POLITEKNIK
MALAYSIA

BAHAGIAN PEPERIKSAAN DAN PENILAIAN
JABATAN PENDIDIKAN POLITEKNIK
KEMENTERIAN PENDIDIKAN TINGGI

JABATAN KEJURUTERAAN AWAM

PEPERIKSAAN AKHIR

SESI DISEMBER 2016

DCC3113 : HIGHWAY AND TRAFFIC ENGINEERING

TARIKH : 11 APRIL 2017
MASA : 8.30 AM - 10.30 AM (2 JAM)

Kertas ini mengandungi **TUJUH (7)** halaman bercetak.
Bahagian A: Struktur (2 soalan)
Bahagian B: Struktur (4 soalan)
Dokumen sokongan yang disertakan : Formula

JANGAN BUKA KERTAS SOALAN INI SEHINGGA DIARAHKAN

(CLO yang tertera hanya sebagai rujukan)

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)** agencies that are involved in highway construction.

*Nyatakan **LIMA (5)** agensi yang terlibat dalam pembinaan jalanraya*

[5 marks]
[*5 markah*]

CLO1
C2

(b) Explain **TWO (2)** types of transportation

*Terangkan **DUA (2)** jenis pengangkutan.*

[5 marks]
[*5 markah*]

CLO1
C3

(c) **Table 1** show the test results pertaining to a Marshall Trial Mix with different bitumen contents. Plot the test results and calculate the optimum bitumen content for the ACB 28 mix given below:

Jadual 1 menunjukkan keputusan ujikaji yang berkaitan dengan Marshall Trial Mix dengan kandungan bitumen yang berbeza. Plotkan keputusan ujikaji dan kirakan kandungan bitumen optimum untuk campuran ACB 28 di bawah:

Table 1/*Jadual 1*: Test Result/*Keputusan ujikaji*

Bitumen content (%)	Density (Mg/cu.m^3)	Stability (kg)	Flow (mm)	Air voids In Total Mix (%)	VFB (%)
4.0	2.315	1160	2.80	8.0	54.0
4.5	2.320	1200	3.00	6.5	60.0
5.0	2.340	1350	3.20	5.5	67.0
5.5	2.327	1300	3.25	5.0	70.1
6.0	2.318	1240	3.50	4.5	75.0

[15 marks]
[*15 markah*]

QUESTION 2
SOALAN 2

CLO1
C1

(a) State **FIVE (5)** materials used in highway construction.

*Nyatakan **LIMA (5)** bahan-bahan yang digunakan dalam pembinaan jalanraya.*

[5 marks]
[*5 markah*]

CLO1
C2

(b) Explain the objectives of asphalt mix design in term of;

Terangkan objektif rekabentuk campuran asfal dari segi;

   i. Workability

   Kebolehkerjaan

   ii. Sufficient stability

   Kestabilan

   iii. Durability

   Jangka hayat

   iv. Sufficient air void

   Lompang udara yang mencukupi

[10 marks]
[*10 markah*]

CLO1
C3

(c) The total load of a truck is 300 kN and it is distributed through 3 axles as shown on the figure **A2(c).** Based on the figure. Calculate the equivalent load factor if all loads are borne by single axle.

Berat keseluruhan truk adalah 300kN dan diagihkan melalui 3 gandar seperti Figure A2(c). Berdasarkan gambarajah A2(c) , kirakan faktor beban setaraan. Kirakan faktor beban setaraan sekiranya semua beban diletakkan pada satu gandar sahaja.
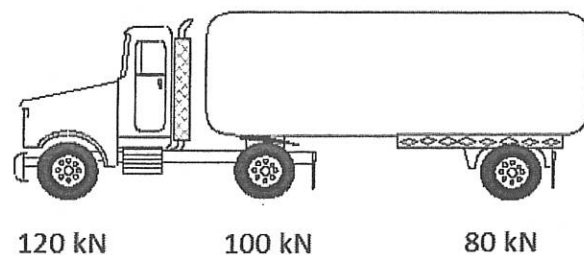

120 kN   100 kN   80 kN

Figure A2(c) / Rajah A2 (c)

[10 marks]
[*10 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 berstruktur. Jawab **DUA (2)** soalan sahaja. .*

QUESTION 1
SOALAN 1

CLO2
C2

(a) Explain the function of flexible pavement and illustrate the layers of flexible pavement structure.

Terangkan fungsi turapan lentur dan lukiskan lapisan struktur turapan lentur.

[15 marks]
[*15 markah*]

CLO2
C4

(b) There are **TWO (2)** methods of construction in rigid pavement. Compare the methods of paving rigid pavement between manual and mechanical.

