SULIT

BAHAGIAN PEPERIKSAAN DAN PENILAIAN
JABATAN PENDIDIKAN POLITEKNIK DAN KOLEJ KOMUNITI
KEMENTERIAN PENDIDIKAN MALAYSIA

JABATAN KEJURUTERAAN AWAM

PEPERIKSAAN AKHIR

SESI JUN 2018

DCC3113: HIGHWAY AND TRAFFIC ENGINEERING

TARIKH : 16 NOVEMBER 2018
MASA : 8.30 PAGI - 10.30 PAGI (2 JAM)

Kertas ini mengandungi **LAPAN (8)** halaman bercetak.
Bahagian A: Struktur (2 soalan)
Bahagian B: Struktur (4 soalan)
Dokumen sokongan yang disertakan :
1. Jadual B3
2. 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. Answers **ALL** questions.

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

QUESTION 1
SOALAN 1

CLO1
C1

(a) Transportation is part of infrastructural development of a country. List **FIVE(5)** main structures in transportation.

*Pengangkutan adalah sebahagian daripada pembangunan infrastruktur sesebuah negara. Senaraikan **LIMA (5)** struktur utama pengangkutan.*

[10 marks]
[*10 markah*]

CLO1
C2

(b) Good planning must have a standard policy. Describe briefly the general policy of transportation planning.

Perancangan yang baik mesti mempunyai dasar piawaian. Terangkan dengan ringkas dasar umum perancangan pengangkutan.

[15 marks]
[*15 markah*]

QUESTION 2
SOALAN 2

CLO1
C1

(a) State **FOUR (4)** types of At Grade Junction.

*Nyatakan **EMPAT (4)** jenis persimpangan searas.*

[4 marks]
[*4 markah*]

CLO1
C2

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

i. Lost Time
ii. Cycle Length
iii. Inter Green Period

Terangkan dengan ringkas terma-terma fasa rekabentuk peredaran lampu isyarat yang berikut:-

i. *Masa Hilang*
ii. *Panjang Kitaran*
iii. *Masa Antara Hijau*

[6 marks]
[*6 markah*]

CLO1
C3

(c) A two phase traffic light system will be installed intersection in town A. The actual flow volume, (Q) and saturation flow, S are shown in **Table A1.**

Satu system lampu isyarat 2 fasa akan dipasang di persimpangan Bandar A. Isipadu aliran (Q) dan aliran tepu (S) persimpangan adalah seperti dalam ***Jadual A1.***

Table A1 / Jadual A1

ARM/ LENGAN (pcu/hr)	North / Utara	South / Selatan	East / Timur	West / Barat
S (Saturation Flow/ Aliran Tepu) (pcu/hr)	1885	1885	1845	1845
Q (Actual Flow / Aliran Sebenar) (pcu/hr)	600	500	500	300

Based on the data, calculate the following:

Berdasarkan data tersebut, kirakan data yang berikut:

i. Optimal cycle time, Co

Masa kitaran optima, Co

ii. Actual green time, G

Masa hijau sebenar, G

Assume / *Anggap:*

Inter-green time / *Masa antara hijau* = 4s

Amber time / *Masa kuning* = 3s

Loss time / *Masa hilang* = 2s

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

QUESTION 1

SOALAN 1

CLO2
C2

(a) It is very important to understand the actual function for each layer of pavement. Explain briefly the surface layer function.

Adalah sangat penting untuk memahami fungsi sebenar setiap lapisan turapan. Terangkan dengan ringkas fungsi lapisan permukaan. [5marks]

[*5 markah*]

CLO2
C3

(b) Sketch clearly the flexible pavement structure including relevant coating.

Lakarkan dengan jelas struktur turapan lentur berserta salutan yang berkaitan.

[10marks]
[*10 markah*]

CLO2
C4

(c) Compare the differences between flexible pavements and rigid pavement.

Bandingkan perbezaan antara turapan lentur dengan turapan tegar.

[10marks]
[*10 markah*]

QUESTION 2

SOALAN 2

CLO2 C2

(a) Road constructions are not complete without road furnitures. Explain briefly **FIVE (5)** functions of road furniture.

*Tidak lengkap pembinaan jalan raya jika tidak dipasang perabot jalan. Terangkan dengan ringkas **LIMA (5)** fungsi perabot jalan.*

[5 marks]
[*5 markah*]

CLO2 C3

(b) Illustrate the traffic conflict at four leg junction.

Ilustrasikan konflik lalu lintas pada persimpangan empat.

[10 marks]
[*10 markah*]

CLO2 C4

(c) (i) The whole weight of a lorry is 260 kN and is channelled through three axles which are 100kN, 90kN and 70kN. Illustrate the arrangement and weight of each axle in the sketch. Then calculate the equivalent factor, e.

