

SULIT



**BAHAGIAN PEPERIKSAAN DAN PENILAIAN
JABATAN PENDIDIKAN POLITEKNIK
KEMENTERIAN PENDIDIKAN TINGGI**

JABATAN KEJURUTERAAN AWAM

PEPERIKSAAN AKHIR

SESI DISEMBER 2017

DCC3113 : HIGHWAY AND TRAFFIC ENGINEERING

TARIKH : 01 APRIL 2018

MASA : 8.30PG – 10.30PG(2JAM)

Kertas ini mengandungi **SEPULUH (10)** halaman bercetak.

Bahagian A: Struktur (2 soalan)

Bahagian B: Struktur (4 soalan)

Dokumen sokongan yang disertakan : **Appendix**

JANGAN BUKA KERTAS SOALAN INI 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.
Terangkan kajian pengangkutan yang dijalankan semasa proses perancangan.

- i. Origin –Destination/direction (OD)

Tujuan – Asalan

- ii. Traffic Volume Study

Kajian Isipada Trafik

- iii. Spot Speed Study

Kajian 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:-
Huraikan terma-terma fasa rekabentuk peredaran lampu isyarat yang berikut:-
- i. lost time / *Masa Hilang*
 - ii. cycle length / *Panjang Kitaran*
 - iii. interval / *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:
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. Actual Flow / *Aliran Sebenar*
 - ii. Total Lost Time / *Jumlah Masa Terhilang*
 - iii. Cycle Length / *Masa Pusingan Optima*
 - iv. Actual Green Time for every phase
Masa Hijau Sebenar bagi setiap fasa.

Given/Diberi:

ARM/LENGAN (pcu/hr)	NORTH/ <i>UTARA</i>	SOUTH/ SELATAN	EAST/ TIMUR	WEST/ BARAT
S (Saturation Flow/ <i>Aliran Tepu</i>)	1970	1970	3160	3160
Q (Actual Flow/ <i>Aliran Sebenar</i>)	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:

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

- i. Subgrade / Subgred*
- ii. Subbase / Sub tapak*
- iii. Base course / Lapisan tapak*
- iv. Binder course / Lapisan pengikat*
- v. Wearing course / Lapisan haus*

[10 marks]

[10 markah]

CLO2
C5

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

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

[10 marks]

[10 markah]

QUESTION 2

SOALAN 2

CLO2
C2

- (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.

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
C3

- (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.

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]

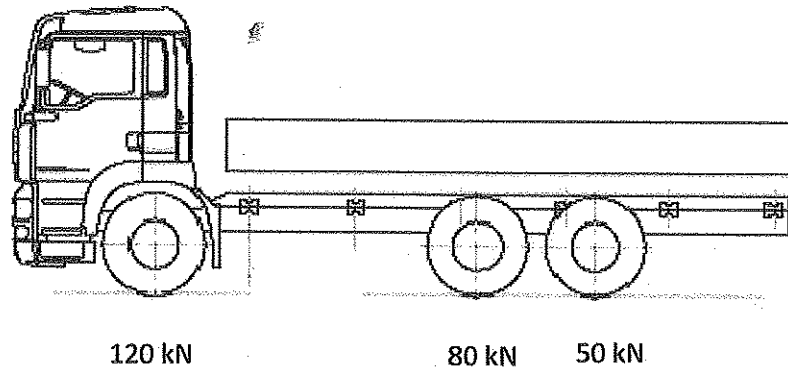


Figure 2c/ Rajah 2c

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 aci 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. Nilai 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 lebuhraya. 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 lampirkan jadual ini (Jadual 3A) bersama Skrip Buku Jawapan.

kg	Newton
1.0	9.80665

Volume	Corr
509-522	1.00
523-535	0.96
536-546	0.93

$$SG_{app} = 2.7 = 2.6$$

$$SG_{Blended} = 1.03 = 2.5$$

SG_{eff}
SG Bitumen

MARSHALL TEST RESULT

TYPE OF MIX : AC14
BITUMEN : 80/100

Sample No	% Bitumen Content	Weight(gram)		Balk Volume cc	Specific Gravity		Volume - % Total			Voids (%)		Stability (N)		Flow (mm)	Stiffness (N/mm)		
		In Air	In Water		SSD	Bulk	TMD	Bitumen	Aggregate	Voids	VMA	VFA	VTM			Measure d	Corr. Stability
a	b	c	d	e	f	h	i	j	k	l	m	n	o	p	q	r	s
1	4.0	1241.0	707.6	1243.0	e-d	100 ((%agg/SGcell) + (%bit/SGbit))	b/g SG-bit	(100-b)/g SG-agg	100-i+j	100-j	100(i+j)	100-(100/g)	CORR		p10		q/r
2		1202.2	684.9	1205.2									0.96	21677		4.2	
3		1206.4	669.3	1210.3									1.00	21583		3.8	
AVG	4.0												0.93	20697		4.1	

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:

Interpretasikan EMPAT (4) teknik pengurusan trafik di bawah:

- i. Physical management of road system
Sistem pengurusan fizikal
- ii. Instruct form and traffic regulation management
Pengurusan peraturan trafik dan borang peraturan
- iii. Management of information to road users
Pengurusan maklumat kepada pengguna jalanraya
- iv. Management of payment of traffic facilities
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.

