UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER I
SESSION 2013/2014

COURSE NAME	:	HIGHWAY TECHNOLOGY AND TRAFFIC MANAGEMENT
COURSE CODE	:	BNP 20303
PROGRAMME	:	2 BNB
EXAMINATION DATE	:	DECEMBER 2013/JANUARY 2014
DURATION	:	2 1/2 HOURS
INSTRUCTION	:	ANSWER **FOUR (4)** QUESTIONS ONLY

THIS QUESTION PAPER CONSISTS OF **TWELVE (12)** PAGES

Q1 (a) Give the function of each layer in flexible pavement.

(8 marks)

(b) Give **THREE (3)** tests to be performed on the material for each layer in flexible pavement and state the function of each test.

(12 marks)

(c) Discuss briefly about technology use in Chip Seals pavement.

(5 marks)

Q2 (a) Discuss **TWO (2)** importance of connections in rigid pavement.

(5 marks)

(b) Describe briefly **TWELVE (12)** processes in road construction .

(20 marks)

Q3 (a) Describe **THREE (3)** functions of geotextile and sketch the position in flexible pavements.

(7 marks)

(b) Design a road pavement (traditional Pavement with Granular Base) for a 2-lane (in one direction) highway with an average daily traffic of 2020 vehicles/lane, 18% of which are commercial vehicles with an-laden weight > 1.5 tons. The design life for the road is 15 years, type of terrain is flat and the annual traffic growth is 4.5%. The sub-grade strength bas on testing is CBR = 20%, CBR Standard Deviation is 4.4% and Normal Deviate is 1.282.

(18 marks)

Q4. (a) Pavement Distress is usually caused by traffic loading, temperature, moisture or sub-gred movement. Discuss why the following defects occur and discuss the repairs to be done.

i) Crocodile cracks

ii) Corrugation

(10 marks)

(b) List **FOUR (4)** process involved in pavement management.

(4 marks)

(c) State **THREE (3)** surface drainage and subsurface drainage.

(6 marks)

(d) A 17-year-old boy has a new driving license less than two months to drive a car at a speed of 120 km / h after leaving a nightclub at 2 am in the suburbs. Teens are taking excessive booze. A car driven by his family owned and serviced last 3 years. When driving in hilly areas teenager lost control on a sharp bend and hit the road divider. The incident happened during a rainy day and found street lights do not work. Teens are thrown out of the car and died at the scene.

Explain **TWO (2)** categories of factors that may cause the incident by incident stated.

(5 marks)

Q5 (a) **Table Q5** shows the data flow and saturation flow of traffic in each direction at the intersection of the input signal light. Yellow time, a = 3s, all red, R = 2s and driver reaction time, (l = 2s for phase 1 and phase 2) and (l = 3s for phase 3 and phase 4).

i) Complete **Table Q5**.

(6 marks)

ii) Calculate the optimum cycle time

(4 marks)

iii) Calculate the effective green time, the actual green time and time controls set.

(5 marks)

iv) Sketch the time.

(4 marks)

(b) Describe and sketch on the following matters: -

i) Super elevation
ii) Horizontal alignment
iii) Vertical alignment

(6 marks)

- END OF QUESTION -

TERJEMAHAN BAHASA MALAYSIA

S1 (a) Berikan fungsi bagi setiap lapisan dalam turapan boleh lentur.

(8 markah)

(b) Nyatakan **TIGA (3)** ujian yang perlu dilakukan terhadap bahan untuk setiap lapisan dalam turapan boleh lentur dan nyatakan fungsi bagi setiap ujian tersebut.

(12 markah)

(c) Bincangkan dengan secara ringkas mengenai teknologi turapan jalan menggunakan *Chip Seals*.

(5 markah)

S2 (a) Bincangkan **DUA (2)** kepentingan sambungan di dalam turapan tegar.

(5 marks)

(b) Huraikan dengan ringkas **DUA BELAS (12)** peringkat proses pembinaan jalan.

(20 markah)

S3 (a) Jelaskan **TIGA (3)** fungsi geotextile di dalam pembinaan jalan dan lakarkan kedudukan geotextile di dalam turapan boleh lentur.