Berat keseluruhan sebuah lori ialah 260 kN dan disalur menerusi tiga gandar iaitu 100kN, 90kN dan 70kN. Illustrasikan susunan dan berat tiap-tiap gandar itu dalam lakaran. Selepas itu kirakan faktor kesetaraan, e.

[6 marks]
[*6 markah*]

(ii) Refer to **Question c(i)**, if the lorry have a single axle, calculate the equivalent factor, e.

*Berpandukan **Soalan c(i)**, jika lori mempunyai satu gandar, kirakan faktor kesetaraan , e.*

[4 marks]
[*4 markah*]

CLO2
C2

QUESTION 3

SOALAN 3

a) Identify **FIVE (5)** materials used in the construction of road base layer.
*Kenalpasti **LIMA (5)** bahan yang digunakan dalam pembinaan lapisan tapak jalan.*

[5 marks]
[5 *markah*]

CLO2
C4

b) **Table B3** shows the test results of Marshall Trial Mix with different bitumen contents. Calculate and complete the data on the attached appendix.
*Please attach this table **(Table B3)** with Answer Script Book.*

***Jadual B3** menunjukkan keputusan ujian Marshall Trial Mix dengan kandungan bitumen yang berbeza. Kira dan penuhkan data pada helaian lampiran.*
*Sila lampirkan jadual ini **(Jadual B3)** bersama skrip jawapan.*

[10 marks]
[10 *markah*]

CLO2
C5

c) Compare **FIVE (5)** characteristics of bitumen and tar.
*Bandingkan **LIMA (5)** ciri-ciri bitumen dan tar.*

[10 marks]
[10 *markah*]

CLO2
C2

QUESTION 4
SOALAN 4

a) Identify **FIVE (5)** purposes of traffic management.
*Kenalpasti **LIMA (5)** tujuan pengurusan lalulintas*

[5 marks]
[5 *markah*]

CLO2
C3

b) List **FIVE (5)** advantages and **FIVE (5)** disadvantages of providing a one-way road system.
*Senaraikan **LIMA (5)** kelebihan dan **LIMA (5)** kelemaham penyediaan sistem jalan sehala.*

[10 marks]
[10 *markah*]

CLO2
C5

c) 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. Describe clearly **TWO (2)** categories of road maintenance in Malaysia with at least **THREE (3)** examples for each category.
i. Routine Maintenance
ii. Emergency 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. Terangkan dengan ringkas **DUA (2)** kategori penyenggaraan jalan di Malaysia beserta dengan sekurang-kurangnya **TIGA (3)** contoh bagi setiap kategori.*
i. Penyelenggaraan Rutin
ii. Penyelenggaraan Kecemasan

[10 marks]
[10 *markah*]

