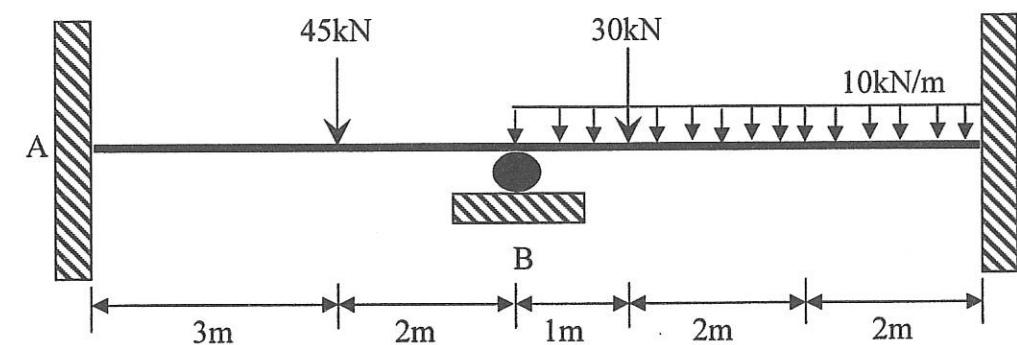


Figure B1
Rajah B1

QUESTION 2

SOALAN 2

Figure B2(a) shows a continuous beam and Figure B2(b) shows a non-sway portal frame. EI is constant for each member.

Rajah B2(a) menunjukkan sebuah rasuk selanjur dan Rajah B2(b) menunjukkan kerangka portal tanpa hujung. EI adalah malar bagi setiap anggota.

CLO1 C1 (a) Identify the Stiffness Factor for statically indeterminate beam as shown in Figure B2(a).

Kenalpasti Faktor Kekukuhan bagi rasuk tak boleh tentu statik yang ditunjukkan dalam Rajah B2(a).

[5 marks]

[5 markah]

CLO1 C2 (b) Calculate the Distribution Factor for continuous beam as shown in Figure B2(a).

Kirakan Faktor Agihan bagi rasuk selanjur yang ditunjukkan dalam Rajah B2(a).

[5 marks]

[5 markah]

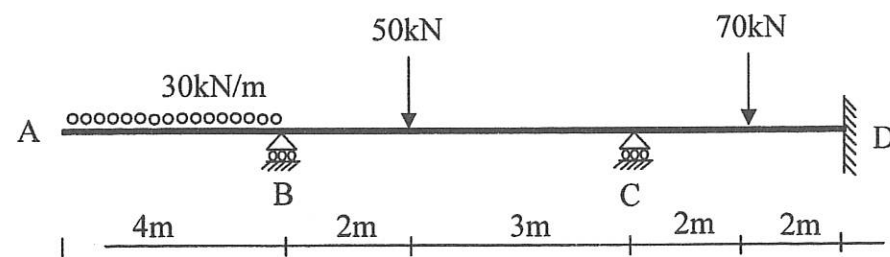


Figure B2(a)
Rajah B2(a)

CLO1 C3 (c) Calculate the Final Moment for Figure B2(b) by using the Moment Distribution Method at point A, B, C and D (3 times of distribution). Given the value of Distribution Factor as shown below:

Kirakan Momen Akhir bagi Rajah B2(b) dengan menggunakan Kaedah Agihan Momen di titik A, B, C dan D (3 kali agihan). Diberi Faktor Agihan seperti dibawah:

$$DF_{AB} = 0, \quad DF_{BA} = 0.4, \quad DF_{BC} = 0.6, \\ DF_{CB} = 0.6, \quad DF_{CD} = 0.4, \quad DF_{DC} = 0.$$

[15 marks]

[15 markah]

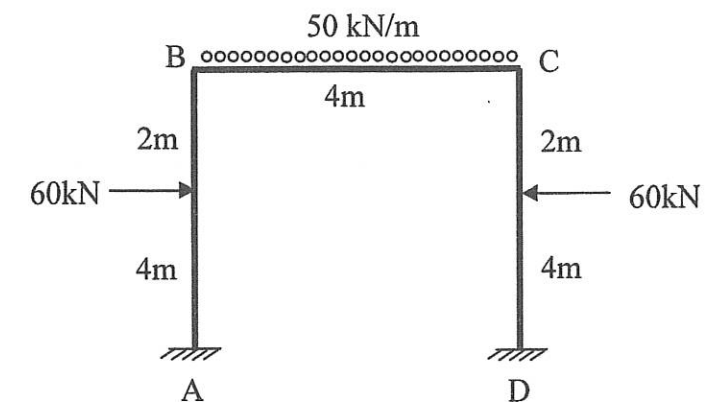


Figure B2(b)
Rajah B2(b)

QUESTION 3

SOALAN 3

CLO2
C1

a) State all the members of the truss shown in **Figure B3(a)** below that have zero force.

