

UNIVERSITI SAINS MALAYSIA

Peperiksaan Semester Kedua
Sidang Akademik 2002/2003

Februari/Mac 2003

REG 262 – Rekabentuk Struktur

Masa : 3 jam

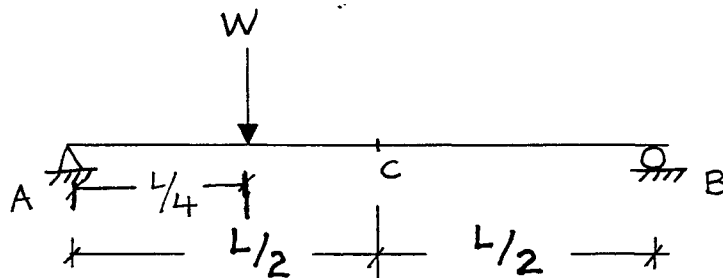
Sila pastikan bahawa kertas peperiksaan ini mengandungi ENAM muka surat yang tercetak sebelum anda memulakan peperiksaan ini.

Jawab LIMA soalan sahaja.

- Bincangkan bentuk-bentuk struktur yang digunakan dalam reka bentuk bangunan dan ciri-cirinya, seperti tindakbalas dan pengagihan daya.
 - Berikan beberapa contoh struktur tidak boleh tentu dalam bangunan serta sebutkan beberapa kelebihanannya.

(20 markah)

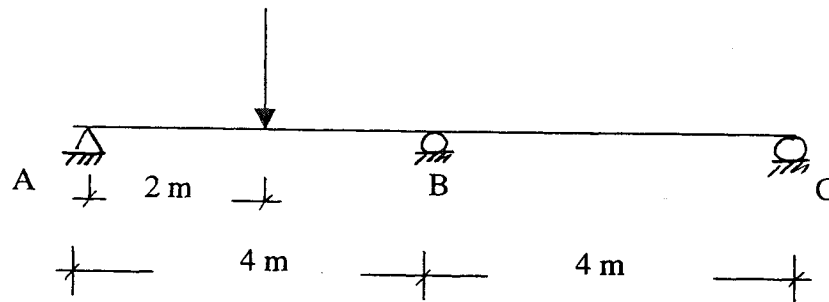
- Kirakan nilai kecerunan dan pesongan yang terjadi pada titik C system rasuk yang ditunjukkan dalam Rajah 1 di bawah menggunakan kaedah rasuk konjugat. (Anggapkan keseluruhan rasuk mempunyai nilai EI yang sama)



Rajah 1

(20 markah)

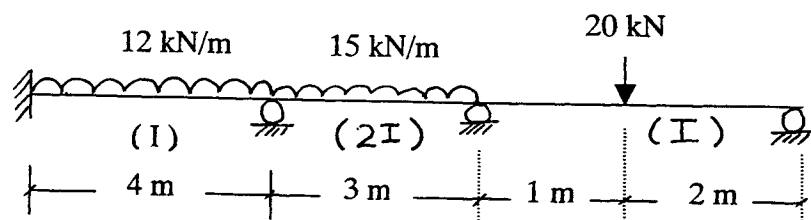
3. Apakah nilai tindakbalas di B untuk sistem rasuk tidak boleh tentu dalam Rajah 2 di bawah menggunakan kaedah kecacatan konsisten. (Keseluruhan rasuk ABC mempunyai nilai EI yang sama)



Rajah 2

(20 markah)

4. Sebuah sistem rasuk berterusan ditunjukkan dalam Rajah 3 di bawah. Kirakan semua tindakbalas pada rasuk tersebut menggunakan kaedah agihan momen. Lukiskan juga gambarajah daya ricih dan momen lentur.