SOALAN TAMAT

LAMPIRAN DAN FORMULA

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INTERSECTION DESIGN

a. $S = 525W$ OR $S = 160W$

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

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

d. $C_0 = \frac{1.5L+5}{1-Y}$

e. $g_{phase} = (C_0 - L)\left(\frac{yphase}{Y}\right)$

f. $G_{phase} = g_{phase} + I - k$

FLEXIBLE PAVEMENT DESIGN

a. Vo = ADT X 365X(Pc/100) x Directional

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

c. ESA @ JBGP = V_c x e

d. $V_x = V_i (1+r)x$

e. c = I x R x T

f. C = 10 x c

g. $TA' = SN = a_1D_1 + a_2D_2 + \ldots\ldots\ldots a_nD_n$

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

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

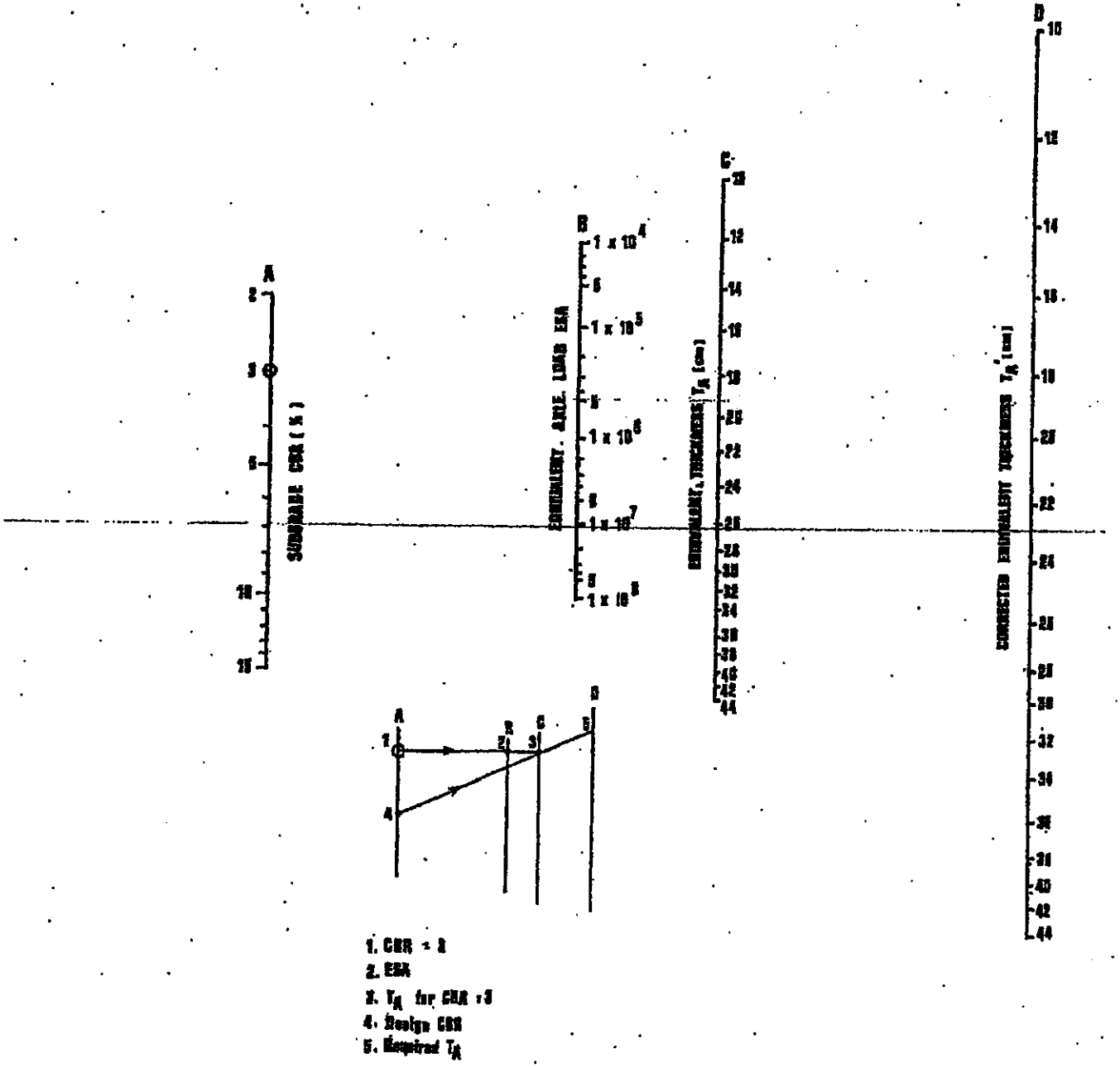
T_A	Total thickness of bituminous layer
< 17.5 cm	5.0 cm
17.5 - 22.5 cm	10.0 cm
23.0 - 29.5 cm	15.0 cm
> 30.0 cm	17.5 cm

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



THICKNESS DESIGN NOMOGRAPH

TABLE B3 / JADUAL B3

MARSHALL TEST RESULT

TYPE OF MIX : ASPHALTIC CONCRETE WEARING COURSE (ACW 20)
SG.AGG BULK : 2.662
SG.AGG.EFF : 2.668
SG. BIT : 1.03
BITUMEN : 80/100 PEN

Volume	Corr
496-508	1.04
509-522	1.00
523-535	0.96

$$h = \frac{100}{[Pagg/Sgeff] + [b/Sgbit]}$$

% BIT. SPEC. NO	%BIT. SPEC. NO.	WEIGHT-gm			BULK VOL. cc.	SPEC. GRAV.		VOLUME - %TOTAL			VOIDS - %			STABILITY - kg			FLOW (mm)	STIFFNESS
		Saturated surface dry	IN AIR	IN WATER		BULK	MAX. THEORY	BIT	AGG.	VOIDS	AGG.	FILLED (BIT)	TOTAL MIX		MEAS.	CORR.		
a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p	q	r	s
%Bit. By wt. Of agg.	% Bit by wt. Of MIX.				c-e	d/f		b x g/ Sgbit	(100-b)g /SGagg	100-i-j	100-j	100 (i/l)	100-(100g/h)	CORR FACTOR		p x o		q/r
AVG	4.5	1212.6	1209.8	690.7	521.9	2.32								0.98	1199		3.32	
AVG	5	1209.9	1208	691.2	518.7	2.33								1.00	1340		3.68	
AVG	5.5	1183.2	1182.9	674	509.2	2.32								1.00	1519		3.96	
AVG	6	1190.1	1189.7	680.4	509.7	2.33								1.00	1572		4.16	