POLITEKNIK
MALAYSIA

BAHAGIAN PEPERIKSAAN DAN PENILAIAN
JABATAN PENDIDIKAN POLITEKNIK
KEMENTERIAN PENDIDIKAN TINGGI

JABATAN KEJURUTERAAN AWAM

PEPERIKSAAN AKHIR

SESI DISEMBER 2015

DCC2063 : MECHANICS OF CIVIL EGINEERING STRUCTURES

TARIKH   : 09 APRIL 2016
MASA   : 11.15 AM – 1.15 PM (2 JAM)

Kertas ini mengandungi **SEPULUH (10)** 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)

SECTION A: 50 MARKS

BAHAGIAN A: 50 MARKAH

INSTRUCTION:

This section consists of **TWO (2)** structured questions. Answer **ALL** the questions.

ARAHAN:

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

QUESTION 1

SOALAN 1

CLO1
C1

(a)   Draw **TWO (2)** types of direct stress.

*Lukiskan **DUA (2)** jenis tegasan terus.*

(5 marks)

[5 *markah*]

CLO1
C2

(b)   A rectangular bar with dimensions of 75 mm width and 25 mm depth is loaded with a compression load of 20 N. Calculate the stress and strain in the bar.
Given $E = 215 \times 10^9$ N/m^2.

Satu bar berkeratan segiempat tepat mempunyai dimensi 75 mm lebar dan 25 mm dalam dikenakan beban mampatan sebanyak 20 N. Kira tegasan dan tegangan di dalam bar. Diberi $E = 215 \times 10^9$ N/m^2.

(8 marks)

[8 *markah*]

CLO1
C2

(c)   A cylindrical rod 3 m long has an area of 1500 mm^2. The rod is elongated to 1.5 mm when a tension load of 140 kN is applied. Calculate:-

Satu rod silinder 3 m panjang mempunyai keluasan 1500 mm^2. Rod tersebut mengalami pemanjangan sebanyak 1.5 mm bila dikenakan daya tegangan 140kN. Kirakan:-

i)   Stress in the rod

Tegasan tegangan di dalam rod

ii) Strain in the rod

Keterikan di dalam rod

iii) Modulus of Elasticity

Modulus Keanjalan

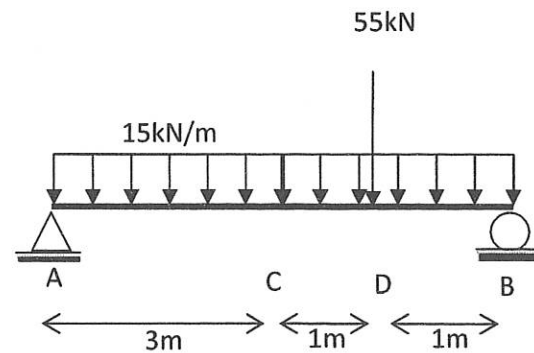(12 marks)

[12 *markah*]

QUESTION 2
SOALAN 2

CLO2
C1

(a) Define a point load and distributed uniform load.

Takrifkan beban tumpu dan beban teragih seragam.

[5 marks]

[5*markah*]

CLO2
C2

(b) **Figure A2 (b),** shows a simply supported beam which carries point load and uniformly distributed load on beams. Calculate the reaction of beam.

Rajah A2 (b), *menunjukkan satu rasuk tupang mudah menanggung beban tumpu dan beban teragih seragam. Kirakan daya-daya tindakbalas rasuk tersebut.*
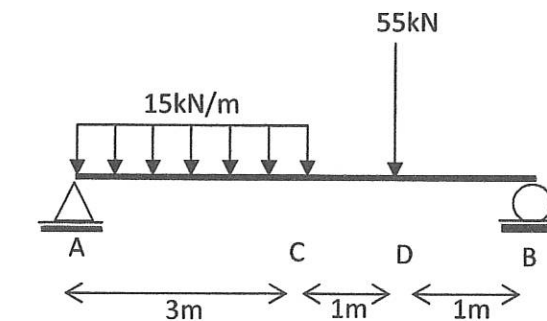

Figure A2 (b)/ Rajah A2 (b)

[5 marks]

[5 *markah*]

CLO2
C3

(c) **Figure A2(c),** shows a simply supported beam which carries point load and uniformly distributed load on beams. Reaction at support A and B given is Ay = 42.5 kN and By = 57.5 kN. Draw shear force diagram **(SFD)** and bending moment diagram **(BMD)** of beams.

