SULIT

BAHAGIAN PEPERIKSAAN DAN PENILAIAN
JABATAN PENDIDIKAN POLITEKNIK
KEMENTERIAN PENDIDIKAN TINGGI

JABATAN KEJURUTERAAN AWAM

PEPERIKSAAN AKHIR

SESI JUN 2016

CC601: STRUCTURAL ANALYSIS 2

TARIKH : 22 OKTOBER 2016
MASA : 11.15 AM - 1.15 PM (2 JAM)

Kertas ini mengandungi **TIGA BELAS (13)** halaman bercetak.
Bahagian A: Soalan Pendek (10 soalan)
Bahagian B: Soalan Struktur (4 soalan)
Dokumen sokongan yang disertakan : **Tiada**

JANGAN BUKA KERTAS SOALAN INI SEHINGGA DIARAHKAN

(CLO yang tertera hanya sebagai rujukan)

SULIT

SECTION A : 40 MARKS
BAHAGIAN A : 40 MARKAH

INSTRUCTION:
This section consists of **TEN (10)** questions. Answer **ALL**.

ARAHAN:
*Bahagian ini mengandungi **SEPULUH (10)** soalan. Jawab **SEMUA** soalan*

CLO1
C1

QUESTION 1
SOALAN 1

Zero Bar is a truss member without internal force. State **TWO (2)** cases in which the internal forces are Zero Bar.

*Zero Bar ialah anggota kekuda yang tidak mempunyai daya dalaman. Nyatakan **DUA (2)** kes dimana daya anggota dalaman adalah Zero Bar*

[4 marks]
[4 markah]

QUESTION 2
SOALAN 2

CLO1
C2

Identify whether the trusses in **Figure A2** is stable and statically determinate.
*Kenal pasti bahawa kekuda dalam **Rajah A2** adalah stabil dan boleh tentu statik.*

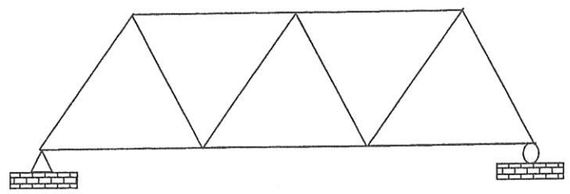

Figure A2 / Rajah A2

(4 marks)
(4 markah)

CLO1
C1

QUESTION 3
SOALAN 3

Identify whether the truss in **Figure A3** is statically determinate or statically indeterminate.

*Kenalpasti kekuda dalam **Rajah A3** adalah boleh tentu statik atau tidak boleh tentu statik.*

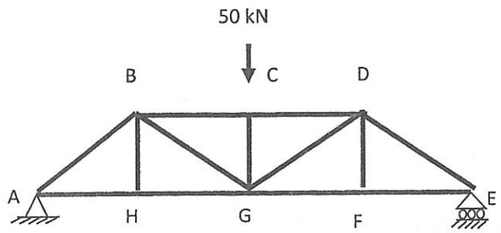

Figure A3 / *Rajah A3*

[4 marks]
[*4 markah*]

CLO2
C2

QUESTION 4
SOALAN 4

By referring to **Figure A4**, determine the vertical displacement at joint C, caused by the increasing in temperature of 20°C for AB and BC members. Given the coefficient of thermal expansion, c is 10.8×10^{-6} /°C.

*Merujuk kepada **Rajah A4**, tentukan anjakan pugak sendi C akibat daripada kenaikan suhu sebanyak 20°C pada AB dan BC. Diberi pekali pengembangan terma, c ialah 10.8×10^{-6} /°C.*

[4 marks]
[*4 markah*]

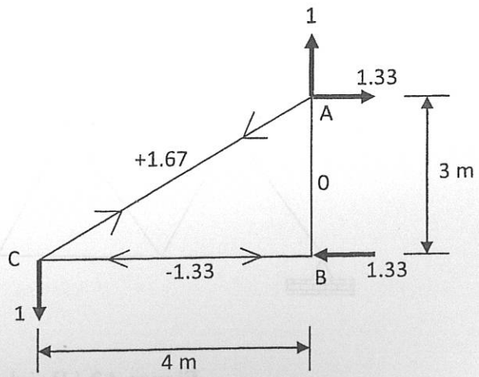

Figure A4 / *Rajah A4*

CLO1
C2

QUESTION 5
SOALAN 5

Differentiate between internal statically indeterminate and external indeterminate trusses.
Bezakan di antara kerangka tak boleh tentu statik dalaman dan kerangka tak boleh tentu statik luaran.

