

**SULIT**

**POLITEKNIK**  
Jabatan Pengajian Politeknik

BAHAGIAN PEPERIKSAAN DAN PENILAIAN  
JABATAN PENGAJIAN POLITEKNIK  
KEMENTERIAN PENDIDIKAN MALAYSIA

JABATAN KEJURUTERAAN AWAM

PEPERIKSAAN AKHIR

SESI JUN 2013

**CC205: MECHANICS OF STRUCTURES**

**TARIKH : 21 OKTOBER 2013**

**TEMPOH : 2 JAM (11.15 AM - 1.15 PM)**

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Kertas ini mengandungi **TIGA BELAS (13)** halaman bercetak.

Bahagian A: Struktur (10 soalan)

Bahagian B: Esei (4 soalan)

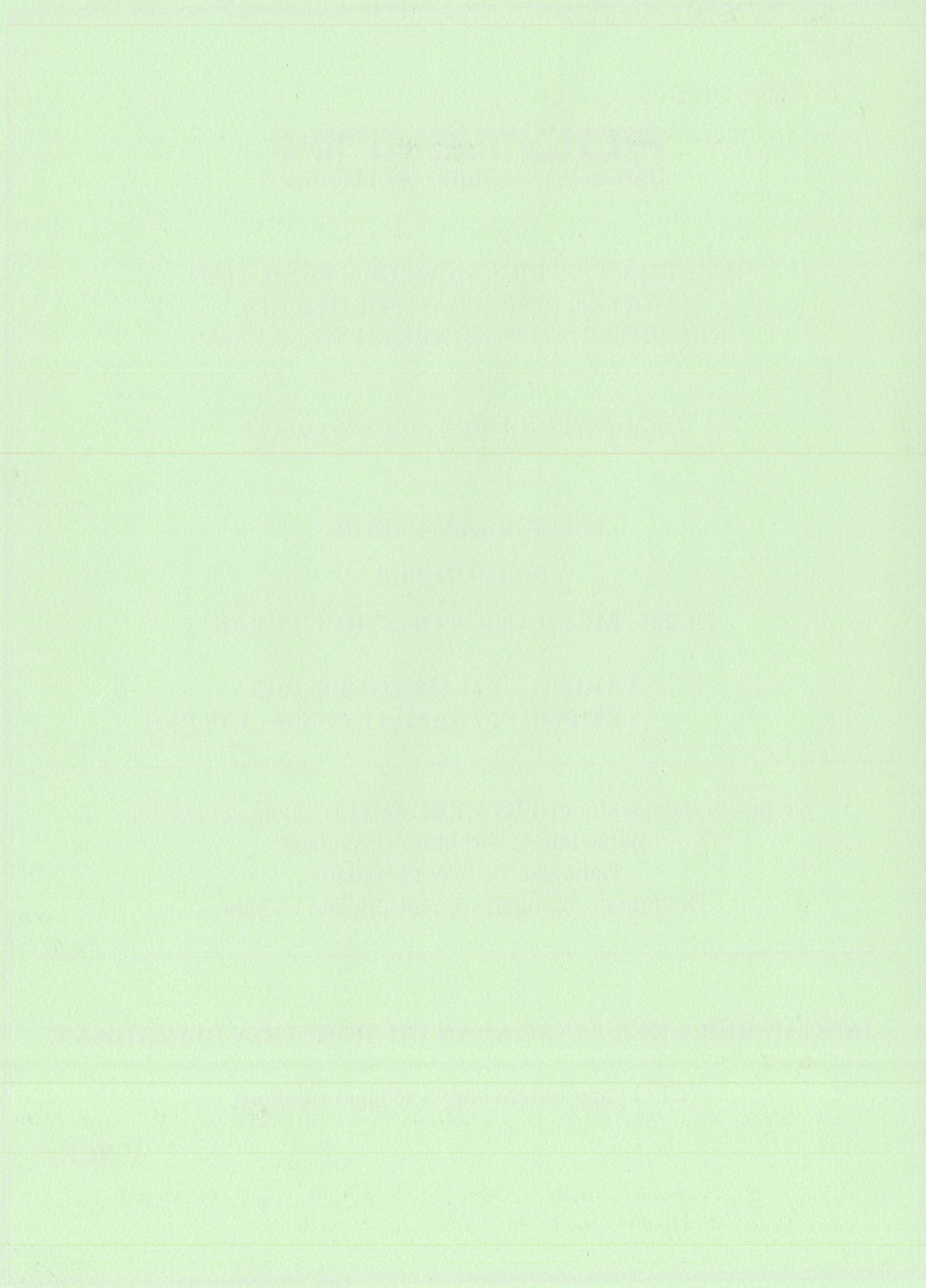
Dokumen sokongan yang disertakan : Tiada

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**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)** short questions. Answer **ALL** Questions.

