SULIT

POLITEKNIK MALAYSIA

BAHAGIAN PEPERIKSAAN DAN PENILAIAN
JABATAN PENDIDIKAN POLITEKNIK
KEMENTERIAN PENDIDIKAN TINGGI

JABATAN KEJURUTERAAN AWAM

PEPERIKSAAN AKHIR

SESI DISEMBER 2015

DCC3113: HIGHWAY & TRAFFIC ENGINEERING

TARIKH : 16 APRIL 2016
MASA : 2.30 PM – 4.30 PM (2 JAM)

Kertas ini mengandungi **LAPAN (8)** halaman bercetak.
Bahagian A: Soalan Struktur (2 soalan)
Bahagian B: Soalan Struktur (4 soalan)

Dokumen sokongan yang disertakan : Formula, Pavement Design Formula dan Table Conversion Factor

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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** the questions.

ARAHAN:

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

QUESTION 1

SOALAN 1

CLO1
C1

a) State **FIVE (5)** categories of highway in Malaysia.
*Nyatakan **LIMA (5)** kategori lebuhraya di Malaysia.*

[5 marks]
[*5markah*]

CLO1
C2

b) Explain the importance of transportation planning.
Terangkan kepentingan perancangan pengangkutan.

[5 marks]
[*5markah*]

CLO1
C3

c) The data for a Marshall Test results is shown in **Figure 1(c)i**
*Data daripada keputusan Ujikaji Marshall ditunjukkan dalam **Figure 1(c) i.***

i. Complete the missing data in **Figure 1(c) i** in the attachment sheet.
*Lengkapkan data pada **Figure 1(c)i** dihelaian lampiran.*

[10 marks]
[*10 markah*]

ii. **Figure 1c(ii)** show the density data from Marshall test for ACB28. Calculate the theoretical maximum density and the corresponding bitumen content.

Figure 1c(ii) *menunjukkan data daripada ujikaji Marshall untuk ACB28. Kirakan ketumpatan maksimum teori dan kandungan bitumen.*

[5 marks]
[*5markah*]

QUESTION 2
SOALAN 2

CLO 1
C1

a) The most common material used as a binder in pavement construction is Bitumen (UK) which is also known as Asphalt (US). List **FIVE (5)** functions of bitumen as in construction.

*Bahan pengikat yang paling luas digunakan dalam pembinaan jalan raya ialah Bitumen atau dikenali juga sebagai Asfalt. Senaraikan **LIMA (5)** fungsi bitumen sebagai bahan dalam pembinaan.*

[5 marks]
[5 markah]

CLO 1
C2

b) Illustrate the phase diagram of a bituminous mix according to the Marshal Mix Design Method.

Lukiskan gambarajah fasa satu campuran bitumen mengikut Kaedah Rekabentuk Marshal Mix.

[10 marks]
[10 markah]

CLO 1
C3

c) Explain in your own words, **FOUR (4)** design factors of thickness of a Flexible Pavement.

*Terangkan menurut kefahaman anda, **EMPAT (4)** faktor rekabentuk ketebalan sebuah turapan lentur.*

[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 construction process of the surface of a flexible pavement.

Terangkan dengan terperinci pembinaan bagi permukaan jalan turapan lentur.

[15 marks]

[*15 markah*]

CLO2 C4

b) Rigid Pavement is the most costly among all other types of road. It uses the term rigid pavement because it does not allow any flexibility. Compare **TWO (2)** types of rigid pavement below:-

*Jalan turapan tegar adalah jalan yang berkualiti tinggi. Ia agak mahal daripada jenis turapan jalan yang lain. Ia dikenali sebagai turapan tegar kerana tidak membenarkan sebarang lenturan. Bandingkan **DUA (2)** jenis turapan tegar di bawah:*

i) Mass Concrete (URC)
Konkrit tanpa Tetulang

ii) Joined Reinforced Concrete (JRC)
Konkrit Tetulang Bersambungan

[10 marks]

[*10 markah*]

QUESTION 2

SOALAN 2

CLO2 C3

(a) The main purpose of a traffic control device is to provide information to road users so they can safely move along a highway, street, pedestrian facility, or bikeway. List **FIVE (5)** basic characteristics of traffic control devices.

