

SULIT



BAHAGIAN PEPERIKSAAN DAN PENILAIAN
JABATAN PENDIDIKAN POLITEKNIK
KEMENTERIAN PENDIDIKAN TINGGI

JABATAN KEJURUTERAAN AWAM

PEPERIKSAAN AKHIR

SESI JUN 2015

DCC3113: HIGHWAY & TRAFFIC ENGINEERING

TARIKH : 2 NOVEMBER 2015

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

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** the questions.

ARAHAN:

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

QUESTION 1

SOALAN 1

CLO 1
C1

(a) Name **FIVE (5)** construction structures used in transportation.

Namakan LIMA (5) struktur pembinaan yang digunakan dalam pengangkutan.

(5 marks)

(5 markah)

CLO 1
C2

(b) Explain briefly the methods of the Origin-Destination (O-D) Study.

Terangkan dengan ringkas kaedah pelaksanaan Kajian Asalan-Destinas (O-D).

(5 marks)

(5 markah)

CLO 1
C3

(c) As an Assistant Engineer, you are requested to perform tests on aggregates to be used for a road construction. Interpret **THREE (3)** of the tests to be conducted.

Sebagai seorang pembantu jurutera, anda dikehendaki untuk menjalankan ujian ke atas batu baur yang akan digunakan dalam pembinaan jalan raya. Terangkan dengan jelas TIGA (3) daripada ujikaji yang akan dijalankan.

(15 marks)

(15 markah)

QUESTION 2

SOALAN 2

CLO 1
C1

- (a) Aggregate is one of the main materials used in pavement construction. List FIVE (5) important properties of aggregates.

Batu Baur atau agregat merupakan salah satu bahan utama dalam pembinaan jalan raya. Senaraikan LIMA (5) ciri-ciri penting batu baur.

(5 marks)

(5 markah)

CLO 1
C2

- (b) In your own words, explain the purposes and apparatus of the Flakiness and Elongation Index Tests (BS812: Part 1:1975).

Menurut kefahaman anda, terangkan tujuan dan peralatan bagi Ujian Indeks Penyerpihan dan Pemanjangan (BS812: Part 1: 1975).

(10 marks)

(10 markah)

CLO 1
C3

- (c) Sketch the diagram of the Flexible Pavement, complete with detailed labels and explanations.

Lakarkan gambarajah Turapan Lentur yang lengkap dengan label dan penerangan.

(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

CLO 2
C2

- (a) Paving is the process of surface layering after spraying the prime coat. Usually the process involves the use of a paver machine. Explain the steps for pavement construction.

Kerja-kerja penurapan bagi lapisan permukaan dilakukan selepas kerja penyebuan salutan tunggal. Biasanya kerja penurapan ini dilakukan menggunakan jentera turapan. Terangkan langkah-langkah kerja penurapan tersebut.

(15 marks)

(15 markah)

CLO 2
C4

- (b) Rigid pavement is more costly among all other types of roads. It uses the term rigid pavements because it does not allow any flexibility. Compare the following types of rigid pavement.

Turapan tegar menggunakan kos yang lebih tinggi berbanding jenis turapan jalan yang lain. Ia dikenali sebagai turapan tegar kerana tidak dibenarkan sebarang lenturan. Bandingkan jenis turapan tegar berikut:

- (i) Joined Reinforced Concrete (JRC)
 (ii) Continuous Reinforced Concrete (CRCP)

- (i) *Konkrit Tetulang Sambungan*
 (ii) *Konkrit Tetulang Berterusan*

(10 marks)
 (10 markah)

QUESTION 2

SOALAN 2

CLO2
C3

- (a) Traffic control devices are needed to control the traffic flow to ensure effective system. Illustrate **FOUR (4)** types of traffic control device.

Alat kawalan trafik adalah diperlukan untuk mengawal aliran trafik untuk menjadikan sistem efektif. Lukiskan EMPAT (4) jenis alat kawalan trafik.

(10 marks)
 (10 markah)

CLO2
C3

- (b) A road at the hierarchy of 05 has a surface width of 7.0 m. It has an initial average daily traffic of 6800 cv/day in both directions. The rate of traffic growth is 7%. The percentage of commercial vehicle is 25% and the design life of the flexible pavement is 10 years. The CBR for the sub-grade road is 5%. Calculate the given data to prove whether the road can support the traffic volume at the end of design life or not.