**ARAHAN:**

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

**QUESTION 1****SOALAN 1**CLO1  
C1

- a) Define Structure in Civil Engineering.  
*Takrifkan Struktur dalam Kejuruteraan Awam.*

(1 mark)  
(1 markah)

- b) Sketch and label the direction of reaction for the following supports:  
*Lakarkan dan labelkan arah tindakbalas bagi penyokong berikut:*

- i. Roller  
*Rola*
- ii. Pinned  
*Pin*
- iii. Fixed end  
*Hujung terikat*

(3 mark)  
(3 markah)

**QUESTION 2****SOALAN 2**CLO1  
C1

Beam is one of the component in a building structure. Give **TWO (2)** types of beam with the aid of diagram.

*Rasuk merupakan salah satu komponen dalam sesebuah struktur binaan bangunan.  
Berikan DUA (2) jenis rasuk dengan bantuan gambarajah.*

(4 marks)  
(4 markah)

## QUESTION 3

## SOALAN 3

CLO1  
C3

Calculate the reaction at each support of a simply supported beam subjected to a load as shown in Figure A3.

*Kira nilai tindakbalas pada setiap penyokong rasuk ditupang mudah yang dikenakan beban seperti dalam Rajah A3*

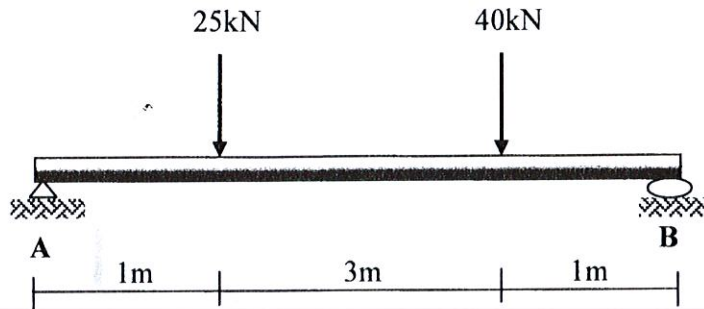


Figure A3 (Rajah A3)

(4 marks)  
(4markah)

## QUESTION 4

## SOALAN 4

CLO1  
C1

Describe the tensile stress and compressive stress by using appropriate diagram.

*Huraikan Tegasan Terikan dan Tegasan Mampatan dengan menggunakan gambarajah yang bersesuaian.*

(4 marks)  
(4markah)

## QUESTION 5

## SOALAN 5

CLO1  
C2

A 25mm diameter of steel rod is subjected to a tensile force of 20kN as shown in Figure A5. Calculate the direct stress in the rod.

*Sebatang rod keluli berdiameter 25mm dikenakan daya tegangan 20kN seperti dalam Figure A5. Kirakan tegasan terus dalam rod tersebut.*



Figure A5 (Rajah A5)

(4 marks)  
(4 markah)

## QUESTION 6

## SOALAN 6

CLO1  
C3

Figure A6 shows a graph of Load versus Elongation for steel specimen when subjected to a tensile test. Recognize the characteristics of material at point A, B, C and D.

Rajah A6 menunjukkan graf Beban lawan pemanjangan bagi satu specimen keluli yang dikenakan ujian tegangan. Kenalpasti ciri-ciri bahan bagi kedudukan A, B, C dan D.

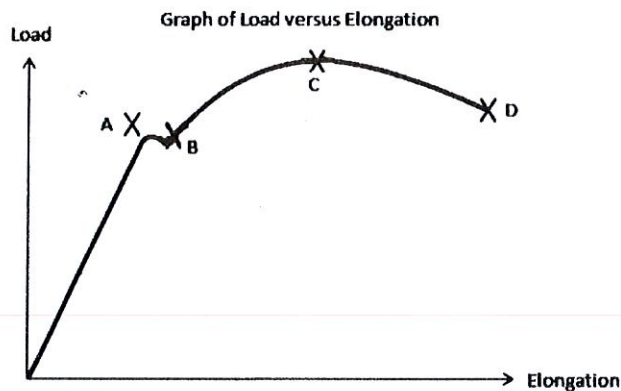


Figure A6 (Rajah A6)

(4 marks)  
(4 markah)

## QUESTION 7

## SOALAN 7

CLO1  
C2

A beam with a cross-section of 200 mm (width) x 400 mm (height) is having 800kNm maximum bending moment. Calculate the maximum bending stress in the section.

