

7

SULIT



BAHAGIAN PEPERIKSAAN DAN PENILAIAN  
JABATAN PENDIDIKAN POLITEKNIK  
KEMENTERIAN PENDIDIKAN TINGGI

JABATAN KEJURUTERAAN AWAM

PEPERIKSAAN AKHIR  
SESI DISEMBER 2017

**DCC3113: HIGHWAY AND TRAFFIC ENGINEERING**

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**TARIKH : 01 APRIL 2018**  
**MASA : 8.30PG – 10.30PG(2JAM)**

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Kertas ini mengandungi **SEBELAS (11)** halaman bercetak.

Bahagian A: Struktur (2 soalan)

Bahagian B: Struktur (4 soalan)

Dokumen sokongan yang disertakan : Appendix

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**JANGAN BUKA KERTAS SOALANINI SEHINGGA DIARAHKAN**

(CLO yang tertera hanya sebagai rujukan)

SULIT



**SECTION A: 50 MARKS****BAHAGIAN A: 50 MARKAH****INSTRUCTION:**

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

**ARAHAN:**

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

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

CLO1  
C1

- (a) State **FIVE (5)** importance of act enforcement aspects related to roads and road laws.

*Nyatakan LIMA (5) kepentingan aspek-aspek pengukuhan akta yang berkaitan dengan jalan dan undang-undang jalanraya.*

[10 marks]  
[10 markah]

CLO1  
C2

- (b) Explain the following transportation studies conducted in a planning process.

- i. Origin –Destination/direction (OD)
- ii. Traffic Volume Study
- iii. Spot Speed Study

*Terangkan kajian pengangkutan yang dijalankan semasa proses perancangan.*

- i. Tujuan – Asalan
- ii. Kajian Isipada Trafik
- iii. Kcjian Laju Setempat

[15 marks]  
[15 markah]

**QUESTION 2****SOALAN 2**

- CLO1  
C1 (a) List **FOUR (4)** selection factors of junction types

*Senaraikan EMPAT (4) faktor pemilihan jenis-jenis persimpangan.*

[4 marks]  
[4 markah]

- CLO1  
C2 (b) Describe the following terms of traffic light circulation phase design:-

- i. lost time
- ii. cycle length
- iii. interval

*Huraikan terma-terma fasa rekabentuk peredaran lampu isyarat yang berikut:-*

- i. *Masa Hilang*
- ii. *Panjang Kitaran*
- iii. *Selang Masa*

[6 marks]  
[6 markah]

- CLO1  
C3 (c) 2-Phase traffic signal will be installed at the intersection in Johor Bahru City. Saturation flow (S) is as shown in the table. Given Interval (I) – 4 seconds, Lost Time (l) – 2s and Amber (A) = 3 seconds. Sketch the 2-phase traffic signal diagram which is acquired from below analysis:

- i. Actual Flow
- ii. Total Lost Time
- iii. Cycle Length
- iv. Actual Green Time for every phase

Lampu Isyarat 2-fasa akan dipasang pada persimpangan di dalam Bandar Johor Bharu. Aliran Tepu (S) adalah seperti yang dijadualkan. Diberi masa antara hijau (I) - 4 saat, Masa Hilang (l) - 2 saat dan Masa Kuning(K) - 3 saat. Lakarkan rajah trafik signal 2 fasa yang diperolehi daripada analisis di bawah:

- i. Aliran Sebenar
- ii. Jumlah Masa Terhilang
- iii. Masa Pusingan Optima
- iv. Masa Hijau Sebenar bagi setiap fasa.

Given/Diberi:

ARM/LENGAN (pcu/hr)	NORTH/ UTARA	SOUTH/ SELATAN	EAST/ TIMUR	WEST/ BARAT
S (Saturation Flow/Aliran Tepu)	1970	1970	3160	3160
Q ( Actual Flow/ Aliran Sebenar)	835	948	1132	1147

[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 struktur. Jawab DUA (2) soalan sahaja.*

**QUESTION 1****SOALAN 1**CLO2  
C2

- (a) Identify **FIVE (5)** methods used in preparation of materials at base layer of flexible pavement.