*Terdapat **DUA (2)** kaedah pembinaan dalam turapan tegar. Bandingkan kaedah menurap turapan tegar antara manual dan mekanikal.*

[10 marks]
[*10 markah*]

QUESTION 2
SOALAN 2

CLO2
C3

(a) Traffic signboards are needed to help control the traffic operation and to help the road user. Illustrate **TWO (2)** types of each signboard.

*Papan tanda diperlukan untuk mengawal operasi lalulintas dan untuk membantu pengguna jalanraya. Lakarkan **DUA (2)** jenis papan tanda bagi setiap kategori.*

[10 marks]
[*10 markah*]

CLO2
C3

(b) The following conditions are given :

Maklumat yang disediakan adalah seperti berikut :

Chess of road JKR 05
Jenis Laluan Jalan JKR 05

Initial daily traffic volume (ADT) 6,600
Purata Lalulintas Harian (ADT) 6,600

Percentage of commercial vehicles 15%
Peratus kenderaan perdagangan 15%

Annual growth rate 7%
Kadar pertumbuhan tahunan 7%

Equivalence factor 2.0
Faktor setara 2.0

Subgrade CBR 5%
CBR subgred 5%

Type of terrain : Rolling terrain
Jenis muka bumi : Beralun

Calculate the thickness of all layers in flexible pavement .

Kirakan ketebalan setiap lapisan turapan lentur

[15 marks]
[*15 markah*]

QUESTION 3
SOALAN 3

CLO2
C2

(a) Types of junctions chosen are determined by certain factors. List and briefly explain **THREE (3)** of them.

*Jenis simpang yang dipilih adalah ditentukan oleh beberapa faktor. Senaraikan dan terangkan secara ringkas **TIGA (3)** daripadanya.*

[5 marks]
[*5 markah*]

CLO 2
C3

(b) A four leg two-way road junction in your area is known to be a prone area for serious accidents lately. By applying the concept of "reducing conflict points may reduce accidents", choose any **FOUR (4)** ways of reducing conflict points by showing sketches of conflict points before and after the proposals.

*Satu persimpangan empat jalan dua hala di kawasan anda diketahui sebagai kawasan yang terdedah kepada kemalangan teruk pada akhir-akhir ini. Dengan menggunakan konsep "mengurangkan titik konflik akan mengurangkan kemalangan", pilih mana-mana **EMPAT (4)** cara mengurangkan titik konflik dengan menunjukkan lakaran titik konflik sebelum dan selepas langkah diambil.*

[15 marks]
[*15 markah*]

CLO2
C5

(c) Interpret the information below into a phase-time diagram.

Tafsirkan maklumat di bawah ke dalam gambarajah fasa-masa.

Time / Phase	Phase A	Phase B
Effective green time, s	35	42
Amber, s	3	3
Inter-green time, s	4	8
Lost time, s	2	

[5 marks]
[*5 markah*]

QUESTION 4
SOALAN 4

CLO2
C3

(a) Explain **FIVE (5)** effects of car park areas on traffic flow.

Terangkan LIMA (5) kesan kawasan tempat letak kereta kepada aliran trafik.

[10 marks]
[*10 markah*]

CLO2
C3

(b) Explain **FIVE (5)** duties that are carried out by the road maintenance management.

Terangkan LIMA (5) tugas yang perlu dilakukan oleh pengurusan penyelenggaraan jalan.

[15 marks]
[*15 markah*]

SOALAN TAMAT

LAMPIRAN FORMULA DCC3113: HIGHWAY & TRAFFIC ENGINEERING

INTERSECTION DESIGN

a. $S = 525\ W \quad or\ S = 160\ W$

b. $y = \frac{Q}{S}$

c. $L = \sum l + \sum (l - k)$

d. $C_o = \frac{1.5L + 5}{1 - Y}$

e. $g_{phase} = (C_o - L)(\frac{y_{phase}}{Y})$

FLEXIBLE PAVEMENT DESIGN

a. $Vo = ADT \times 365 \times (Pc / 100) \times Directional$

b. $Vc = Vo[1 + r]^n - 1]/r$

c. $ESA\ @JBGP = Vc \times e$

d. $Vx = Vi(1 + r)x$

e. $c = I \times R \times T$

f. $C = 10 \times c$

g. $TA' = SN = a1\ D1 + a2\ D2 + ... + an\ Dn$

$G_{phase} = g_{phase} + l - k$

PAVEMENT DESIGN FORMULA

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

Table 3.2   Maximum Hourly Capacity under ideal conditions

Road Type	Passenger Vehicle Units per hour
Multi lane	2000 per lane
Two lanes (bothways)	2000 total for bothways
Three lanes (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	$T = 100/(100+Pc)$
Rolling	$T = 100/(100+2Pc)$
Mountainous	$T = 100/(100+5Pc)$

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	Unconfined Compressive strength(7 days) 30-40 kg/cm2	0.45
	Mechanically Stabilized crushed aggregate	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