*Tujuan utama peranti kawalan trafik adalah untuk memberi maklumat kepada pengguna jalan raya supaya selamat bergerak di sepanjang lebuh raya, jalan, kemudahan pejalan kaki, atau lorong basikal . Senaraikan **LIMA (5)** ciri-ciri asas alat peranti kawalan lalu lintas.*

[10 marks]

[*10 markah*]

CLO2 C3

(b) Sketch **THREE (3)** typical Axle Combinations with **FOUR (4)** examples of traffic loads.

*Lakarkan **TIGA (3)** Kombinasi Gandar biasa beserta **EMPAT (4)** contoh beban trafik.*

[15 marks]

[*15 markah*]

QUESTION 3

SOALAN 3

CLO2 C2

a) Explain the following terms of a traffic light circulation phase design :
Huraikan dari segi reka bentuk fasa peredaran lampu isyarat yang berikut:

i) Actual Green Time , G.
Masa Hijau Sebenar, G

ii) Lost Time, L
Masa Hilang, L

[5 marks]

[5 *markah*]

CLO2
C3

b) Sketch the conflict point at the 4-leg intersection in **Figure 3 (b)** below:
*Lakarkan titik konflik pada persimpangan cabang- 4 di dalam **Figure 3 (b)** di bawah:*

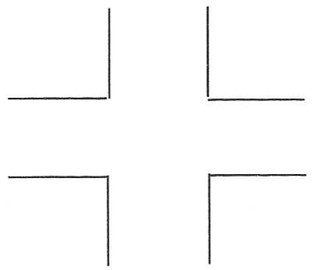


Figure 3 (b)

[15 marks]
[*15 markah*]

CLO2
C5

c) There are four categories of road junction/intersection. If the total volume of the two-way traffic on a major road is 2000 vehicle/hour, categorize which type of junction/intersection is suitable according to the "Arahan Teknik Jalan 11/87".

Terdapat empat jenis persimpangan jalan. Sekiranya jumlah trafik bagi kedua-dua arah di jalan utama ialah 2000 kenderaan /jam, kategorikan jenis persimpangan apakah yang sesuai merujuk kepada Arahan Teknik jalan 11/87.

[5 marks]
[5 markah]

QUESTION 4
SOALAN 4

CLO2
C3

a) Choose **TWO (2)** techniques used to manage traffic in urban areas complete with examples.
*Pilih **DUA (2)** teknik yang di gunakan untuk menguruskan lalulintas di kawasan Bandar beserta dengan contoh.*

[10 marks]
[10 markah]

CLO2
C3

b) Pavement maintenance includes all the methods and techniques used to restore or maintain a specified level of service and to prolong pavement life by slowing its deterioration rate. Relate **FIVE (5)** examples of situation with each category of pavement maintenance.

*Penyelenggaraan turapan termasuklah semua kaedah dan teknik yang digunakan untuk mengembalikan atau mengekalkan tahap perkhidmatan jalan supaya jangka hayat turapan lebih panjang serta dapat memperlahankan kadar kemerosotan turapan. Kaitkan **LIMA (5)** contoh situasi dengan setiap kategori penyelenggaraan turapan.*

[15 marks]
[*15* markah]

