

UNIVERSITI SAINS MALAYSIA

Peperiksaan Semester Pertama
Sidang 1992/93

Oktober/November 1992

REG 262 - Kejuruteraan 3 (Struktur)

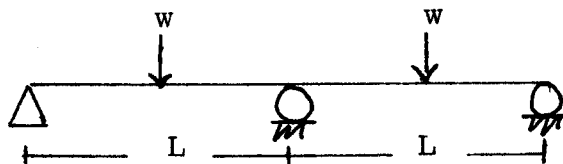
Masa : (3 Jam)

Sila pastikan bahawa kertas peperiksaan ini mengandungi ENAM muka surat yang tercetak sebelum anda memulakan peperiksaan ini.

Jawab LIMA soalan sahaja. EMPAT daripada BAHAGIAN A dan SATU daripada BAHAGIAN B.

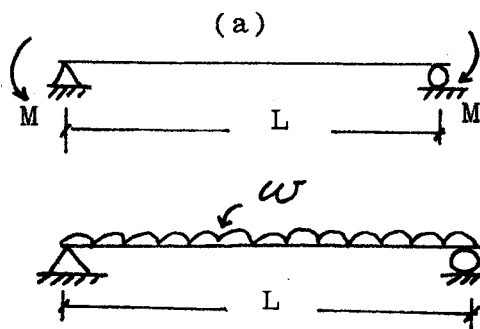
BAHAGIAN A

- Apakah yang dimaksudkan dengan struktur tidak boleh tentu serta sebutkan dua kaedah utama bagaimana struktur tersebut boleh dianalisis?
 - Jelaskan bagaimana anda dapat menganalisis struktur Rajah 1 (b) dengan menggunakan Kaedah Kelunturan.



(20 markah)

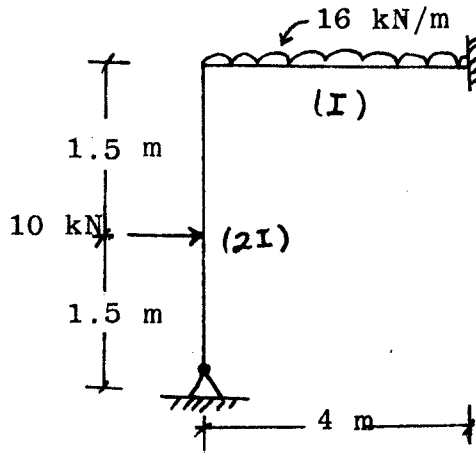
- Tentukan cerun maksima dan pesongan maksima untuk sistem rasuk Rajah 2a, b dan c dengan menggunakan Kaedah Rasuk Jodoh. EI tetap untuk kesemua rasuk.



(20 markah)

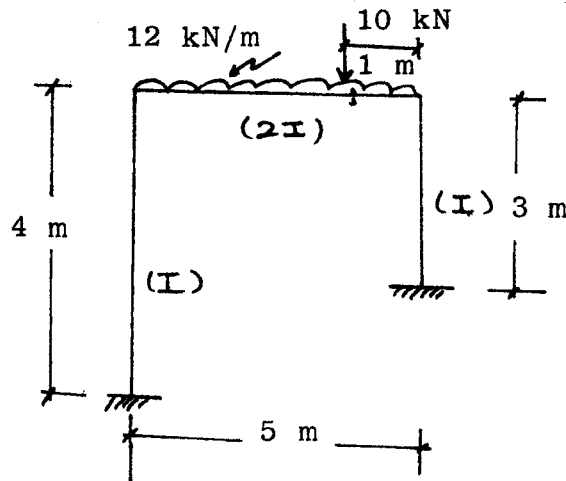
...2/-

3. Jalankan suatu analisis untuk struktur kerangka Rajah 3 dan tentukan semua daya dalam ahli. Lukiskan juga gambarajah momen lentur untuk semua ahli.



(20 markah)

4. Rajah 4 menunjukkan sebuah kerangka yang boleh mengalami gerak sisi. Kirakan semua daya ricih dan momen lentur yang berbangkit akibat beban keatas struktur.