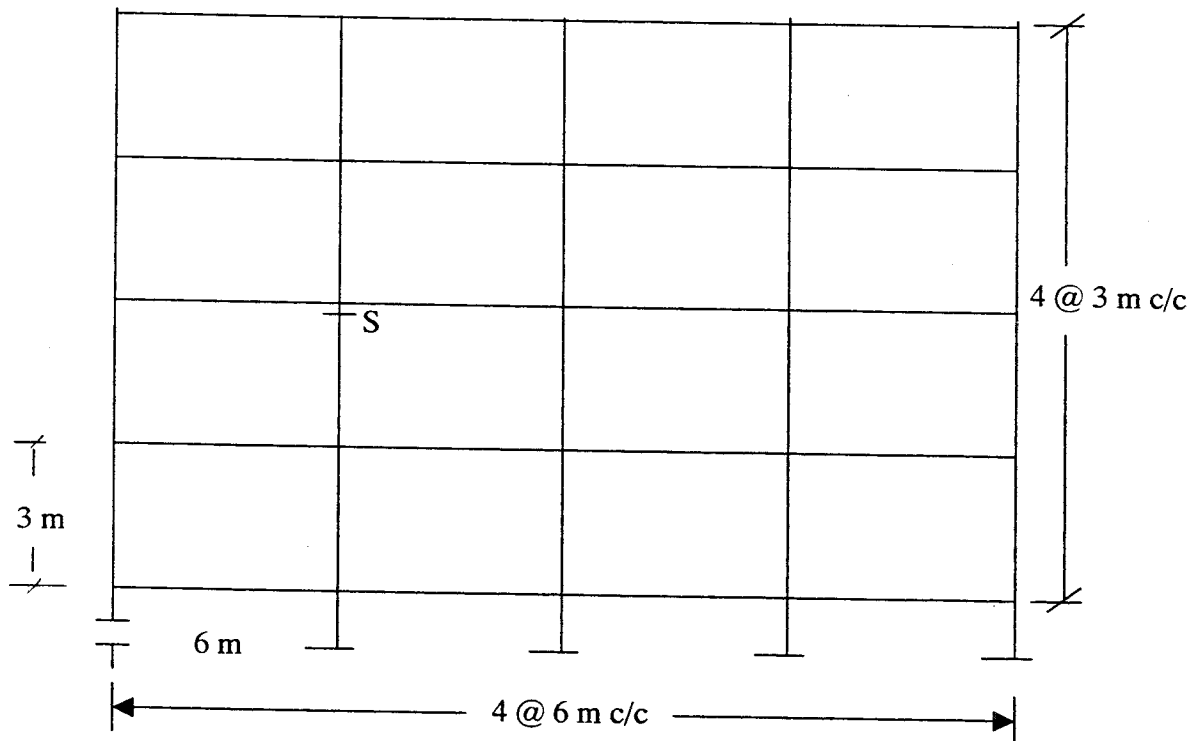


Rajah 3

(20 markah)

- 3 -

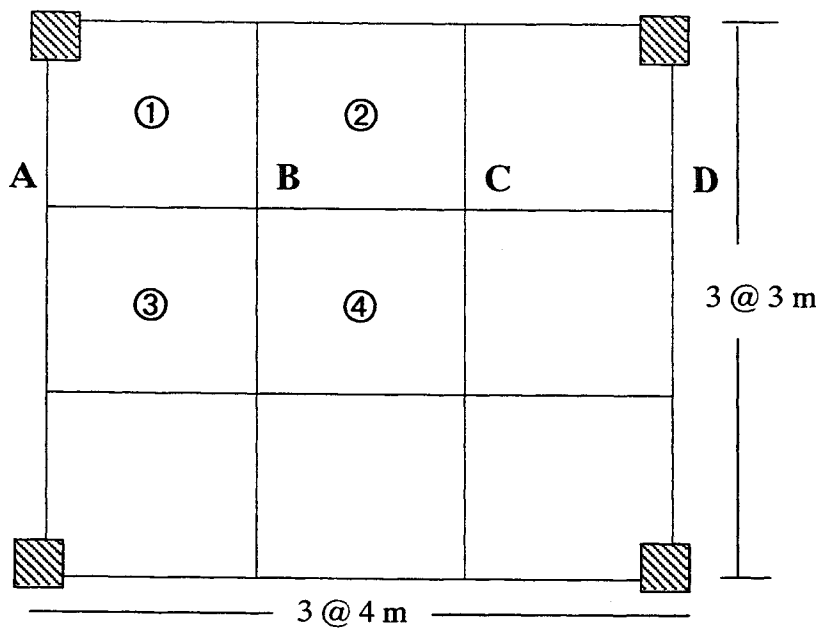
5. Sebahagian daripada kerangka bangunan 4 tingkat ditunjukkan dalam Rajah 4.
- (a) Tunjukkan beberapa kes beban mati, G_k dan beban hidup, Q_k yang dapat memberikan momen maksimum pada sistem rasuk tingkat kedua.
- (b) Kirakan nilai momen maksimum pada bahagian tiang di S jika beban atas rasuk adalah $G_k = 30 \text{ kN/m}$ dan $Q_k = 22 \text{ kN/m}$. (Anggapkan $I_{\text{rasuk}} = 2I$ dan $I_{\text{tiang}} = I$)