Rajah A2(c) *menunjukkan satu rasuk tupang mudah menerima beban tumpu dan beban teragih seragam. Tindakbalas di A dan B diberi ialah Ay = 42.5 kN dan By = 57.5 kN. Lukiskan gambarajah daya ricih (GDR) dan gambarajah momen lentur (GML).*

Figure A2(c) / Rajah A2(C)

[15 marks]

[15 *markah*]

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

CLO2
C1

(a) Define a second moment of area.

    Takrifkan momen luas kedua.

                                    [5 marks]

                                    [5 markah]

CLO2
C2

(b) H-section beam is shown in **Figure B1 (a)**. Calculate the centroid of the section at
    y-axis and x-axis.

    *Satu keratan rasuk berbentuk H ditunjukkan dalam **Rajah B1 (a)**. Kirakan sentroid bagi*
    keratan tersebut pada paksi-y dan paksi-x.

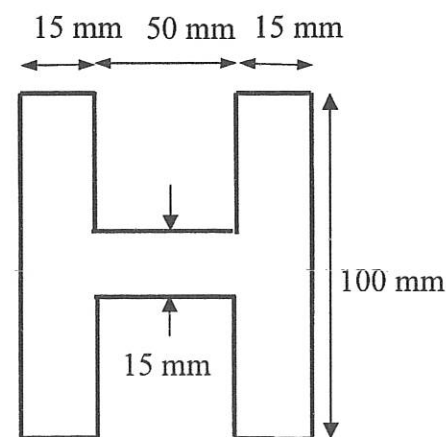   [5 marks]

                                    [5 markah]

Figure B1 (a) / *Rajah B1 (a)*

CLO2
C3

(c) A simply supported beam with C-section as shown in **Figure B1 (b)** is subjected to a uniform distributed load. The bending moment maximum, M_{max} is given as 20 kNm. Based on the figure below;

*Rasuk disokong mudah mempunyai keratan rentas berbentuk C ditunjukkan dalam **Rajah B1 (b)** dikenakan beban teragih seragam. Diberi nilai momen maksimum bersamaan 20 kNm. Berpandukan rajah di bawah;*
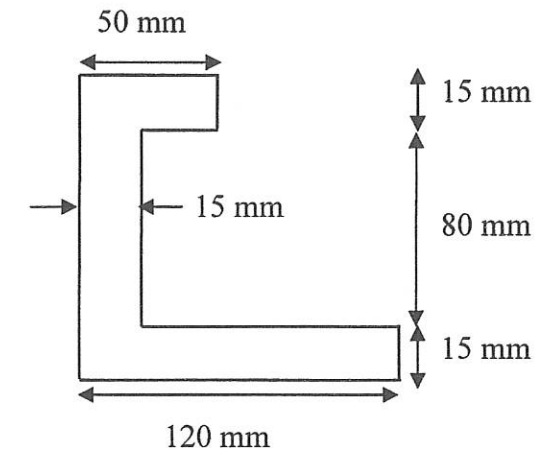

Figure B1 (b) / *Rajah B1 (b)*

  i. Calculate the position of neutral axis of cross section

      Kirakan kedudukan paksi neutral bagi keratan rentas rasuk

                                    [4 marks]

                                    [4 markah]

  ii. Calculate second moment of area for beam cross section

      Kira momen luas kedua bagi keratan rentas rasuk

                                    [4 marks]

                                    [4 markah]

  iii. Calculate bending stress for the beam

      Kirakan tegasan lentur bagi rasuk

                                    [4 marks]

                                    [4 markah]

  iv. Draw the bending stress distribution

      Lukiskan gambarajah taburan tegasan lentur   [3 marks]

                                    [3 markah]

QUESTION 2
SOALAN 2

CLO2
C2

(a) Explain shear stress and shear strain.