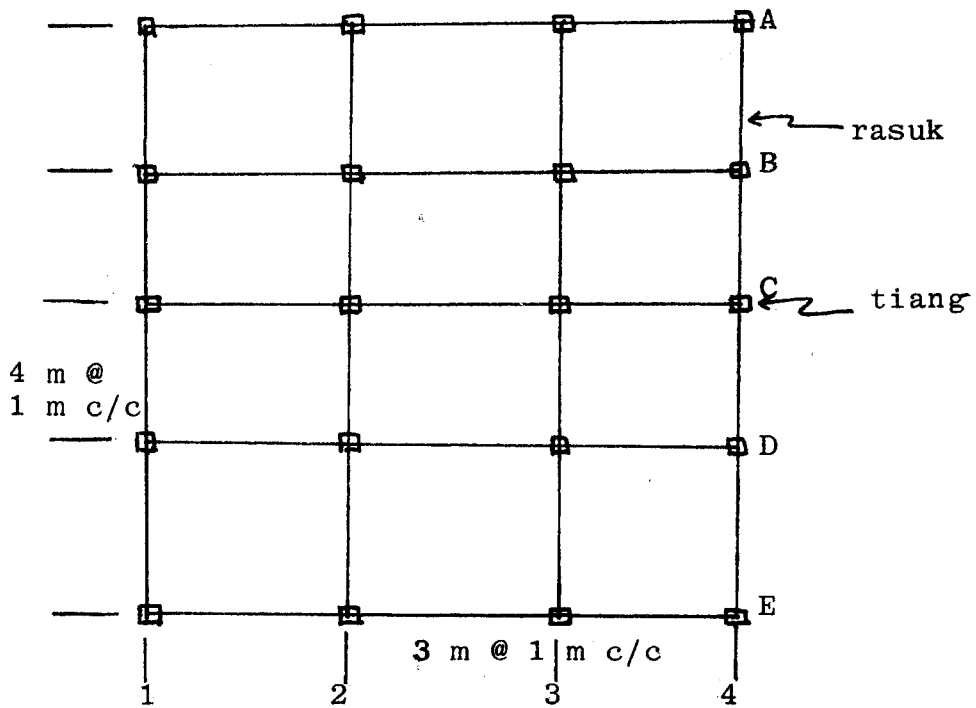
(20 markah)

...3/-

BAHAGIAN B

- 5 (a) Jelaskan apakah yang dimaksudkan dengan:
- i. Faktor keselamatan keatas beban (partial safety factor) dan
 - ii. Rekabentuk ketakat akhir.
- (b) Kirakan jumlah beban keatas rasuk C-1-2-3-4 serta kirakan momen dalam rentang pendek kepingan D-E-2-3. Jumlah beban seragam rekabentuk adalah $= 6.5 \text{ kN/m}^2$.

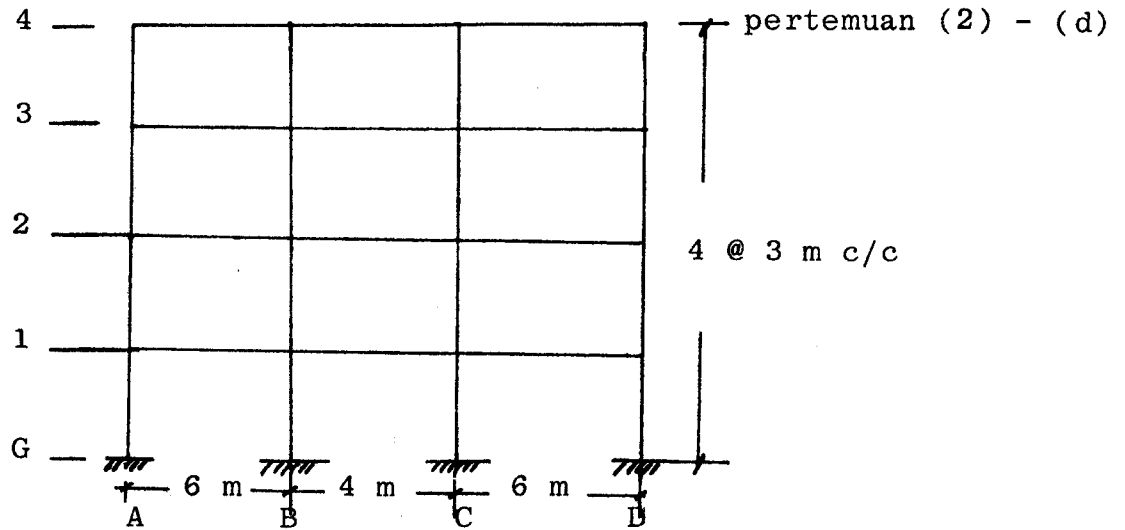
(20 markah)