Sebuah jalan berhierarki 05 mempunyai lebar permukaan 7.0 m. Purata harian trafik permulaan adalah 6800 penumpang/hari bagi kedua-dua arah. Kadar pertumbuhan trafik ialah 7%. Manakala peratus kenderaan perdagangan ialah 25%. Hayat rekabentuk bagi turapan lentur ialah 10 tahun. Nilai CBR bagi subgrad jalan ialah 7%. Kirakan data di atas untuk menunjukkan bahawa jalan dapat menyokong jumlah trafik pada akhir hayat reka bentuk atau tidak.

(15 marks)
 (15 markah)

QUESTION 3

SOALAN 3

CLO2
C2

- (a) Identify **FIVE (5)** types of intersection
Kenalpasti LIMA (5) jenis persimpangan

(5 marks)
 (5 markah)

CLO2
C3

- (b) **Table 3-B** shows the peak hour-volumes and saturation flow for a major intersection on an expressway.

Jadual 3-B di bawah menunjukkan isipadu waktu puncak dan aliran tepu bagi suatu persimpangan dalam lebuhraya.

Table 3-B / Jadual 3-B

Lane group		North/ Utara	South/ Selatan	East/ Timur	West/ Barat
Flow, (pcu/hr)	Car	280	245	580	690
	Motorcycle	150	112	150	100
	Bus	50	40	47	40
	Heavy vehicle	60	58	49	60
Saturation flow, S (pcu/hr) <i>Aliran tepu</i>		3160	3160	1970	1970

Given values:

Car/Kereta = 1.00 pcu

Bus/Bas = 2.25 pcu

Motorcycle /Motersikal = 0.33 pcu

Heavy vehicle/Kenderaan Berat = 1.75 pcu

Assume:

Amber time/Masa kuning, $a = 3$ sec

Lost time/Masa hilang, $l = 2$ sec

Integrated period/Masa antara hijau, $I = 4$ s

From the data given, calculate:

Dari data yang di beri, kirakan:

- i) Optimum cycle for both phases
Kitaran optimum bagi kedua-dua fasa.
- ii) The actual green time for each phase
Hijau sebenar bagi setiap fasa

- iii) The time diagram for each phase
Gambarajah masa bagi setiap fasa

(15 marks)
(15 markah)

- (c) Based on the calculation for Q3 (b), develop the time diagram for the traffic phase signal for the junction.

Berdasarkan pengirangan bagi Q3 (b), hasilkan gambarajah masa bagi fasa lampu isyarat persimpangan tersebut.

(5 marks)
(5 markah)

QUESTION 4

SOALAN 4

CLO2
C3

- (a) Statistics show increasing numbers of road accidents yearly, although all the management and supervision of roads are constantly improved. As a traffic manager, interpret **FOUR (4)** solutions to reduce this problem.

Setiap tahun, statistic menunjukkan pertambahan kadar kemalangan jalan raya walaupun pihak pengurusan sentiasa mempertingkatkan kerja kerja pengurusan dan pengawasan. Sebagai pengguna jalan raya, huraikan EMPAT (4) cadangan untuk mengurangkan masalah ini.

(10 marks)
(10 markah)

CLO2
C3

- (b) Road maintenance is a continuous process that involves maintaining and repairing existing roads. It is carried out to control the rate of damage and to ensure safety. In your own words, explain clearly the following rehabilitation techniques that are listed below.

Penyelenggaraan jalan raya merupakan satu proses berterusan yang melibatkan penjagaan dan pembaikan jalan sedia ada. Ia dijalankan bagi mengawal kerosakan dan memastikan keselamatan. Terangkan dengan jelas teknik pemulihan yang di senaraikan di bawah.