Rajah 4

(20 markah)

6. Sebuah sistem lantai yang ditunjukkan dalam Rajah 5 diperbuat daripada konkrit bertulang dan dibebankan dengan beban hidup, $Q_k = 3 \text{ kN/m}^2$. Jika ketebalan lantai adalah 100 mm dan berat lepaan adalah 1 kN/m^2 , kirakan momen lentur pada arah panjang dan lebar lantai untuk panel lantai ①, ②, ③ dan ④ serta jumlah beban yang akan teragih kepada rasuk A B C dan D.



Rajah 5

Rujukan : Jadual 3.15 (BS8110:part 1:1985)

Jadual 3.16 (BS8110:part 1:1985)

Ketumpatan Konkrit = 24 kN/m^3

(20 markah)

| Table 3.15 Bending moment coefficients for rectangular panels supported on four sides with provision for torsion at corners | | | | | | | | | |
|---|---------------------------------------|-------|-------|-------|-------|-------|-------|-------|--|
| Type of panel and moments considered | Short span coefficients, β_{sx} | | | | | | | | Long span coefficients, β_{sy} , for all values of l_y/l_x |
| | Values of l_y/l_x | | | | | | | | |
| | 1.0 | 1.1 | 1.2 | 1.3 | 1.4 | 1.5 | 1.75 | 2.0 | |
| <i>Interior panels</i> | | | | | | | | | |
| Negative moment at continuous edge | 0.031 | 0.037 | 0.042 | 0.046 | 0.050 | 0.053 | 0.059 | 0.063 | 0.032 |
| Positive moment at mid-span | 0.024 | 0.028 | 0.032 | 0.035 | 0.037 | 0.040 | 0.044 | 0.048 | 0.024 |
| <i>One short edge discontinuous</i> | | | | | | | | | |
| Negative moment at continuous edge | 0.039 | 0.044 | 0.048 | 0.052 | 0.055 | 0.058 | 0.063 | 0.067 | 0.037 |
| Positive moment at mid-span | 0.029 | 0.033 | 0.036 | 0.039 | 0.041 | 0.043 | 0.047 | 0.050 | 0.028 |
| <i>One long edge discontinuous</i> | | | | | | | | | |
| Negative moment at continuous edge | 0.039 | 0.049 | 0.056 | 0.062 | 0.068 | 0.073 | 0.082 | 0.089 | 0.037 |
| Positive moment at mid-span | 0.030 | 0.036 | 0.042 | 0.047 | 0.051 | 0.055 | 0.062 | 0.067 | 0.028 |
| <i>Two adjacent edges discontinuous</i> | | | | | | | | | |
| Negative moment at continuous edge | 0.047 | 0.056 | 0.063 | 0.069 | 0.074 | 0.078 | 0.087 | 0.093 | 0.045 |
| Positive moment at mid-span | 0.036 | 0.042 | 0.047 | 0.051 | 0.055 | 0.059 | 0.065 | 0.070 | 0.034 |
| <i>Two short edges discontinuous</i> | | | | | | | | | |
| Negative moment at continuous edge | 0.046 | 0.050 | 0.054 | 0.057 | 0.060 | 0.062 | 0.067 | 0.070 | — |
| Positive moment at mid-span | 0.034 | 0.038 | 0.040 | 0.043 | 0.045 | 0.047 | 0.050 | 0.053 | 0.034 |
| <i>Two long edges discontinuous</i> | | | | | | | | | |
| Negative moment at continuous edge | — | — | — | — | — | — | — | — | 0.045 |
| Positive moment at mid-span | 0.034 | 0.046 | 0.056 | 0.065 | 0.072 | 0.078 | 0.091 | 0.100 | 0.034 |
| <i>Three edges discontinuous (one long edge continuous)</i> | | | | | | | | | |
| Negative moment at continuous edge | 0.057 | 0.065 | 0.071 | 0.076 | 0.081 | 0.084 | 0.092 | 0.098 | — |
| Positive moment at mid-span | 0.043 | 0.048 | 0.053 | 0.057 | 0.060 | 0.063 | 0.069 | 0.074 | 0.044 |
| <i>Three edges discontinuous (one short edge continuous)</i> | | | | | | | | | |
| Negative moment at continuous edge | — | — | — | — | — | — | — | — | 0.058 |
| Positive moment at mid-span | 0.042 | 0.054 | 0.063 | 0.071 | 0.078 | 0.084 | 0.096 | 0.105 | 0.044 |
| <i>Four edges discontinuous</i> | | | | | | | | | |
| Positive moment at mid-span | 0.055 | 0.065 | 0.074 | 0.081 | 0.087 | 0.092 | 0.103 | 0.111 | 0.056 |