Nyatakan semua anggota dalaman kerangka seperti **Rajah B3(a)** yang mempunyai daya dalaman sifar.

[5 marks]

[5 markah]

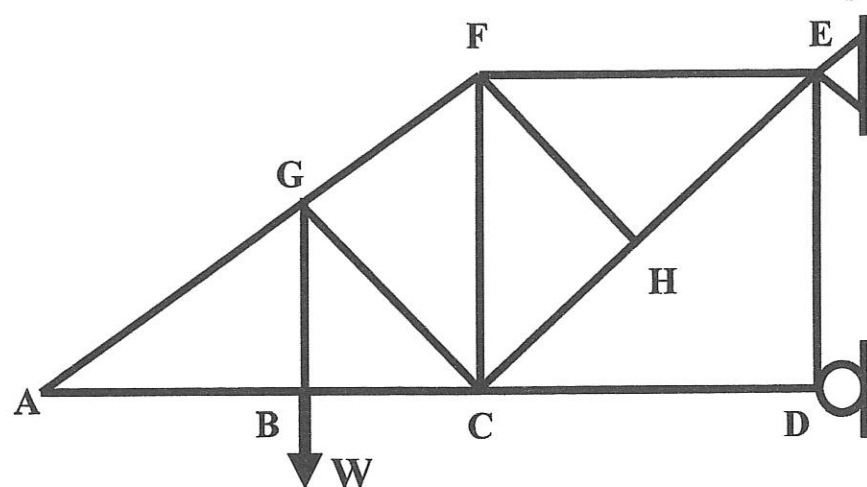


Figure B3(a)
Rajah B3(a)

CLO2
C2

(b) Identify the forces in members BC and BE of the loaded truss shown in **Figure B3(b)** by using the method of section. State whether the internal force is tension or compression.

Kenalpasti daya dalaman anggota BC dan BE untuk kerangka di dalam **Rajah B3(b)** dengan menggunakan kaedah keratan. Nyatakan daya dalaman anggota tersebut samada tegangan atau mampatan.

[5 marks]

[5 markah]

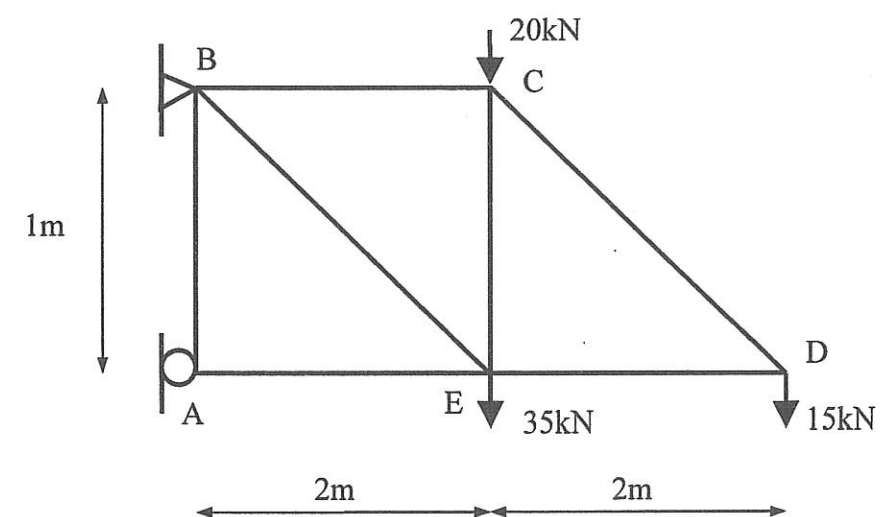


Figure B3(b)
Rajah B3(b)

CLO2
C3

(c) By using Method of Joint, determine the internal forces in all of the members of the truss shown in **Figure B3(c)** due to the external loads. Member FE and ED have an equal length. State whether the internal forces is tension or compression.
*Dengan menggunakan kaedah sendi, tentukan daya dalaman bagi semua anggota kerangka dalam **Rajah B3(c)** dibawah akibat beban yang dikenakan. Anggota FE dan ED mempunyai ukuran panjang yang sama. Nyatakan daya dalam anggota tersebut samada tegangan atau mampatan.*

[15 marks]

[15 markah]