- i. Restoration
- ii. Resurfacing
- iii. Recycling

- i. Penstoran semula
- ii. Penurapan semula
- iii. Kitar semula

(15 marks)
(15 markah)

SOALAN TAMAT

PAVEMENT DESIGN FORMULA

Table 3.1 Guide for Equivalence Factor

Percentage of selected heavy goods vehicles*	0-15%		16-50%	51-100%
	local	trunk		
Type of road 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/cm ²	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

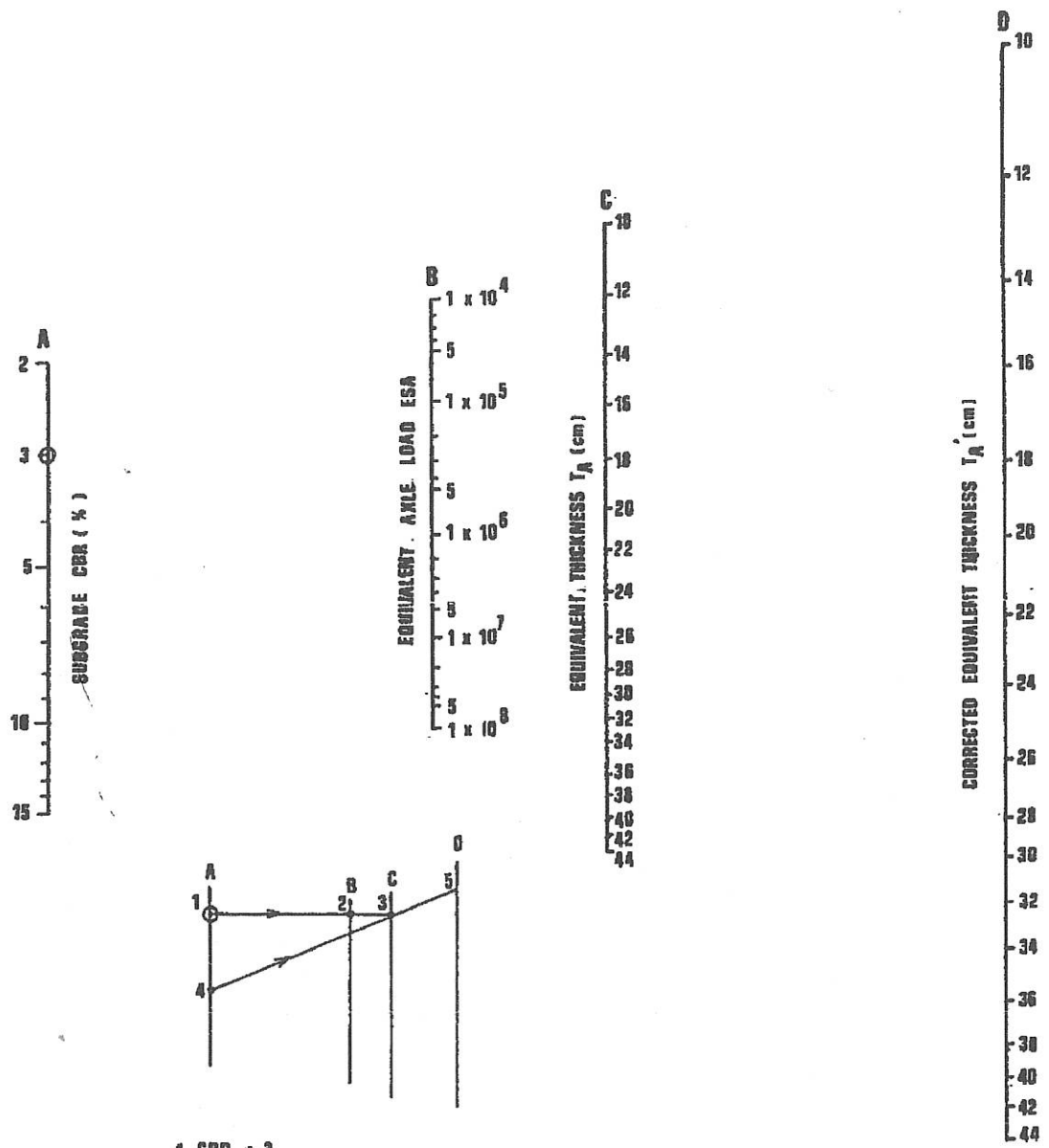
Type of layer	Minimum thickness	
Wearing Course	4 cm	
Binder Course	5 cm	
Base Course	Bituminous	5 cm
	Wet Mix	10 cm
	Cement treated*	10 cm
Subbase Course	Granular	10 cm
	Cement treated	15 cm

Table 3.7 Standard & Construction Layer Thickness

Type of layer	Standard 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
	Wet mix	10-20 cm
	Cement treated	10-20 cm
Subbase Course	Granular	10-30 cm
	Cement treated	15-20 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