Table 3.16 Shear force coefficients for uniformly loaded rectangular panels supported on four sides with provision for torsion at corners

| Type of panel and location | β_{vx} for values of l_y/l_x | | | | | | | | β_{vy} |
|--|--------------------------------------|------|------|------|------|------|------|------|--------------|
| | 1.0 | 1.1 | 1.2 | 1.3 | 1.4 | 1.5 | 1.75 | 2.0 | |
| <i>Four edges continuous</i> | | | | | | | | | |
| Continuous edge | 0.33 | 0.36 | 0.39 | 0.41 | 0.43 | 0.45 | 0.48 | 0.50 | 0.33 |
| <i>One short edge discontinuous</i> | | | | | | | | | |
| Continuous edge | 0.36 | 0.39 | 0.42 | 0.44 | 0.45 | 0.47 | 0.50 | 0.52 | 0.36 |
| Discontinuous edge | — | — | — | — | — | — | — | — | 0.24 |
| <i>One long edge discontinuous</i> | | | | | | | | | |
| Continuous edge | 0.36 | 0.40 | 0.44 | 0.47 | 0.49 | 0.51 | 0.55 | 0.59 | 0.36 |
| Discontinuous edge | 0.24 | 0.27 | 0.29 | 0.31 | 0.32 | 0.34 | 0.36 | 0.38 | — |
| <i>Two adjacent edges discontinuous</i> | | | | | | | | | |
| Continuous edge | 0.40 | 0.44 | 0.47 | 0.50 | 0.52 | 0.54 | 0.57 | 0.60 | 0.40 |
| Discontinuous edge | 0.26 | 0.29 | 0.31 | 0.33 | 0.34 | 0.35 | 0.38 | 0.40 | 0.26 |
| <i>Two short edges discontinuous</i> | | | | | | | | | |
| Continuous edge | 0.40 | 0.43 | 0.45 | 0.47 | 0.48 | 0.49 | 0.52 | 0.54 | — |
| Discontinuous edge | — | — | — | — | — | — | — | — | 0.26 |
| <i>Two long edges discontinuous</i> | | | | | | | | | |
| Continuous edge | — | — | — | — | — | — | — | — | 0.40 |
| Discontinuous edge | 0.26 | 0.30 | 0.33 | 0.36 | 0.38 | 0.40 | 0.44 | 0.47 | — |
| <i>Three edges discontinuous (one long edge continuous)</i> | | | | | | | | | |
| Continuous edge | 0.45 | 0.48 | 0.51 | 0.53 | 0.55 | 0.57 | 0.60 | 0.63 | — |
| Discontinuous edge | 0.30 | 0.32 | 0.34 | 0.35 | 0.36 | 0.37 | 0.39 | 0.41 | 0.29 |
| <i>Three edges discontinuous (one short edge continuous)</i> | | | | | | | | | |
| Continuous edge | — | — | — | — | — | — | — | — | 0.45 |
| Discontinuous edge | 0.29 | 0.33 | 0.36 | 0.38 | 0.40 | 0.42 | 0.45 | 0.48 | 0.30 |
| <i>Four edges discontinuous</i> | | | | | | | | | |
| Discontinuous edge | 0.33 | 0.36 | 0.39 | 0.41 | 0.43 | 0.45 | 0.48 | 0.50 | 0.33 |

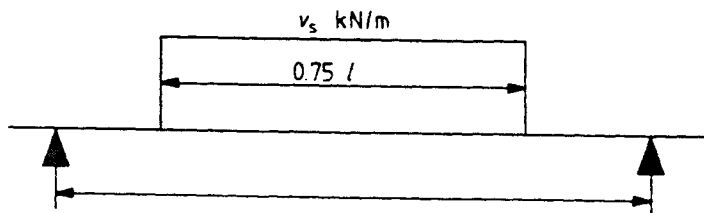


Figure 3.10 Distribution of load on a beam supporting a two-way spanning slab