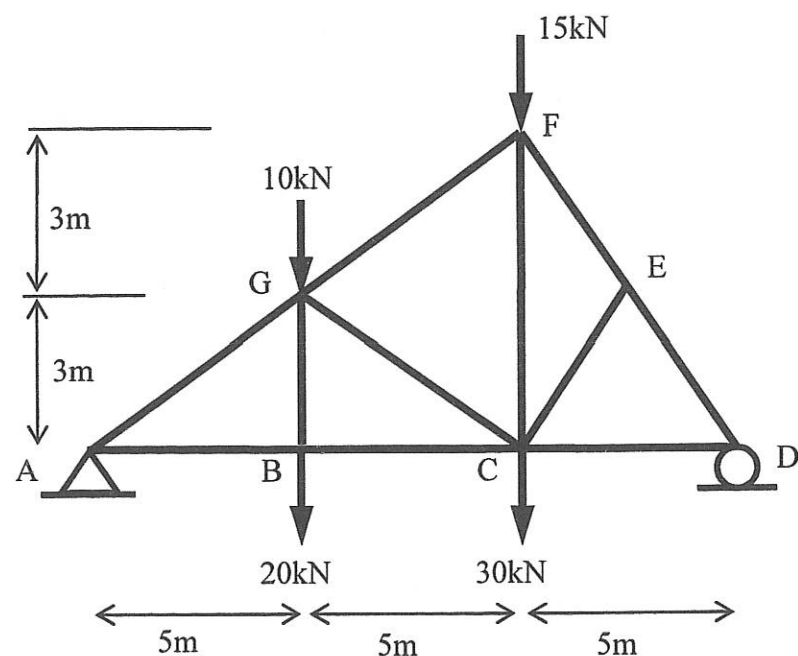


Figure B3(c)
Rajah B3(c)

QUESTION 4

SOALAN 4

A simply supported truss is subjected to a horizontal axial load as shown in **Figure B4**. Given the cross sectional area, A and the modulus elasticity, E is constant in each member of the truss.

*Kekuda disokong mudah dikenakan beban tumpu mengufuk seperti ditunjukkan di dalam **Rajah B4**. Diberi luas keratan rentas, A dan modulus keanjalan, E adalah malar bagi setiap anggota kekuda.*

CLO2
C1

(a) State the value of reaction at support A and B .

Tentukan nilai tindakbalas pada penyokong A dan B.

[4 marks]

[4 markah]

CLO2
C2

(b)

i. Compute the force in all members of the truss due to the external load if BD member is a redundant.

Kirakan daya dalaman bagi semua anggota kekuda yang disebabkan oleh beban luar jika anggota BD adalah lebih.

[4 marks]

[4 markah]

ii. Calculate the internal forces in all members of the truss due to the virtual unit load at BD member.

Kirakan daya dalaman bagi semua anggota kekuda yang disebabkan oleh beban unit di anggota BD.

[5 marks]

[5 markah]

CLO2
C3

(c) Calculate the actual force in all members of the truss by using magnitude of redundant, R.

Kirakan daya dalaman bagi semua anggota kekuda dengan menggunakan magnitud lebih, R.

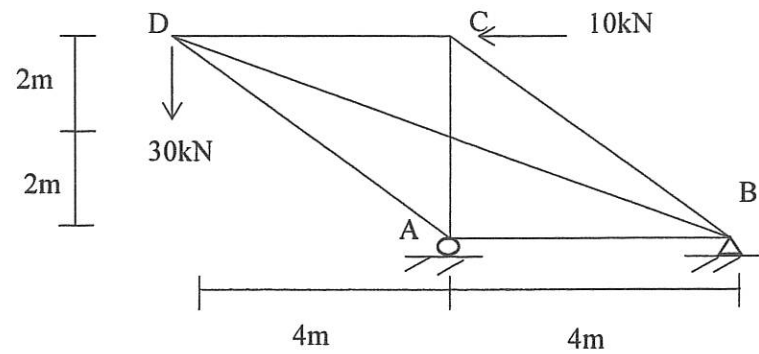


Figure B4(a)
Rajah B4(a)

[12 marks]
[12 markah]

SOALAN TAMAT

FORMULA

1. Slope Deflection Method

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

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

Table 1 : Fixed End Moment

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

2. Moment Distribution Method

i. Stiffness Factor

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

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

ii. Distribution Factor

$$DF = K / \Sigma K$$

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

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

3. Statically Indeterminate Truss

i. Redundant Force, $R = \frac{\Sigma P\mu L/AE}{\Sigma \mu^2 L/AE}$

ii. Internal Force, $F_i = P_i + \mu_i R$

FORMULA

4. Displacement

Displacement caused due to:

- i. external load,

$$\Delta = \Sigma P\mu L/AE$$

- ii. temperature change,

$$\Delta = \Sigma \mu cLt$$

- iii. fabrication error,

$$\Delta = \Sigma \mu\lambda$$

5. Influence Lines

- i. $R_A = 1 - x/L$, $R_B = x/L$

- ii. $V_c = -x/L$, $V_c = 1 - x/L$

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