*Kenalpasti LIMA (5) kaedah yang digunakan dalam penyediaan bahan-bahan pada lapisan tapak turapan boleh lentur.*

[5 marks]  
[5 markah]

CLO2  
C3

- (b) Interpret the functions for each structural layer of flexible pavement below:

- i. Subgrade
- ii. Subbase
- iii. Base course
- iv. Binder course
- v. Wearing course

*Tafsirkan fungsi setiap lapisan struktur bagi turapan boleh lentur di bawah:*

- i. *Subgred*
- ii. *Sub tapak*
- iii. *Lapisan tapak*
- iv. *Lapisan pengikat*
- v. *Lapisan haus*

[10 marks]  
[10 markah]

- CLO2 (c) Compare **FIVE (5)** advantages between rigid pavement and flexible pavement.  
C5

*Bandingkan **LIMA (5)** kelebihan antara turapan tegar dan turapan boleh lentur.*

[10 marks]  
[10 markah]

## QUESTION 2

### SOALAN 2

- CLO2 (a) Regulation device, warning device and guidance device are categories of traffic control device according to their functions. Explain **FIVE (5)** basic characteristics of traffic control devices.  
C2

*Peranti Peraturan, Peranti Amaran dan Peranti Panduan adalah kategori peranti kawalan lalulintas mengikut fungs. Terangkan **LIMA (5)** ciri-ciri asas peranti kawalan lalu lintas.*

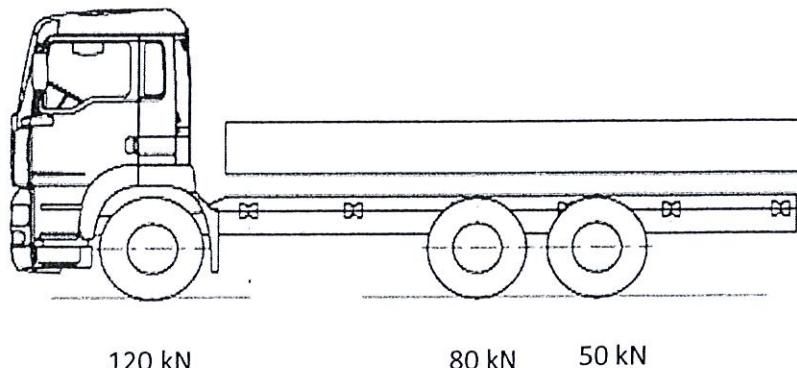
[5 marks]  
[5 markah]

- CLO2 (b) A flexible pavement with surface of 7.5m width and shoulder of 1.50m width. It has initial average daily traffic of 6500veh/day for both directions with equivalence factor of 2.0. The rate of traffic growth is at 7% and the percentage of commercial vehicle is 15%. Design the road with a life span design of 10 years, and CBR for sub-grade of the road is at 6 % with flat terrain. The wearing course is asphalt concrete, while for the base and sub-base course is from crushed aggregate. Use the JKR Malaysia Design Method as given.  
C3

*Turapan anjal dengan kelebaran permukaan sebanyak 7.5m dan bahu jalan selebar 1.50m. Purata lalulintas harian adalah 6500kend/hari untuk kedua-dua arah dengan faktor setaraan adalah 2.0. Kadar pertumbuhan lalulintas ialah 7% dan peratus kenderaan perdagangan adalah sebanyak 15%. Rekabentuk jalan tersebut selama 10*

tahun hayat rekabentuk dengan nilai CBR sub-gred adalah 6% dan bentuk rupabumi yang mendatar. Permukaan jalan diperbuat daripada konkrit berasfal, manakala bagi tapak dan sub-tapak masing-masing adalah daripada batu baur hancur. Gunakan kaedah Rekabentuk JKR Malaysia seperti yang diberikan.

[15 marks]  
[15 markah]



**Figure 2c/ Rajah 2c**

CLO2  
C5

- (c) An axle is a central shaft for a rotating wheel or gear. For wheeled vehicles, the axle may be fixed to the wheels, rotating with them, or fixed to the vehicle itself, with the wheels rotating around the axle. **Figure 2c** shows the overall weight of lorry is at 250kN and the weight is being transmitted to the pavement through the arrangement of three axles. Evaluate the equivalency factor, e for the vehicle by using correct formula.

Gandar adalah aici pusat untuk roda berputar atau gear. Pada kenderaan beroda, gandar boleh ditetapkan ke roda, berputar bersama atau kekal pada kenderaan itu dengan roda berputar di gandar. Seperti didalam **Rajah 2c**, Berat sebuah lori adalah 250kN dan beban dialihkan kepada turapan jalan melalui tiga gandar. Nilaikan faktor kesetaraan, e bagi kenderaan tersebut dengan formula berkaitan yang betul.

[5 marks]  
[5 markah]

**QUESTION 3****SOALAN 3**CLO2  
C2

- (a) Aggregate, fillers, bitumen, cement, and steel reinforcement are the materials used in highway construction. These materials need to be tested before able to be used in construction. Identify **FIVE (5)** types of test with the objectives of each test.

*Batu Baur, pengisi, bitumen, simen, dan keluli tetulang adalah bahan-bahan yang digunakan dalam pembinaan lebuh raya. Bahan-bahan ini perlu diuji sebelum dapat digunakan dalam pembinaan. Kenalpasti **LIMA (5)** jenis ujian beserta dengan objektif bagi setiap ujian.*

[5 marks]  
[5 markah]

CLO2  
C4

- (b) **Table 3A** shows the test results of Marshall Trial Mix with different bitumen contents. Solve the missing data in the table.