SOALAN TAMAT

Attachment

Lampiran

Spec No	% Bitumen Content	Specimen Height	In Air	In Water	Volume (cm^3)	Specific Gravity		Asphalt Volume %	Voids %			Unit Weight g cm^3	Corr. Factor	Stability (kg)		Flow (mm)	Stiffness
						Bulk	Theory		Mix	Filled Bitumen (VFB)	Aggregate (VMA)			Measure	Corrected		
a	*b*	*c*	*d*	*e*	*f*	*g*	*h*	*i*	*j*	*k*	*l*	*m*	*n*	*o*	*p*	*q*	*r*
					d-e	*d/f*	*	$\frac{b \times g}{SG_{bitumen}}$	*100-100(g/k)*	$\frac{\cdot}{(\cdot-i)}$	*i+j*	*g* × 1.0	**		*n* × *o*		$^{p}/_{q}$
1	4.5		1200.28	642.74			2.384	9.689		50.01768	19.370	2.153	0.89	10.66	9.49	13.06	
2	5.0		1210.95	645.00			2.372	10.700		52.28865	20.463	2.14	0.86	14.55	12.51	14.54	
3	5.5		1228.09	660.68			2.359	11.902		58.96614	20.184	2.164	0.86	15.84	13.62	16.1	
4	6.0		1239.65	664.67			2.347	12.936		61.33596	21.090	2.156	0.83	13.65	11.33	18.03	
5	6.5		1252.10	672.64			2.336	14.047		65.2728	21.520	2.161	0.83	9.27	7.69	21.53	

Figure 1 (c) i

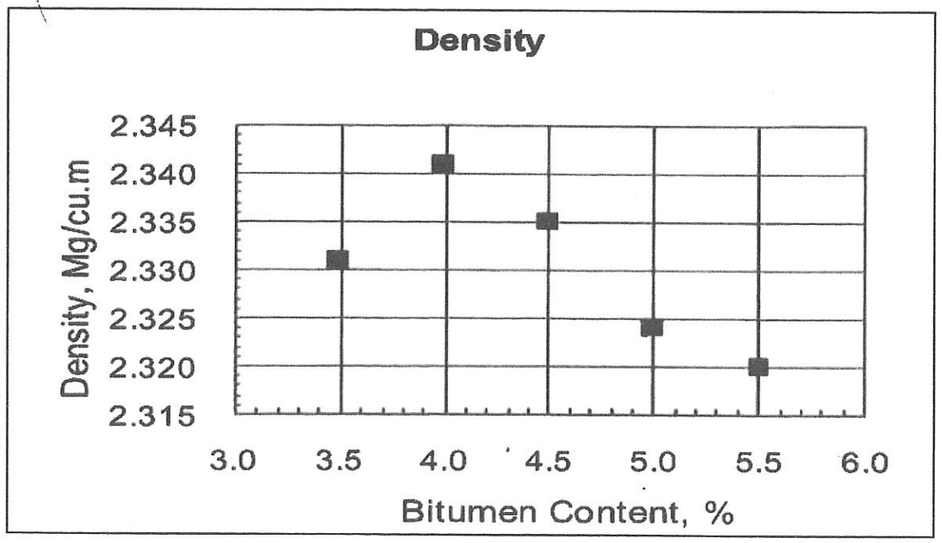


Figure 1 (c) ii

Note: Please return this attachment with the answer script.

Nota:Sila sertakan lampiran ini bersama dengan kertas jawapan.

FORMULA DCC3113: HIGHWAY & TRAFFIC ENGINEERING

1. **FLEXIBLE PAVEMENT DESIGN**

   a. $Vo = ADT \times 365 \times (Pc / 100) \times Directional$
   b. $ESA\ @JBGP = Vc \times e$
   c. $Vx = Vi(1 + r)x$
   d. $c = I \times R \times T$
   e. $C = 10 \times c$
   f. $TA' = SN = a1\ D1 + a2\ D2 + \ldots.. + an\ Dn$

2. **INTERSECTION DESIGN**

   a. $S = 525\ W \ \ or\ S = 160\ W$
   b. $y = \frac{Q}{S}$
   c. $L = \sum l + \sum (I - k)$
   d. $C_o = \frac{1.5L+5}{1-Y}$
   e. $g_{phase} = (C_o - L)(\frac{y_{phase}}{Y})$
   f. $G_{phase} = g_{phase} + l - k$