[4 marks]
[*4 markah*]

CLO2
C3

QUESTION 6
SOALAN 6

Table A6 shows the internal force in each member of an indeterminate structure.

a. Calculate magnitude of coefficient, R.
b. Calculate the actual force, F

***Jadual A6** menunjukan daya dalaman anggota kekuda struktur tidak boleh tentu statik.*

a. Kira nilai R
b. Kira nilai daya dalaman sebenar, F

[4 marks]
[*4 markah*]

Table A6 / *Jadual 6A*

Anggota	L (m)	P_i	u_i	$u P_i L$	u^2L	$F = P_i + uR$
AB	12	+15	0.67	120.6	5.39	
AD	15	+18.75	-0.84	-236.25	10.58	
BC	12	+15	0.67	120.6	5.39	
BD	9	0	1.0	0	9	
CD	15	-18.75	-0.84	+236.25	10.58	
			Σ			

QUESTION 7

SOALAN 7

CLO1 C1

By referring to **Figure A7,** draw the influence line for shear force at point C.

*Merujuk kepada **Rajah A7**, lukiskan garis imbas bagi daya ricih pada titik C.*

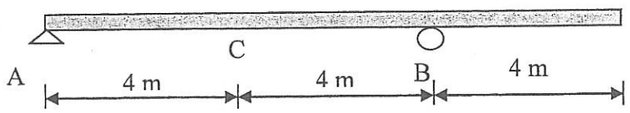

Figure A7 / *Rajah A7*

[4 marks]

[4 markah

QUESTION 8

SOALAN 8

CLO1 C2

Calculate the reaction at support C in **Figure A8** due to the loads given.

*Kirakan tindak balas pada tupang C yang terbentuk pada **Rajah A8** disebabkan beban-beban yang diberikan.*

[4 marks]

[4 markah]

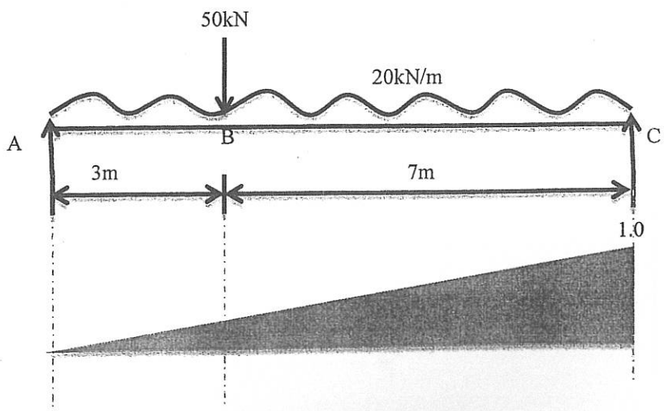

Figure A8 / *Rajah A8*

CLO1 C2

QUESTION 9

SOALAN 9

Figure A9 shows the influence line diagram for a member of truss. Calculate the maximum tension force in the member due to the moving load series.

***Rajah A9** menunjukkan gambarajah garis imbas bagi satu anggota kekuda. Kirakan daya tegangan maksimum dalam anggota tersebut yang disebabkan oleh satu siri beban yang bergerak..*

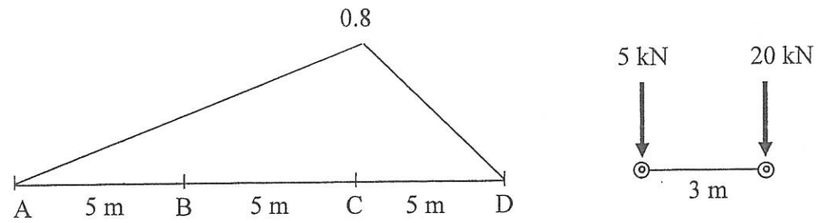

Figure A9/*Rajah A9*

[4 marks]

[4 markah]

CLO1
C3

QUESTION 10

SOALAN 10

By referring to **Figure A10**, illustrate the influence lines diagram for CF member.