Satu rasuk berkeratan rentas 200 mm lebar x 400 mm dalam mempunyai momen lentur maksimum 800 kNm. Kirakan tegasan lentur maksimum dalam keratan tersebut.

(4 marks)  
(4 markah)

## QUESTION 8

## SOALAN 8

CLO1  
C2

A column with cross sectional area of 150mm width and 120mm height carries 15kN load in 15 mm eccentricity as shown in Figure A8. Determine maximum stress in the section

*Sebatang tiang yang mempunyai keratan rentas 150 mm lebar dan 120mm ketebalan, membawa beban 15 kN pada kesipian 15mm seperti dalam Rajah A8. Tentukan tegasan maksimum pada keratan tersebut.*

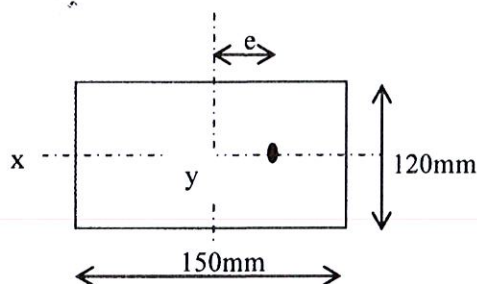


Figure A8 (Rajah A8)

(4 marks)  
(4 markah)

## QUESTION 9

## SOALAN 9

CLO1  
C2

Figure A9 shows two pieces of steel plate connected together by 4 bolts of 24mm diameter. Calculate the average shear stress in each bolt.

*Figure A9 menunjukkan dua keping plat keluli disambungkan dengan menggunakan 4 bolt berdiameter 24mm. Kirakan tegasan ricih purata pada setiap bolt.*

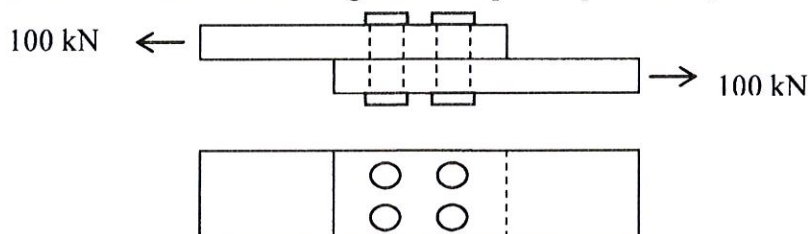


Figure A9 (Rajah A9)

(4 marks)  
(4 markah)

## QUESTION 10

## SOALAN 10

The deformation of a beam is usually expressed in terms of its deflection.

*Ubah bentuk sesuatu rasuk biasanya digambarkan sebagai pesongan.*

CLO1  
C1

- (a) Define the term of deflection  
*Takrifkan istilah pesongan*

(2 marks)  
(2 markah)

CLO1  
C2

- (b) Explain why it is necessary to compute deflection in structures.  
*Terangkan keperluan mengira pesongan dalam sesuatu rasuk.*

(2 marks)  
(2 markah)

**SECTION B : 60 MARKS****BAHAGIAN B : 60 MARKAH****INSTRUCTION:**

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

**ARAHAN:**

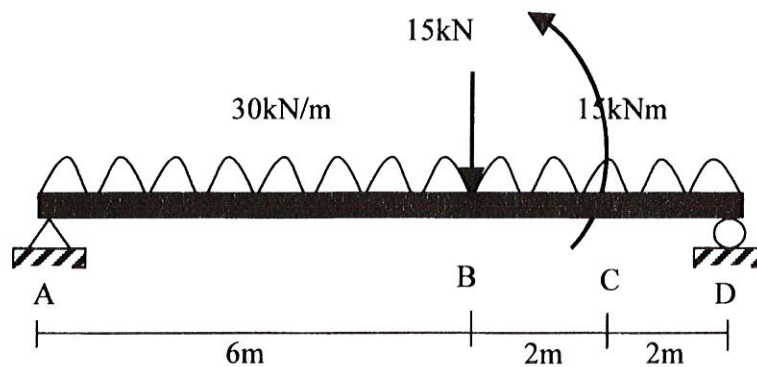
Bahagian ini mengandungi **EMPAT (4)** soalan berstruktur. Jawab **TIGA (3)** soalan sahaja.