*Jadual 1 menunjukkan keputusan ujian Marshall Trial Mix dengan kandungan bitumen yang berbeza. Selesaikan data Jadual 3A pada helaian lampiran.*

[10 marks]  
[10 markah]

*Please attach this table (**Table 3A**) with Answer Script Book*

*Sila lampirakan jadual ini (Jadual 3A) bersama Skrip Buku Jawapan.*

## MARSHALL TEST RESULT

TYPE OF MIX : AC14  
RECEIPT NUMBER : 80100

	kg	Newton
	Volume	Corr
SG <sub>app</sub>	= 2.6	1.0
SG <sub>Blended</sub>	= 2.5	0.99
	50-522	1.00
	523-535	0.96
	536-546	0.93

CLO2  
C5

- (c) Compare **FIVE (5)** characteristic of cutback bitumen and emulsified bitumen.

*Bandingkan **LIMA (5)** ciri-ciri bitumen "cutback" dan bitumen emulsi.*

[10 marks]  
[10 markah]

#### QUESTION 4

##### SOALAN 4

CLO2  
C2

- (a) Explain **FIVE (5)** purposes of traffic management.

*Terangkan **LIMA (5)** tujuan pengurusan trafik.*

[5 Marks]  
[5 Markah]

CLO2  
C3

- (b) Interpret **FOUR (4)** traffic management techniques below:

- i. Physical management of road system
- ii. Instruct form and traffic regulation management
- iii. Management of information to road users
- iv. Management of payment of traffic facilities

*Interpretasikan **EMPAT (4)** teknik pengurusan trafik di bawah:*

- i. *Sistem pengurusan fizikal*
- ii. *Pengurusan peraturan trafik dan borang peraturan*
- iii. *Pengurusan maklumat kepada pengguna jalanraya*
- iv. *Pengurusan pembayaran bagi kemudahan trafik*

[10 Marks]  
[10 Markah]

CLO2  
C5

- (c) Compare TWO (2) categories of road maintenance with suitable example for each category.
- Routine maintenance
  - Emergency maintenance

*Bandingkan DUA (2) kategori penyelenggaraan jalan dengan memberikan contoh yang sesuai bagi setiap kategori.*

- Penyelenggaraan rutin
- Penyelenggaraan kecemasan

[10 Marks]  
[10 Markah]

SOALAN TAMAT

## Appendix

$$V_0 = ADT \times 0.5 \times 365 P_c / 100$$

$$V_c = \frac{V_0 [(1+r)^x - 1]}{r}$$

$$ESA = e \times V_c$$

$$V_i = V_1 (1 + r)^x$$

$$C = I \times R \times T$$

$$C = c \times 10$$

$$T_A = a_1 D_1 + a_2 D_2 + \dots + a_n D_n$$

Table 3.1 Guide for Equivalence Factor

Percentage of selected heavy goods vehicles*	0-15%		16-50%	51-100%
Type of road Equivalence Factor	local 1.2	trunk 2.0	3.0	3.7

\* Selected heavy goods vehicles refer to those conveying timber and quarry materials.

Table 3.2 Maximum Hourly Capacity Under Ideal Conditions

Road Type	Passenger Vehicle Units per hour
Multi lane Two lanes (bothways) Three lanes (bothways)	2000 per lane 2000 total for bothways 4000 total for bothways

Table 3.3 Carriageway Roadway Reduction Factor

Carriageway Width	Shoulder Width			
	2.00m	1.50m	1.25m	1.00m
7.5m	1.00	0.97	0.94	0.90
7.0m	0.88	0.86	0.83	0.79
6.0m	0.81	0.78	0.76	0.73
5.0m	0.72	0.70	0.67	0.64



Table 3.4 Traffic Reduction Factor

Type of Terrain	Factor*
Flat	$T = 100/(100+P_c)$
Rolling	$T = 100/(100+2P_c)$
Mountainous	$T = 100/(100+5P_c)$

\* Nota Bene:  $P_c$  is as per 3.3.2

Table 3.5 Structural Layer Coefficients

Component	Type of Layer	Property	Coefficient
Wearing and Binder Course	Asphalt Concrete		1.00
Base Course	Dense Bituminous Macadam	Type 1: Stability > 400 kg	0.80
		Type 2: Stability > 300 kg	0.55
	Cement Stabilized Mechanically Stabilized crushed aggregate	Unconfined Compressive strength(7 days) 30-40 kg/cm <sup>2</sup>	0.45
		CBR ? 80%	0.32
Subbase	Sand, laterite etc.	CBR ? 20%	0.23
	Crushed aggregate	CBR ? 30%	0.25
	Cement Stabilized	CBR ? 60%	0.28