Table 3.7   Standard & Construction Layer Thickness

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

A

SUBGRADE CBR (%)

2
3
5
10
15

B

EQUIVALENT. AXLE. LOAD ESA

1×10^4
5
1×10^5
5
1×10^6
5
1×10^7
5
1×10^8

C

EQUIVALENT, THICKNESS T_A (cm)

10
12
14
16
18
20
22
24
26
28
30
32
34
36
38
40
42
44

D

CORRECTED EQUIVALENT THICKNESS T_A' (cm)

10
12
14
16
18
20
22
24
26
28
30
32
34
36
38
40
42
44

A B C D
1 2 3 5
4
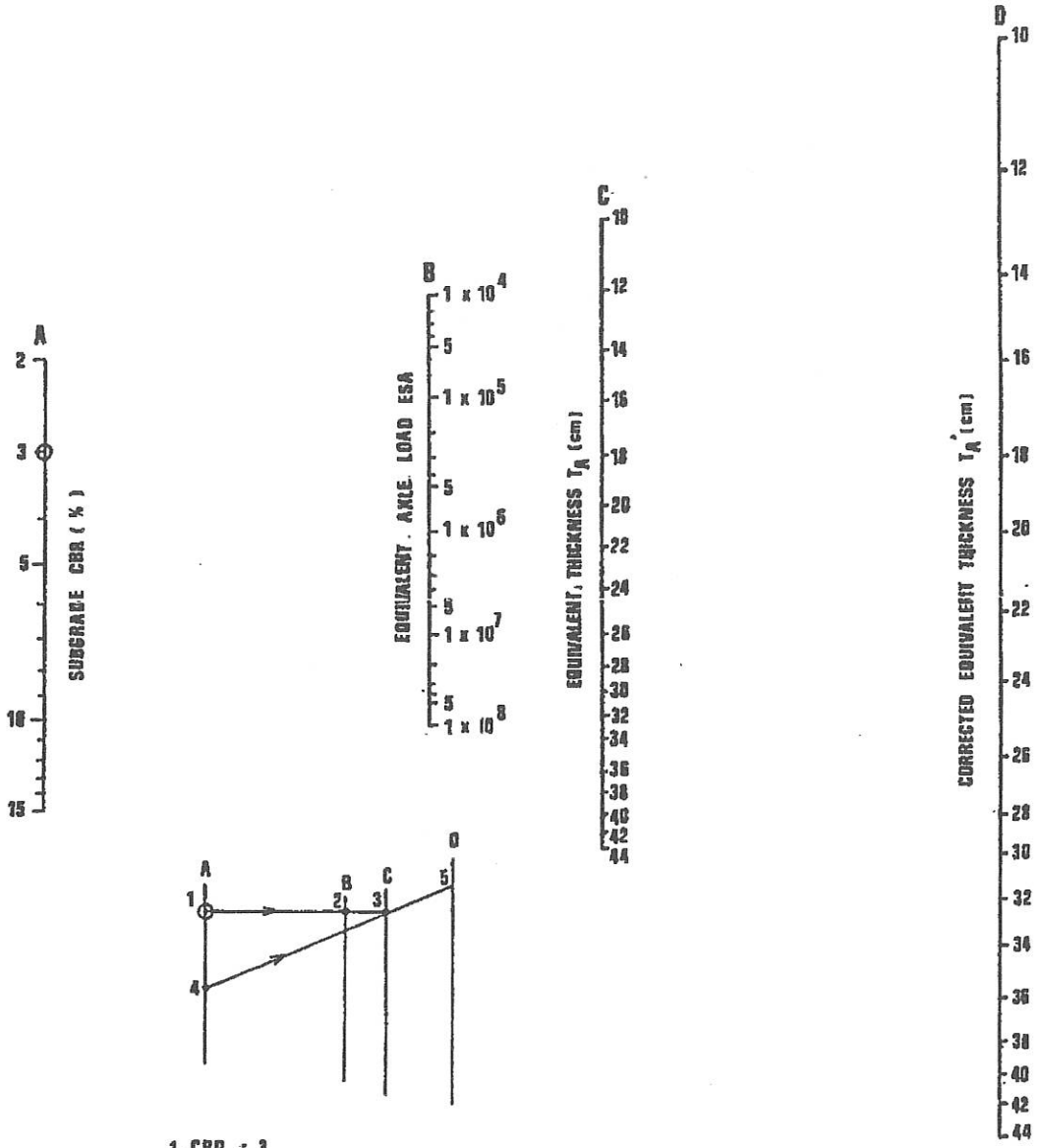
1. CBR = 3
2. ESA
3. T_A for CBR = 3
4. Design CBR
5. Required T_A

THICKNESS DESIGN NOMOGRAPH