Pelan Lantai

...4/-

6. Rajah 6 menunjukkan pelan hadapan sesatah suatu bangunan bertingkat. Kirakan momen maksima positif rentang 2-BC momen maksima negatif rasuk 2 - ABCD dan momen pada tiang bawah pertemuan (2) - (c).



Beban keatas rasuk:

$G_k = 3.2 \text{ kN/m}$ (Beban mati)

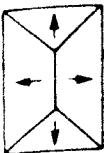
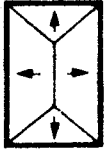
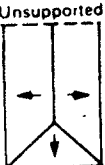

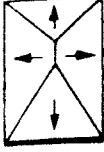
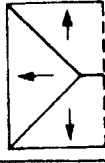
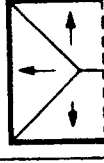
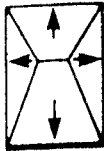

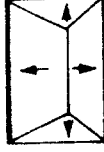
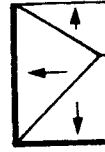
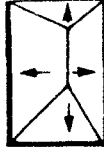
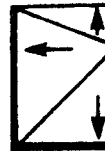
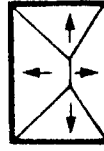
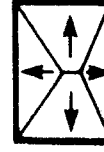
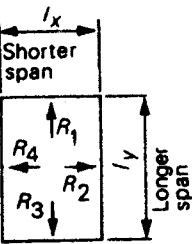
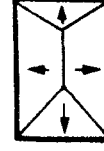
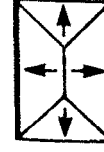
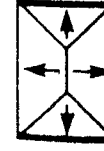
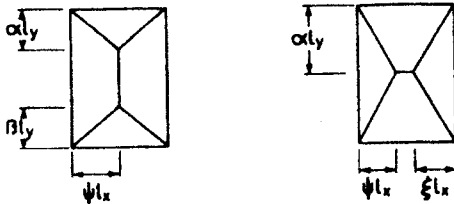
$Q_k = 4.5 \text{ kN/m}$ (Beban hidup)

