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UNIVERSITI TUN HUSSEIN ONNMALAYSIA

FINAL EXAMINATION
SEMESTER II
SESSION 2012/2013

COURSE NAME	:	TRANSPORTATION ENGINEERING
COURSE CODE	:	BFT 4033/40303
PROGRAMME	:	4 BFF
EXAMINATION DATE	:	JUNE 2013
DURATION	:	3 HOURS
INSTRUCTION	:	ANSWER **ALL** QUESTIONS

THIS QUESTION PAPER CONSISTS OF **NINE (9)** PAGES

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Q1 Local authority of Keretapi Project is constructing a railway track of Railway class-II with design speed of 120 km/hr. Train axle load is 18 ton and Stiffness Modulus, k = 175.5 kg/cm^2. It is planned to use rail type of R.54 which elasticity modulus is 2×10^6 kg/cm^2 and Inertia moment is 2346 cm^4 (**Figure Q1**). Based on all information above, you are asked to:

(a) Determine load components (P and λ).

(5 marks)

(b) Determine moment maximum M_m.

(10 marks)

(c) Determine deflection at 2.50 meters from point load.

(10 marks)

Q2 Local Government is planning to construct an Airport with the standard for Boeing 747-100, Boeing 737-200 and Boeing 727-200. The following **Table** Q2(a) gives the average annual departures and maximum take-off weight of each aircraft type expected to use an airport pavement. Conversion factors for converting from one aircraft type to another can be seen in **Table Q2(b)**. The runway Airport pavement will be constructed using flexible pavement with three layers: Hot-mix asphalt, Base course and Sub-base course (**Figure Q2(a)**). CBR subgrade is 6% and CBR for Sub-base is 20%. Based on all information above

(a) Determine Wheel load for each aircraft (note that the 727-200 is the design aircraft)

(10 marks)

(b) Design the total thickness of pavement and thickness of each layer (use **Figure Q2(b)** and **Figure Q2(c)**).

(15 marks)

Q3 Water perform in the wave field orbital motions in two different conditions such as large depth/short waves and short depth/long waves (**Figure Q3(a)** and **Figure Q3(b)**). Studies like JONSWAP have shown that wind-generated wave properties depend on wind speed V_W and fetch F, the angle-average length the wind is blowing over the water. Based on the data collection, maximum height of wave is 1.8 meters with the angle of 35° and data of wind speed are 10 m/sec, 15 m/sec and 20 m/sec. k = 0.301 m^{-1}. You are asked to

(a) Determine wave dispersion and phase speed for short wave and long wave

(12 marks)

(b) Determine average wave height and wave period due to the wind

(13 marks)

Q4 Vertical wall breakwaters are constructed surrounding the Harbor for the safety and protection from the waves.The breakwaters are designed typically for non-breaking waves with two different types: *with shallow mound* and *no shallow mound.* Waves data and dimensions of breakwaters are shown in **Figure Q4(a)** and **Figure Q4(b)**. Based on information above,

(a) Design the Horizontal Force breakwaters *with shallow mound* by using Miche-Rundgren approach and Goda approach

(10 marks)

(b) Design the Horizontal Force breakwaters with *no shallow mound* by using Miche-Rundgren and Goda approach

(10 marks)

(c) Comment briefly the results obtained from Q4(a) and Q4(b)

(5 marks)

- END OF QUESTION -

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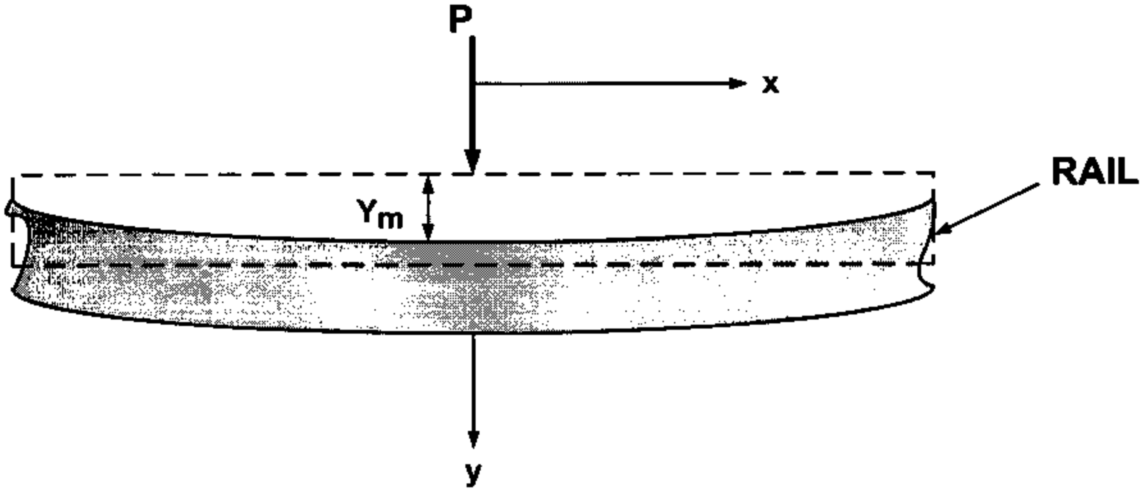