**QUESTION 1****SOALAN 1**

CLO1  
C3

Draw Shear Force Diagram (SFD) and Bending Moment Diagram (BMD) for simply supported beam as shown in Figure B1.

Lukiskan gambarajah Daya Ricih dan Momen Lentur bagi Rasuk Disokong Mudah seperti yang ditunjukkan dalam Rajah B1.



**Figure B1 (Rajah B1)**

(20 marks)  
(20 markah)



## QUESTION 2

## SOALAN 2

CLO1  
C3

A simply supported beam with symmetrical I-section is subjected to a uniform load of 25kN/m as shown in Figure B2.

*Satu rasuk disokong mudah berkeratan I-simetri menanggung beban teragih seragam seperti dalam Rajah B2.*

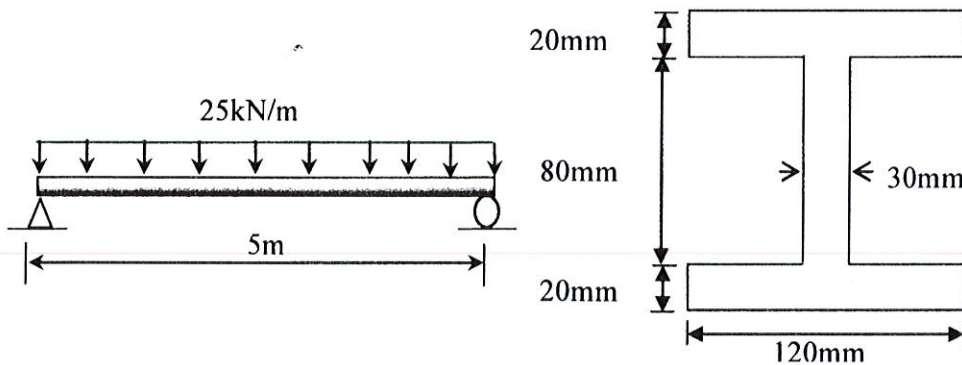


Figure B2 (Rajah B2)

- a) Calculate the maximum bending stress for beam section.  
*Kira tegasan lentur maksimum bagi keratan rasuk.*

(15 marks)  
(15 markah)

- b) Sketch the bending stress distribution diagram.  
*Lakarkan rajah taburan tegasan lentur.*

(5 marks)  
(5 markah)

## QUESTION 3

## SOALAN 3

CLO1  
C2

- a) Explain briefly the types of shear stress in bolt connection by using appropriate diagram.

*Terangkan dengan ringkas jenis-jenis tegasan ricih dalam sambungan bolt beserta gambarajah yang bersesuaian.*

(4marks)  
(4 markah)

CLO1  
C3

- b) A simply supported beam as shown in Figure B3 has a rectangular cross section.  
*Satu rasuk ditupang mudah seperti dalam Rajah B3 berkeratan rentas segiempat tepat.*

- i. Calculate the shear stress at intervals of 25 mm from top section to the point of neutral axis.

*Kirakan tegasan ricih pada setiap sela 25mm dari atas keratan hingga ke paksi neutral.*

(14 marks)  
(14 markah)

- ii. Draw the shear stress distribution diagram of the beam.

*Lukiskan rajah taburan tegasan ricih rasuk tersebut.*

(2 marks)  
(2 markah)

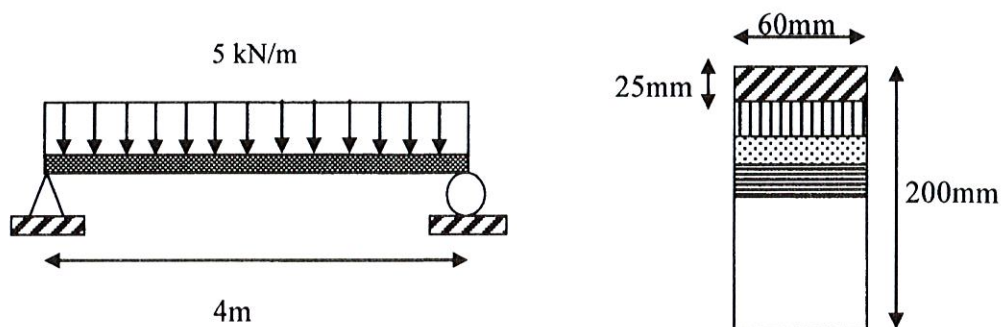


Figure B3 (Rajah B3)

## QUESTION 4

## SOALAN 4

CLO1  
C3

Calculate slope and deflection at point D for the simply supported beam in Figure B4 by using Moment Area Method in term of EI.