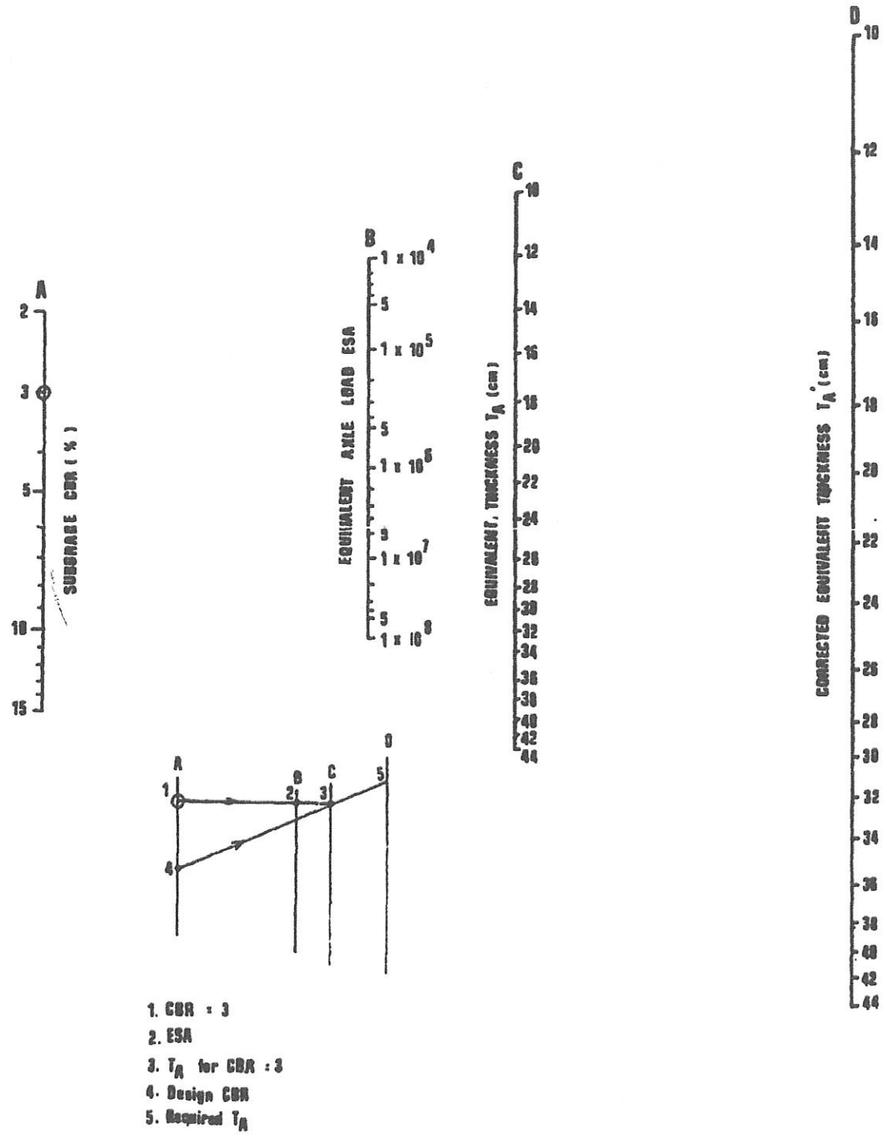


FIG-2 THICKNESS DESIGN NOMOGRAPH

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	local	trunk		
Equivalence Factor	1.2	2.0	3.0	3.7

Table 3.2 Maximum Hourly Capacity under ideal conditions

Road Type	Passenger Vehicle Units per hour
Multilane	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