Momen sifat tekun rasuk - I

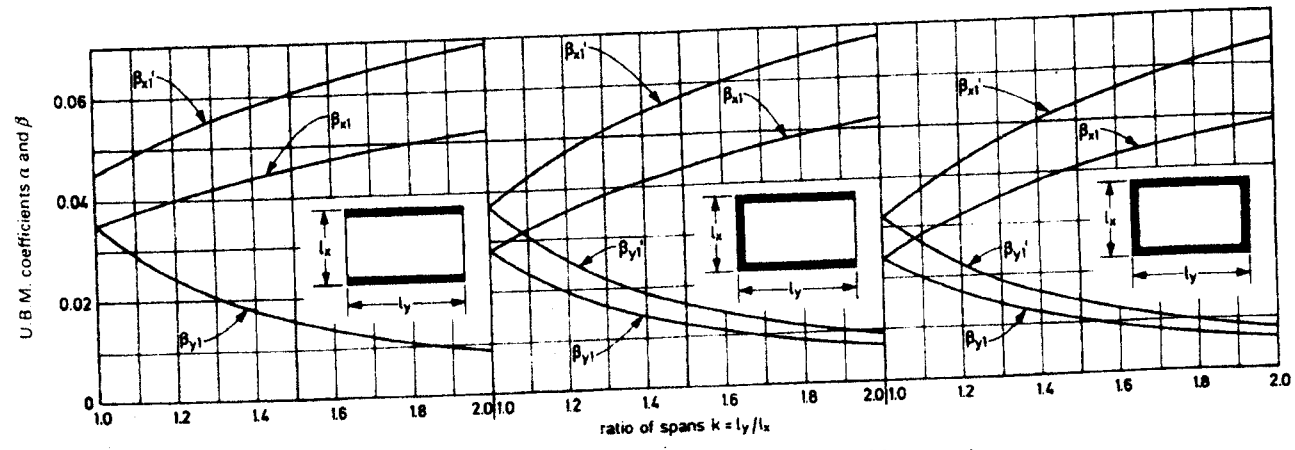
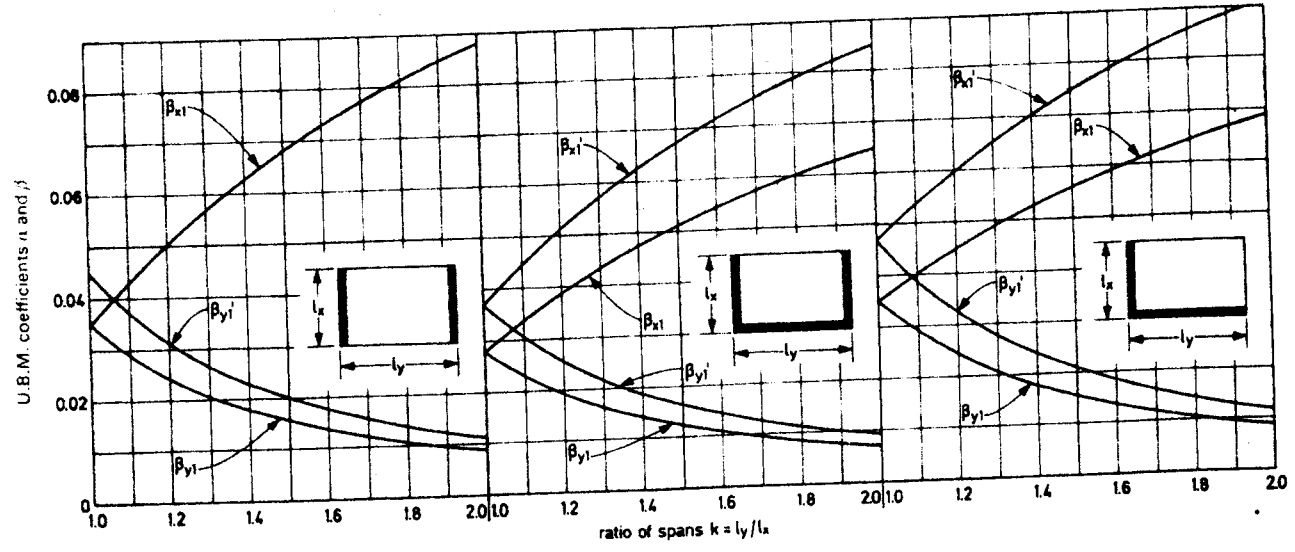