(7 markah)

(b) Anda dikehendaki merekabentuk turapan jalan *(Traditional Pavement with Granular Base)* untuk 2-lorong dalam satu arah lebuh raya dengan purata trafik harian 2020 kenderaan/lorong, 18% daripada yang kenderaan perdagangan > 1.5 tan. Jangka hayat reka bentuk *(Design life)* untuk jalan adalah 15 tahun, jenis kawasan rata dan pertumbuhan trafik tahunan adalah 4.5%. Keputusan ujian sub-gred adalah CBR = 20%, Sisihan Piawai CBR ialah 4.4% dan Normal menyimpang adalah 1.282.

(18 markah)

S4. (a) Distress turapan biasanya disebabkan oleh beban trafik, suhu, kelembapan atau pergerakan *sub-gred*. Bincangkan penyebab dan kerja pembaikan yang perlu dilakukan bagi kecacatan berikut:-

i) Retak Buaya
ii) Peralunan

(10 markah)

(b) Senaraikan **EMPAT (4)** proses yang terlibat di dalam Pengurusan Turapan.

(4 markah)

(c) Nyatakan **TIGA (3)** sistem perparitan permukaan dan sistem perparitan sub-permukaan.

(6 markah)

(d) Seorang remaja berusia 17 tahun mempunyai lesen memandu baru kurang dua bulan memandu kereta pada kelajuan 120 km/j selepas meninggalkan kelab malam pada jam 2 pagi di kawasan pinggir bandar. Remaja tersebut mengambil minuman keras secara berlebihan. Kereta yang dipandu oleh beliau kepunyaan keluarganya dan terakhir diservis 3 tahun yang lalu. Ketika memandu di kawasan berbukit remaja tersebut hilang kawalan di selekoh tajam dan melanggar pembahagi jalan. Insiden tersebut berlaku ketika hari hujan dan lampu jalan didapati tidak berfungsi. Remaja tersebut tercampak keluar dari kereta dan mati ditempat kejadian.

Terangkan **DUA (2)** ketegori faktor yang berkemungkinan menyebabkan insiden tersebut berdasarkan insiden yang dinyatakan.

(5 markah)

S5 (a) **Jadual S5** menunjukkan data aliran trafik dan aliran tepu bagi setiap arah masukan di persimpangan lampu isyarat. Masa kuning, a= 3s, semua merah, R= 2s dan masa tindakbalas pemandu, (*l*= *2*s untuk fasa 1 dan fasa 2) dan (*l*= *3*s untuk fasa 3 dan fasa 4).

i) Lengkapkan **Jadual S5**.

(6 markah)

ii) Kirakan masa kitar optimum

(4 markah)

iii) Kirakan masa hijau berkesan, masa hijau sebenar dan masa kawalan set.

(5 markah)

iv) Lakarkan gambarajah masa.

(4 markah)

(b) Jelas dan lakarkan mengenai perkara-perkara berikut:-

i) *Superelevation*
ii) *Horizontal alligment*
iii) *Vertical alligment*

(6 markah)

-SOALAN TAMAT-

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TABLE Q3.1/JADUAL S3.1:
Axle Configutation and Load Equivalence Factors (LEF)

Vehicle		Load Equivalence Factor (LEF)
HPU Class Designation	Class	
Cars and Taxis	C	0
Small Lorries and Vans (2 Axles)	CV1	0.1
Large Lorries (2 to 4 Axles)	CV2	4.0
Articulated Lorries (3 or more Axles)	CV3	4.4
Buses (2 or 3 Axles)	CV4	1.8
Motorcycles	MC	0
Commercial Traffic (Mixed)	CV%	3.7

TABLE Q3.2/JADUAL S3.2 : Lane Distriibution Factors

Number of Lanes (in ONE direction)	Lane Distribution Factor, L
One	**1.0**
Two	**0.9**
Three or more	**0.7**

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TABLE Q3.3/JADUAL S3.3 : Terran Factors

Type of Terrain	Terrain Factor, T
Flat	1.0
Rolling	1.1
Mountainous/Steep	1.3

TABLE Q3.4/JADUAL S3.4 : Total Growth Factors

Design Period (Years)	Annual Growth Rate (%)					
	2	3	4	5	6	7
10	10.95	11.46	12.01	12.58	13.18	13.82
15	17.29	18.60	20.02	21.58	23.28	25.13
20	24.30	26.87	29.78	33.06	36.79	41.00
25	32.03	36.46	41.65	47.73	54.86	63.25
30	40.57	47.58	56.08	66.44	79.06	94.46

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TABLE Q3.5/JADUAL S3.5 : Traffic Categories used in ATJ (ESAL =80 kN)