*Kira kecerunan dan pesongan pada titik D bagi rasuk tupang mudah dalam Rajah B4 menggunakan Kaedah Momen Luas dalam sebutan EI.*

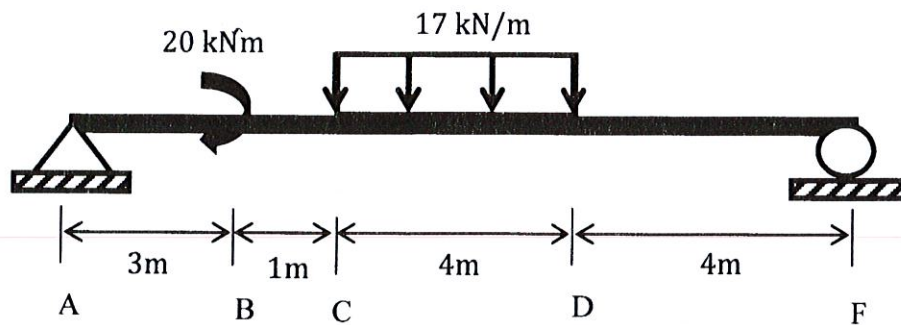
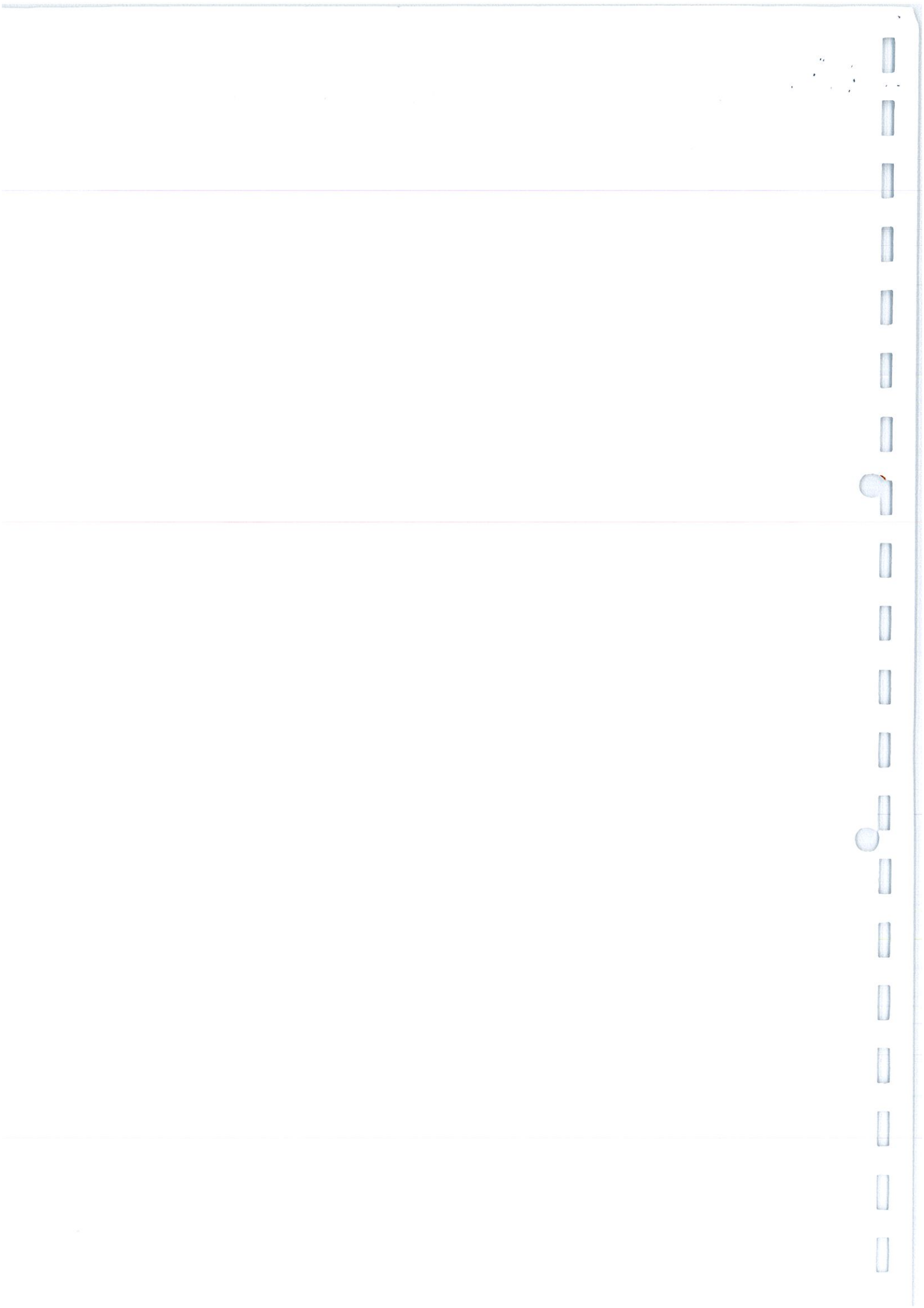