Table 3.6 Minimum Layer Thickness

Type of Layer	Minimum Thickness	
Wearing Course	4 cm	
Binder Course	5 cm	
Base Course	Bituminous	5 cm
	Wet Mix	10 cm
	Cement treated*	10 cm
Subbase Course	Granular	10 cm
	Cement treated	15 cm

\* No to Bene

Table 3.7 Standard & Construction Layer Thickness

Type of layer	Standard thickness	One layer lift
Wearing course	4-5 cm	4-5 cm
Binder course	5-10 cm	5-10 cm
	Bituminous	5-20 cm
Base	Wet mix	10-20 cm
Course	Cement treated	10-20 cm
Subbase	Granular	10-30 cm
Course	Cement treated	15-20 cm

Table 3.8 Minimum Thickness of Bituminous Layer

T <sub>A</sub>	Total thickness of bituminous layer
≤ 17.5 cm	5.0 cm
17.5 - 22.5 cm	10.0 cm
23.0 - 29.5 cm	15.0 cm
> 30.0 cm	17.5 cm



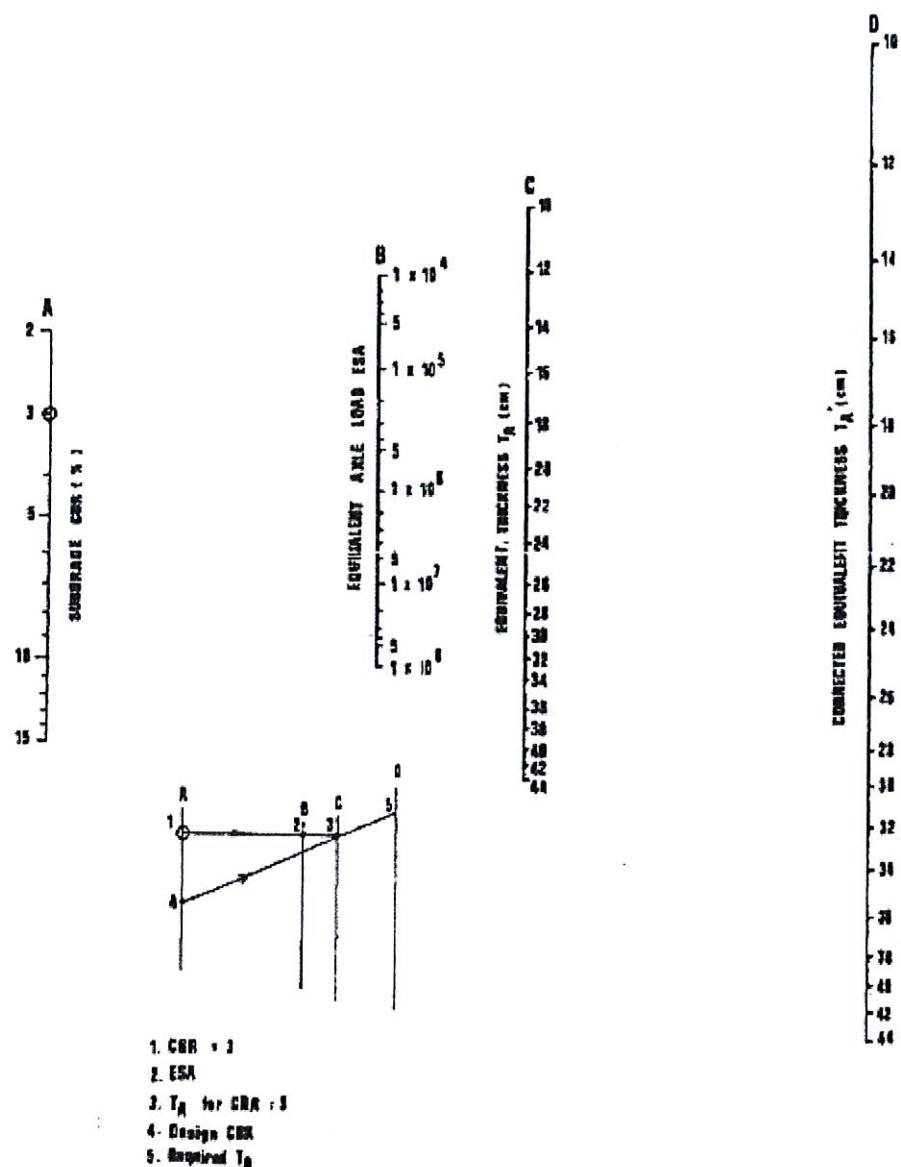


Figure 1: Thickness Design Nomograph