*Merujuk kepada **Rajah A10** ,illustrasikan gambar rajah garis imbas untuk anggota CF .*

[4 marks]
[4 markah]

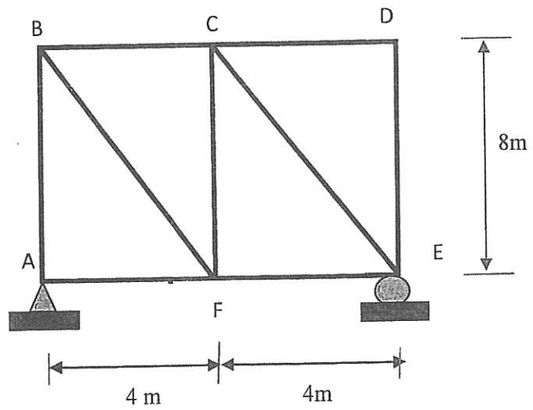

Figure A10 / *Rajah A10*

SECTION B : 60 MARKS
BAHAGIAN B : 60 MARKAH

INSTRUCTION:
This section consists of **FOUR (4)** structured questions. Answer **THREE (3)** questions only.

ARAHAN:
*Bahagian ini mengandungi **EMPAT (4)** soalan berstruktur. Jawab **TIGA (3)** soalan sahaja.*

QUESTION 1
SOALAN 1

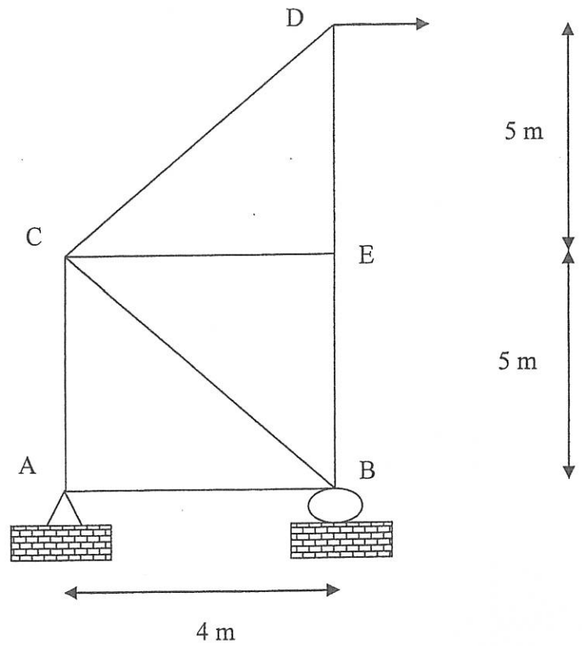

Figure B1 / *Rajah B1*

A simply supported truss is subjected to a load at joint D as shown in **Figure B1**. Given reaction force at support A, V_A = 125 kN (↓), H_A = 50 kN (←) and at support B, V_B = 125 kN (↑).

*Kekuda disokong mudah seperti yang ditunjukkan pada **Rajah B1**. Diberi nilai tindakbalas pada sokong A, V_A = 125 kN (↓), H_A = 50 kN (←) dan tindakbalas pada sokong B, V_B = 125 kN (↑).*

CLO 2 C2

(a) Determine the internal force for each member of the truss which is subjected to a point load at joint D by using **method of joints**.

Tentukan daya dalaman di setiap anggota kekuda satah apabila dikenakan beban tumpu pada sendi D dengan menggunakan ***kaedah sendi****.*

[14 marks]
[14 *markah*]

CLO 2 C5

(b) Based on the answer in Question 1(a), produce a diagram of truss by showing forces including sign direction.

Berdasarkan kepada Soalan 1(a), hasilkan gambarajah kekuda dengan menunjukkan daya-daya termasuk tanda arah daya.

[6 marks]
[6 *markah*]

QUESTION 2
SOALAN 2

By referring to the truss shown in **Figure B2** . Given the cross sectional area of each member, A = 500mm^2 and Young Modulus, E = 200kN/mm^2.

Dengan merujuk ***Rajah B2****. Diberi luas keratan rentas setiap ahli, A = 500mm^2 dan Modulus Young, E = 200kN/mm^2 .*

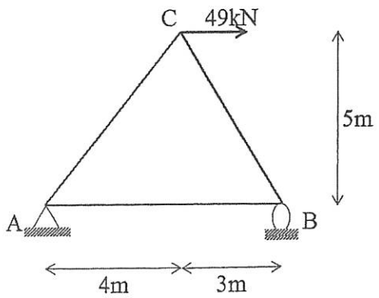

Figure B2 / *Rajah B2*

CLO 2 C3

a) Calculate the reaction at support caused by the external load.
Kirakan daya pada tupang yang disebabkan daya luar.

[3 marks]
[3 *markah*]

CLO 2 C3

b) Calculate the internal forces for each member of the truss due to external load.
Kirakan nilai daya dalaman di dalam setiap ahli disebabkan daya luar.

[3 marks]
[3 *markah*]

CLO 2 C3

c) Calculate the reaction at support caused by a vertical virtual unit load at joint C.
Kirakan daya pada tupang yang disebabkan daya pugak unit di titik C.