Figure B4 (Rajah B4)

(20 marks)  
(20 markah)

SOALAN TAMAT



## LIST OF FORMULA FOR CC205 – MECHANICS OF STRUCTURES

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

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

3. 
$$E = \frac{\sigma}{\varepsilon}$$

4. 
$$E = \frac{PL}{A\delta L}$$

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

6. 
$$I_{xx} = \frac{bd^3}{12} + Ah^2$$

7. 
$$Z = \frac{I}{y_{\max}}$$

8. 
$$\sigma = \frac{M}{I} \cdot y$$

9. 
$$\tau = \frac{VAy}{Ix.b}$$

10. 
$$\sigma_{\max/\min} = \frac{P}{A} \pm \frac{Pe_x \bar{y}}{I_{xx}} \pm \frac{Pe_y \bar{x}}{I_{yy}}$$

**Maximum Moment**

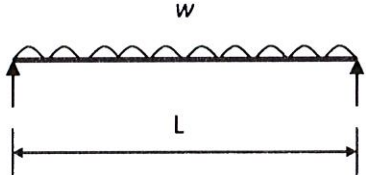
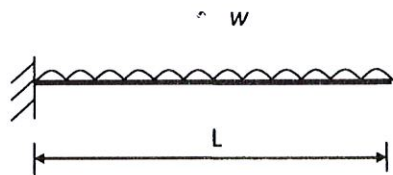
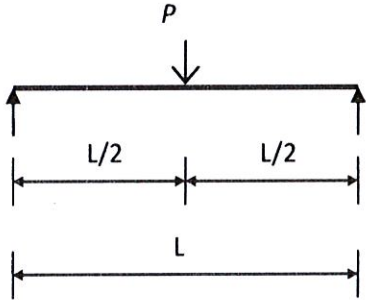
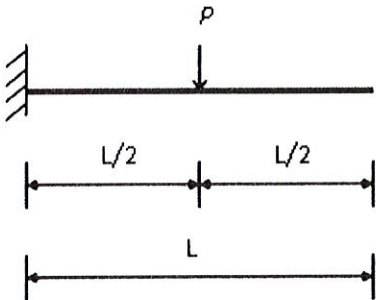
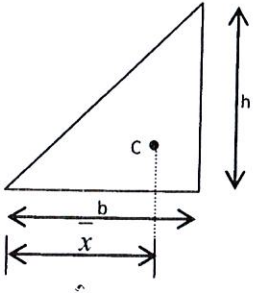
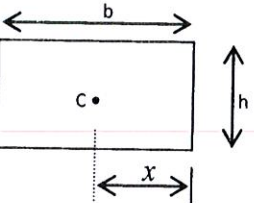
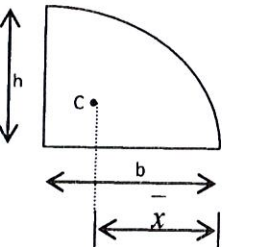
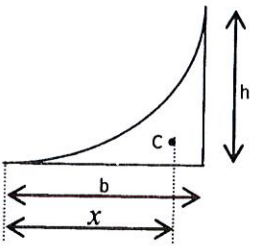
<i>Beam</i>	<i>Maksimum Moment</i>
	$\frac{wL^2}{8}$
	$-\frac{wL^2}{2}$
	$\frac{PL}{4}$
	$-\frac{PL}{2}$

Table 1 : Geometric Properties of Areas

	Shape	Area, A	centroid, $\bar{x}$
Triangle		$\frac{1}{2}bh$	$\frac{2}{3}b$
Rectangle		$bh$	$\frac{b}{2}$
Semi parabola		$\frac{2}{3}bh$	$\frac{5}{8}b$
Parabolic spandrel		$\frac{1}{3}bh$	$\frac{3}{4}b$