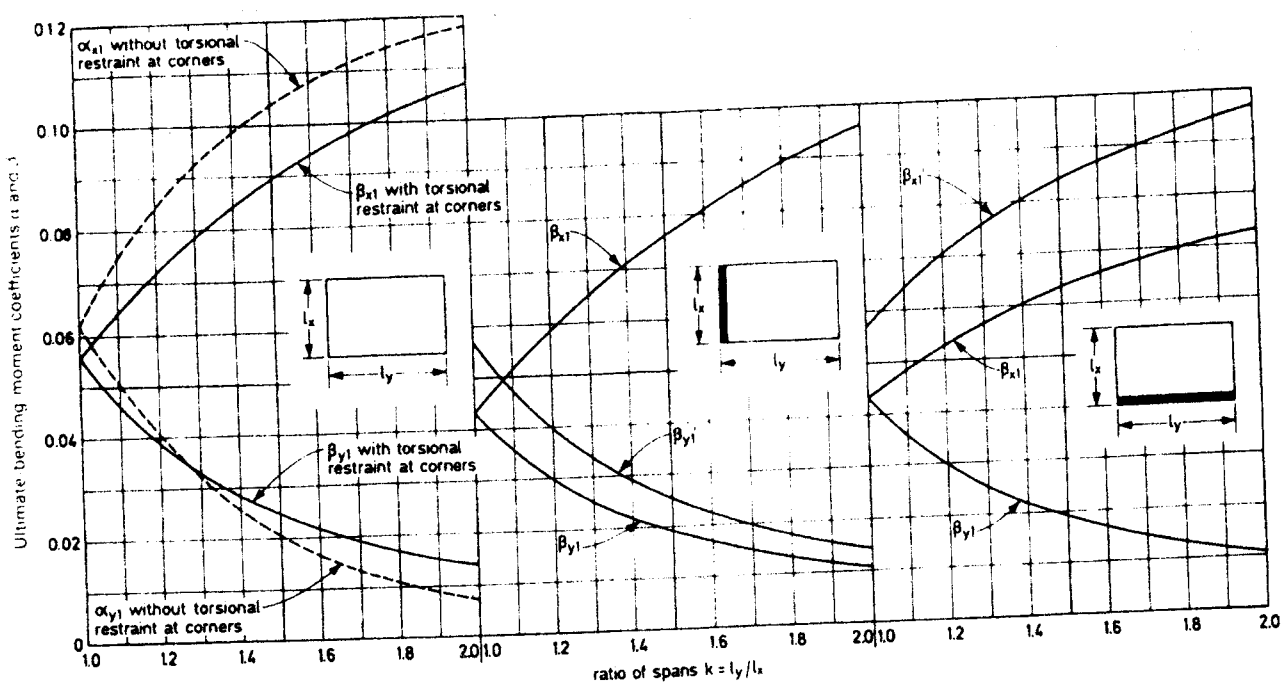
Momen sifat tekun tiang - $3/2I$