Traffic Category	Design Traffic (ESAL x 10^6)	Probability (Percentile) Applied to Properties of Sub-Grade Materials
▪ T 1	**≤ 1.0**	≥ 60%
▪ T 2	**1.1 to 2.0**	≥ 70%
▪ T 3	**2.1 to 10.0**	≥ 85%
▪ T 4	**10.1 to 30.0**	≥ 85%
▪ T 5	**> 30.0**	≥ 85%

TABLE Q3.6/JADUAL S3.6 : Classes pf Sub-Grade Strength (based on CBR)

Sub-Grade Category	CBR (%)	Elastic Modulus (MPa)	
		Range	Design Input Value
▪ SG 1	**5 to 12**	50 to 120	**60**
▪ SG 2	**12.1 to 20**	80 to 140	**120**
▪ SG 3	**20.1 to 30.0**	100 to 160	**140**
▪ SG 4	**> 30.0**	120 to 180	**180**

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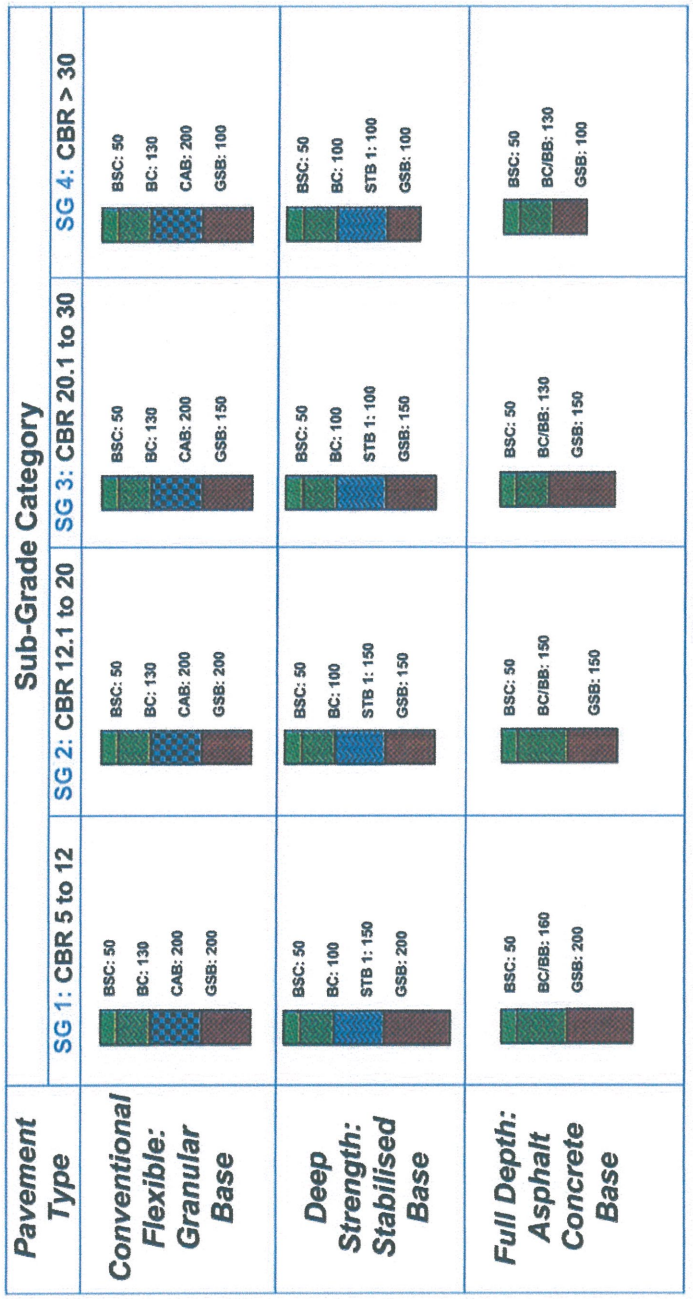

FIGURE 3.1/RAJAH 3.1 : Pavement Structures for Traffic Category T3: 2.0 to 10.0

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TABLE Q5/JADUAL S5 : Traffic Flow (pcu/hour) and Saturated Flow (pcu/hour) values for each phase and movement.

Phase	Phase 1		Phase 2		Phase 3		Phase 4	
Movement	A	B	A	B	A	B	A	B
								
Traffic Flow, q (pcu/hour)	255	986	457	256	128	146	247	112
Saturated Flow (pcu/hour)	1785	3250	3250	1785	1785	3250	1785	3250
q/S								
Y								