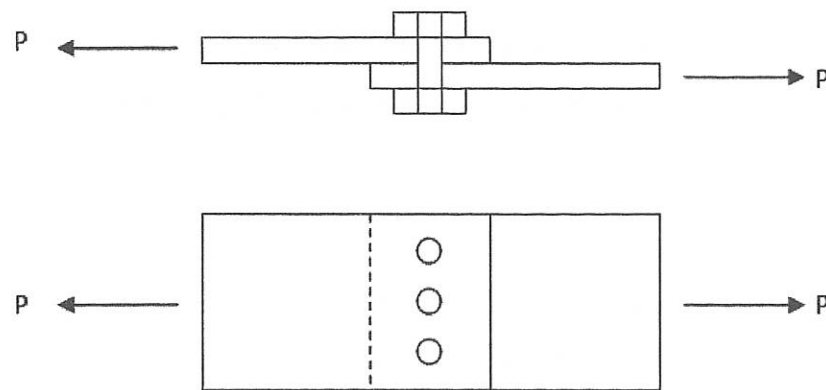*Terangkan tegasan ricih dan terikan ricih.*

[5 marks]

[*5 markah*]

CLO2
C3

(b) **Figure B2(b)** shows two plates of 10 mm thickness are connected by three 20 mm diameter bolts. Calculate the shear stress in the bolts if P = 100 kN.

Rajah B2(b) menunjukkan dua plat berketebalan 10 mm disambung dengan tiga bolt bergarispusat 20 mm. Kirakan tegasan ricih dalam bolt jika P = 100 kN.
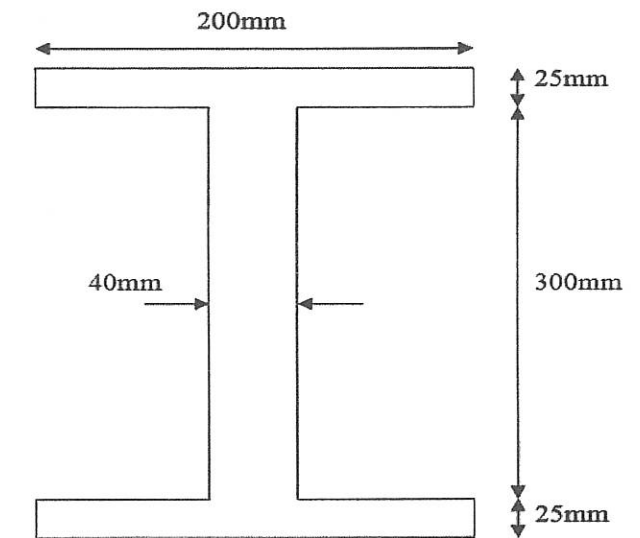
[5 marks]

[*5 markah*]

Figure B2 (b)/Rajah B2 (b)

CLO2
C3

(c) **Figure B2(c)** shows an I-section beam that is subjected to a shearing force of 150 kN. Calculate the shear stress at the neutral axis and the flange.

Rajah B2(c) menunjukkan rasuk berkeratan I menanggung daya ricih 150 kN. Kirakan tegasan ricih pada paksi neutral dan bebibir.

Figure B2 (c)/Rajah B2 (c)

[15 marks]

[*15 markah*]

QUESTION 3
SOALAN 3

A simply supported beam is loaded as shown in **Figure B3**.