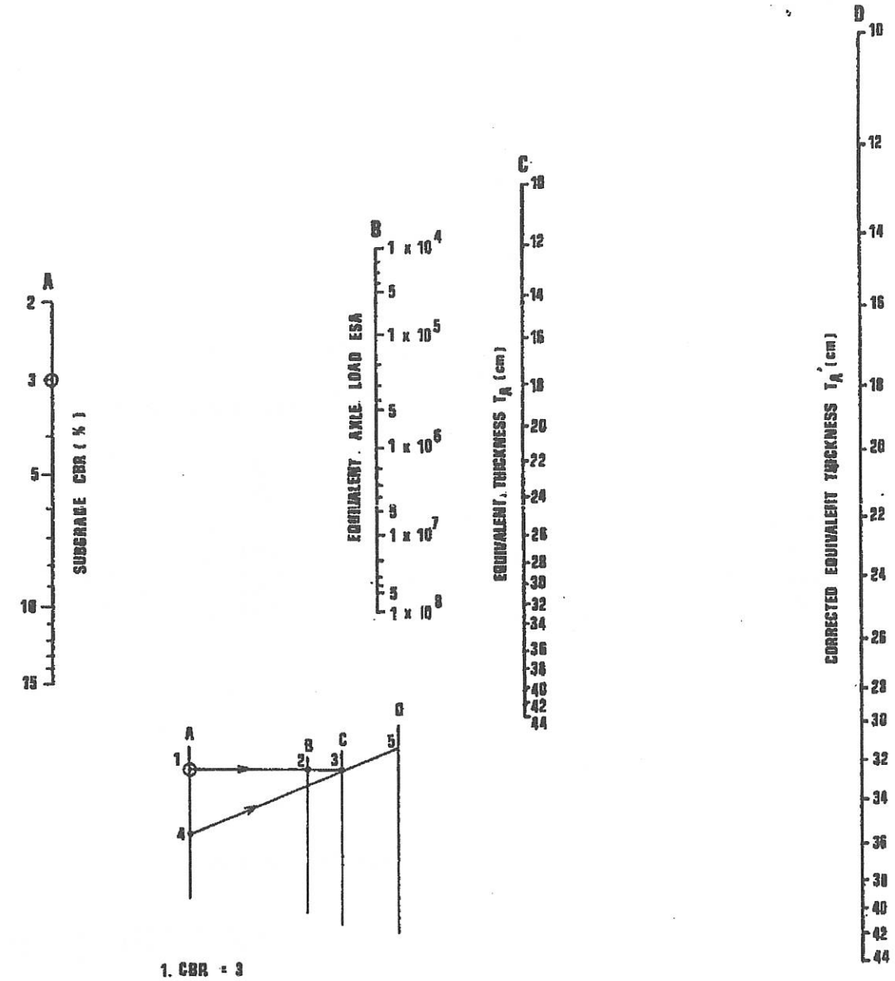
Type of layer		Minimum thickness
Wearing Course		4 cm
Binder Course		5 cm
Base Course	Bituminous	5 cm
	Wet Mix	10 cm
	Cement treated*	10 cm
Subbase Course	Granular	10 cm
	Cement treated	15 cm

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



THICKNESS DESIGN NOMOGRAPH

Table 4.1: Conversion Factors to P.C.U's
(Source Arahan Teknik (Jalan) 8/86)

Type of Vehicle	Equivalent Value in P.C.U's			
	Urban Standards	Rural Standards	Round About	Traffic Signal
Passenger Car	1.00	1.00	1.00	1.00
Heavy vehicles	2.00	3.00	2.80	1.75
Buses	3.00	3.00	2.80	2.25
Motorcycle	0.75	1.00	0.75	0.33
Bicycle	0.33	0.50	0.50	0.20

Table 4.2 : Saturated flow Determination

Broad access road (m)	3.00	3.50	4.00	4.50	5.00	5.50
Saturated flow (u.k.p/hour)	1850	1875	1975	2175	2550	2900