[3 marks]
[3 *markah*]

CLO 2 C3

d) Calculate the internal force in each member of the truss due to a vertical virtual unit load at joint C.
Kirakan daya dalaman setiap ahli kerangka disebabkan oleh daya pugak unit di titik C.

[3 marks]
[3 *markah*]

CLO 2 C5

e) From the internal forces due to external load and virtual unit load, evaluate the vertical displacement at joint C.
Daripada nilai daya dalaman disebabkan beban sebenar dan beban unit, hasilkan jumlah anjakan pugak pada titik C.

[8 marks]
[8 *markah*]

QUESTION 3
SOALAN 3

A simply supported truss is subjected to a horizontal and vertical load as shown in **Figure B3**. Given reaction at joint A, V_A=2kN and reaction at joint D, V_D= 18 kN, H_D = -12 kN. The cross sectional area, A and modulus elasticity, E are constant for each member of truss.

*Kekuda sokong mudah dikenakan beban tumpu ufuk dan pugak seperti yang ditunjukkan dalam **Rajah B3**. Diberi daya tindak balas pada sendi A, V_A=2 kN dan daya tindak balas pada sendi D, V_D=18 kN dan H_D = -12 kN. Luas keratan rentas, A dan modulus keanjalan, E adalah malar untuk setiap anggota kekuda.*

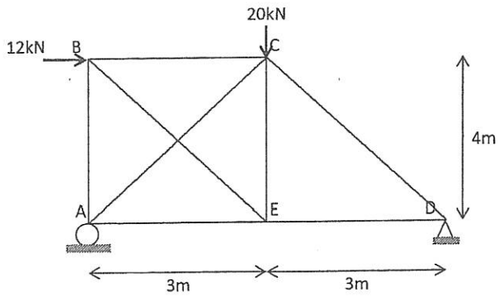

Figure B3 / Rajah B3

CLO 1 C3 a) Select BE member as the redundant member. Calculate the internal forces in all truss members.
Pilih anggota BE sebagai lelebih. Kirakan nilai daya dalaman bagi setiap anggota kekuda.

[7 marks]
[*7 markah*]

CLO 1 C3 b) Calculate the internal forces in all members due to the virtual unit load.
Kira daya dalaman bagi semua anggota kekuda disebabkan oleh beban unit.

[6 marks]
[*6 markah*]

CLO 1 C3 c) Calculate the magnitude of redundant,R.
Kirakan magnitude nilai lelebih, R.

[3 marks]
[*3 markah*]

CLO 1 C5 d) Produce the actual force in all members of the truss by using magnitude of redundant, R.
Hasilkan daya dalaman bagi semua anggota kekuda dengan menggunakan magnitud lelebih, R.

[4 marks]
[*4 markah*]

QUESTION 4
SOALAN 4

Refer to **Figure B4**:
*Berdasarkan **Rajah B4**:*

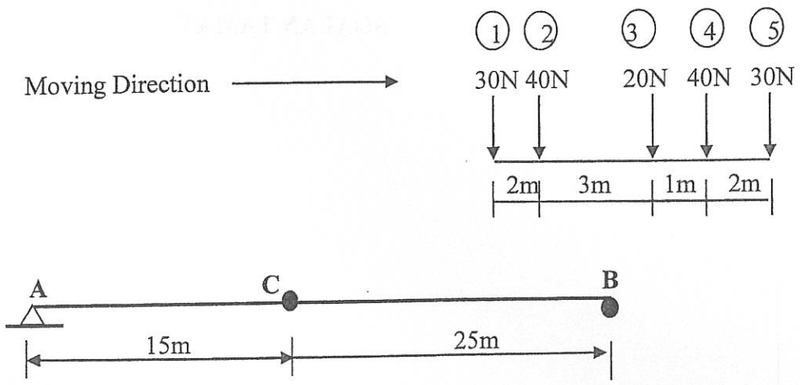

Figure B4/Rajah 4

CLO1 C3 a) Calculate the maximum shear forces of beam at point C.
Kirakan daya ricih maksimum rasuk pada titik C.

[10 marks]
(10 markah)

CLO 2
C4

b) Determine the Absolute Maximum Moment (AMM) of simply supported beam due to a series of loads as shown in **Figure B4**.

*Tentukan nilai momen maksimum mutlak (MMM) bagi rasuk tupang mudah yang dikenakan beban tumpu bersiri seperti yang ditunjukkan dalam **Rajah B4**.*

[10 marks]
(10 markah)

SOALAN TAMAT