...5/-

Two-way slabs: Rectangular panels: Loads on beams

Panels supported along four edges	Panels unsupported along one edge
  <p> $k > 1: R_1 = R_3 = \frac{1}{4}wl_x^2$ $R_2 = R_4 = \frac{1}{4}(k - \frac{1}{k})wl_x^2$ $\alpha = \beta = 1/2k$ $k = 1: R_1 = R_2 = R_3 = R_4 = \frac{1}{4}wl_x^2$ </p>	  <p> $R_1 = 0$ $R_2 = R_4 = \frac{1}{4}(k - \frac{1}{k})wl_x^2$ $R_3 = \frac{1}{4}wl_x^2$ $\beta = 1/2k$ </p>
 <p> $k < 1\frac{1}{2}: R_1 = \frac{1}{4}wl_x^2$ (min.) $\alpha = 1/2k$ (min.) $R_2 = R_4 = \frac{1}{4}(k - \frac{1}{k})wl_x^2$ $R_3 = \frac{1}{4}wl_x^2$ (max.) $\beta = 5/6k$ (max.) </p>	  <p> $k > 2: R_1 = R_3 = \frac{1}{4}k(1 - \frac{1}{k})wl_x^2$ $R_2 = 0$ $R_4 = \frac{1}{4}k^2wl_x^2$ $\psi = k/2$ </p>
 <p> $k \leq 1\frac{1}{2}: R_1 = \frac{1}{4}R_3$ approx. (min.) $\alpha = 3k/8$ $\beta = 5k/8$ $R_2 = R_4 = \frac{3}{16}k^2wl_x^2$ $\psi = \xi = 3k/8$ $R_3 = \frac{3}{8}k(1 - \frac{1}{k})wl_x^2$ approx. (max.) </p>	 <p> $R_1 = 0$ $\beta = 5/8k$ $R_2 = \frac{3}{8}R_4$ (min.) $\psi = \frac{1}{2}$ $R_3 = \frac{1}{8}wl_x^2$ $R_4 = \frac{3}{8}(k - \frac{1}{k})wl_x^2$ (max.) </p>
 <p> $R_1 = R_3 = \frac{1}{16}wl_x^2$ $R_2 = \frac{1}{4}R_4$ (min.) $R_4 = \frac{1}{4}(k - \frac{1}{k})wl_x^2$ (max.) $\alpha = \beta = \frac{1}{2}k$ $\psi = \frac{1}{2}$ (max.) </p>	 <p> $k > 1\frac{1}{2}: R_1 = \frac{1}{4}R_3$ (min.) $R_2 = 0$ $R_3 = \frac{1}{4}k(1 - \frac{1}{k})wl_x^2$ (max.) $R_4 = \frac{1}{16}k^2wl_x^2$ $\alpha = \frac{1}{2}$ $\psi = 5k/8$ </p>
 <p> $R_1 = \frac{1}{16}wl_x^2$ (min.) $\alpha = \beta = 3/8k$ $R_2 = \frac{1}{4}R_4$ (min.) $\beta = 5/8k$ (max.) $R_3 = \frac{1}{16}wl_x^2$ (max.) $\psi = \frac{1}{2}$ (max.) $R_4 = \frac{1}{4}(k - \frac{1}{k})wl_x^2$ (max.) </p>	 <p> $k \geq 1\frac{1}{2}: R_1 = \frac{1}{16}wl_x^2$ (min.) $R_2 = 0$ $R_3 = \frac{1}{4}wl_x^2$ $R_4 = (k - \frac{1}{k})wl_x^2$ (max.) $\alpha = 3/5k$ $\beta = 1/k$ </p>
 <p> $k < 1\frac{1}{2}: R_1 = R_3 = \frac{1}{16}wl_x^2$ $\alpha = \beta = \frac{1}{2}k$ $R_2 = \frac{1}{4}R_4$ (min.) $\psi = \frac{1}{2}$ (max.) $R_4 = \frac{1}{4}(k - \frac{1}{k})wl_x^2$ (max.) </p>	<p> $k = \frac{l_y}{l_x} = \frac{\text{Longer span}}{\text{Shorter span}}$ $w =$ Intensity of uniformly-distributed service load per unit area. </p>
 <p> $k \leq 1\frac{1}{2}: R_1 = R_3 = \frac{1}{4}k(1 - \frac{1}{k})wl_x^2$ $\alpha = \beta = k/2$ $R_2 = \frac{1}{16}k^2wl_x^2$ (min.) $R_4 = \frac{1}{4}k^2wl_x^2$ (max.) $\psi = k/2$ $\xi = 3k/10$ </p>	 <p> If analysis due to ultimate loads is undertaken, substitute n for w in appropriate formulae. $R_1, R_2, R_3, R_4 =$ total load carried by each support of panel. </p>
 <p> $R_1 = \frac{1}{16}wl_x^2$ (min.) $\alpha = 3/10k$ (min.) $R_2 = R_4 = \frac{1}{4}(k - \frac{1}{k})wl_x^2$ $R_3 = \frac{1}{4}wl_x^2$ (max.) $\beta = 1/2k$ (max.) </p>	<p> Condition of supports - - - - - = No support ———— = Freely supported ———— = Continuity or fixity </p>
 <p> $R_1 = R_3 = \frac{1}{16}wl_x^2$ (min.) $R_2 = R_4 = \frac{1}{4}(k - \frac{1}{k})wl_x^2$ (max.) $\alpha = \beta = 3/10k$ (min.) </p>	<p> Loads marked (min.) apply if panel is entirely freely supported along edge indicated: if partially restrained, load will be slightly greater than given and load marked (max.) on opposite edge will be correspondingly reduced. </p>
 <p> $k < 1\frac{1}{2}: R_1 = R_3 = \frac{1}{16}wl_x^2$ (min.) $R_2 = R_4 = \frac{1}{4}(k - \frac{1}{k})wl_x^2$ (max.) $\alpha = \beta = 5/6k$ (min.) </p>	

Two-way slabs: Rectangular panels: Uniform load: CP 110 requirements TABLE 51



— edge which is discontinuous or which is cast monolithically with support.
 — edge which is continuous.

Bending-moment coefficients β_{x1} and β_{x1}' apply to maximum positive and negative bending moments respectively on short span l_x .

Bending-moment coefficients β_{y1} and β_{y1}' apply to maximum positive and negative bending moments respectively on long span l_y .

240