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

- i. Routine maintenance / *Penyelenggaraan rutin*
- ii. Emergency maintenance / *Penyelenggaraan kecemasan*

[10 Marks]

[10 Markah]

SOALAN TAMAT

Appendix

$$V_0 = ADT \times 0.5 \times 365 F_2 / 100$$

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

$$ESA = e \times V_c$$

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

$$c = l \times R \times T$$

$$C = c \times 10$$

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

Table 3.1 Guide for Equivalence Factor

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

* 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 ^a
Flat	$T = 100/(100+Pc)$
Rolling	$T = 100/(100+2Pc)$
Mountainous	$T = 100/(100+5Pc)$

^a Note Bene: Pc 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 ²	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	5-15 cm
Base	Wet mix	10-20 cm	10-15 cm
Course	Cement treated	10-20 cm	10-20 cm
Subbase	Granular	10-30 cm	10-20 cm
Course	Cement treated	15-20 cm	10-20 cm

Table 3.8 Minimum Thickness of Bituminous Layer

T_A	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

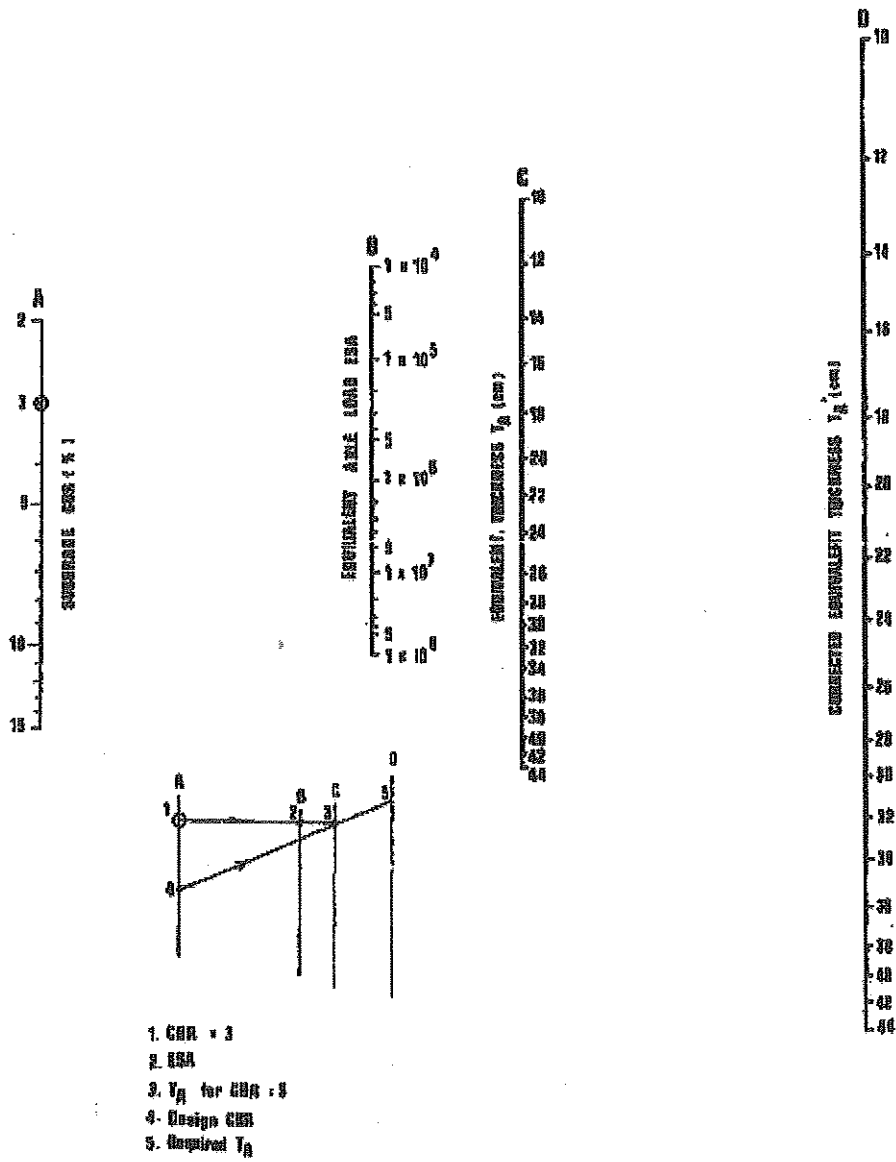


Figure 1: Thickness Design Nomograph