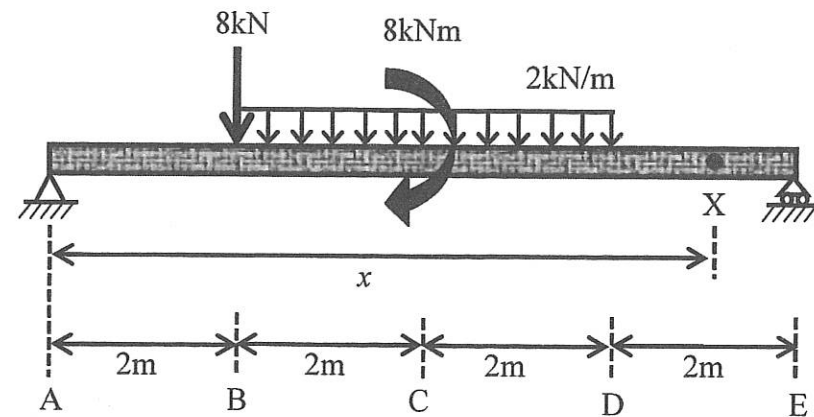*Sebuah rasuk disokong mudah dikenakan beban seperti dalam **Rajah B3**.*

Figure B3/ *Rajah B3*

Based on **Figure B3**;
*Berdasarkan **Rajah B3**;*

CLO2
C2

(a) Compute the reaction force at support A and E.
Hitungkan daya tindak balas pada penyokong A dan E.

[5 marks]
[5 markah]

CLO2
C3

(b) Carry out the derivation of moment equation for this beam at point X by using
Macaulay Method
Terbitkan persamaan momen bagi rasuk tersebut pada titik X dengan menggunakan Kaedah Macaulay.

[5 marks]
[5 markah]

CLO2
C3

(c) Calculate the deflection of beam at point C in term of EI.
Hitungkan pesongan rasuk di titik C dalam sebutan EI

[15 marks]
[15 markah]

QUESTION 4
SOALAN 4

A cantilever beam is loaded as shown in **Figure B4**. By using **Moment Area Method**:

*Satu rasuk julur dikenakan beban seperti di dalam **Rajah B4**. Dengan menggunakan **Kaedah Momen Luas**:*
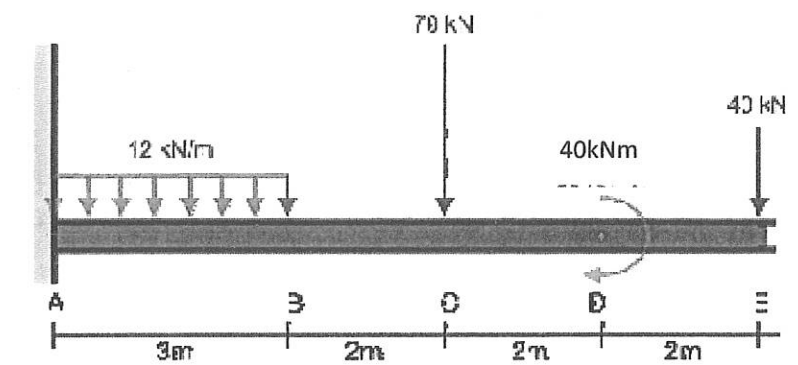

Figure B4 / Rajah B4

CLO1
C1

(a) Draw a free body diagram of beam.
Lukiskan gambarajah jasad bebas rasuk.

[5 marks]
[5 markah]

CLO2
C2

(b) Compute the reaction of beam.
Kirakan nilai daya tindak balas rasuk.

[5 marks]
[5 markah]

CLO2
C3

(c) Calculate the deflection at point E.
Kirakan pesongan pada titik E.

[15 marks]
[15 markah]

SOALAN TAMAT

LIST OF FORMULA FOR DCC 2063

MECHANICS OF CIVIL ENGINEERING STRUCTURES

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

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

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

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

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

6. $z = \dfrac{I}{Y_{max}}$

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

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

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