FIGURE Q1: Railway loading concept

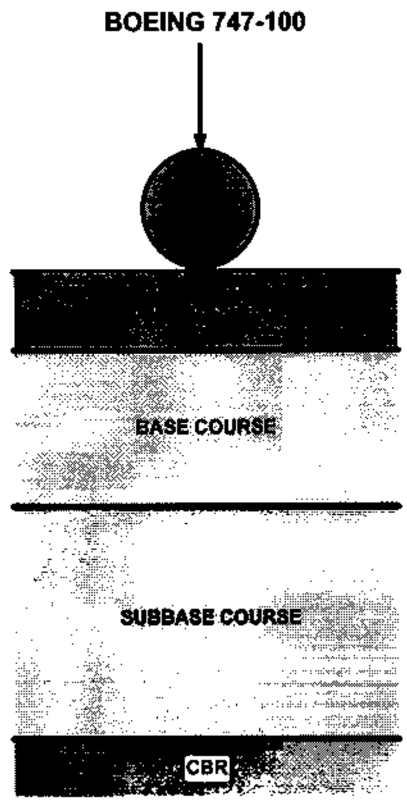

FIGURE Q2(a): Pavement structure for Boeing 747-100

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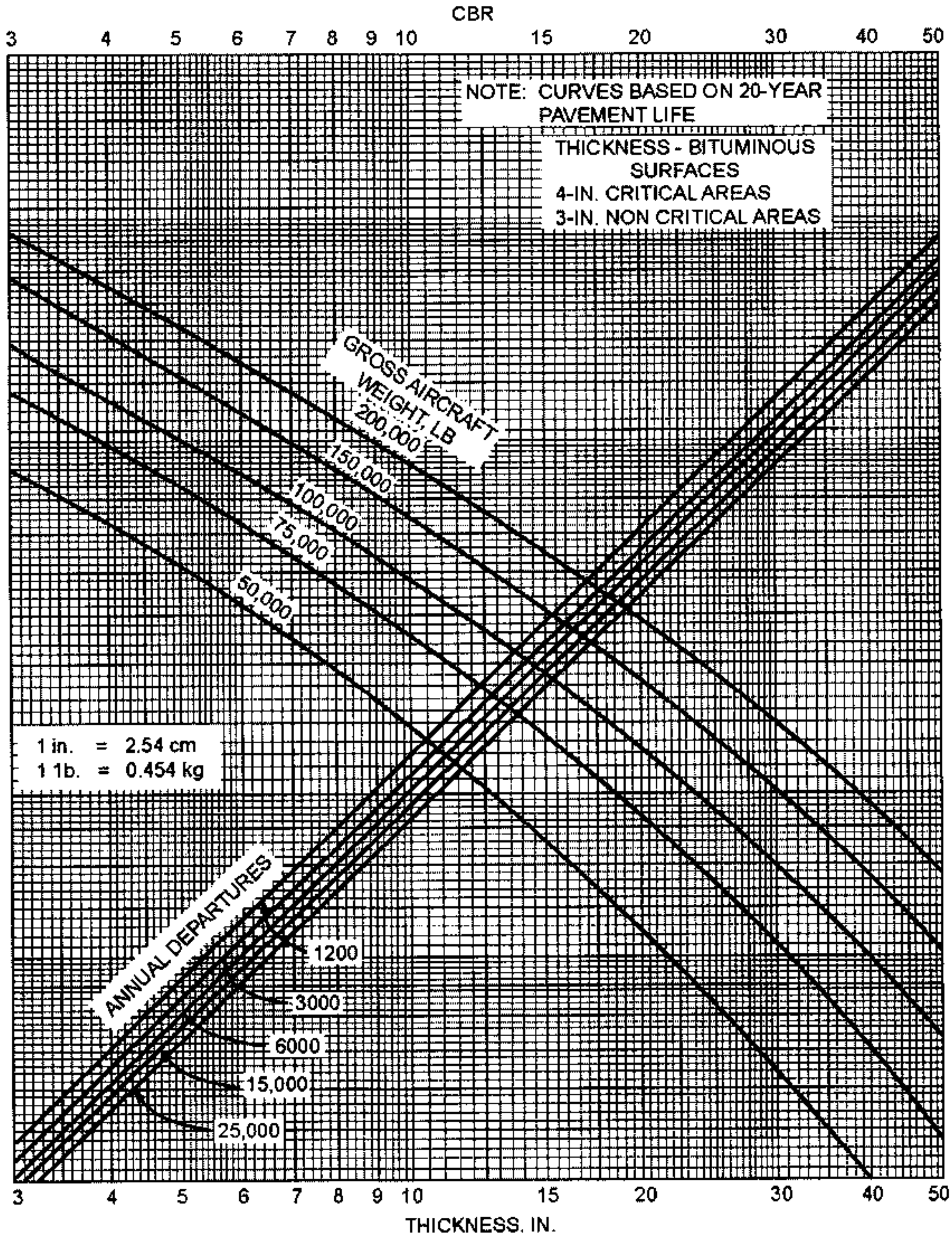

FIGURE Q2(b): Graph of flexible pavement thickness for dual-wheel gear

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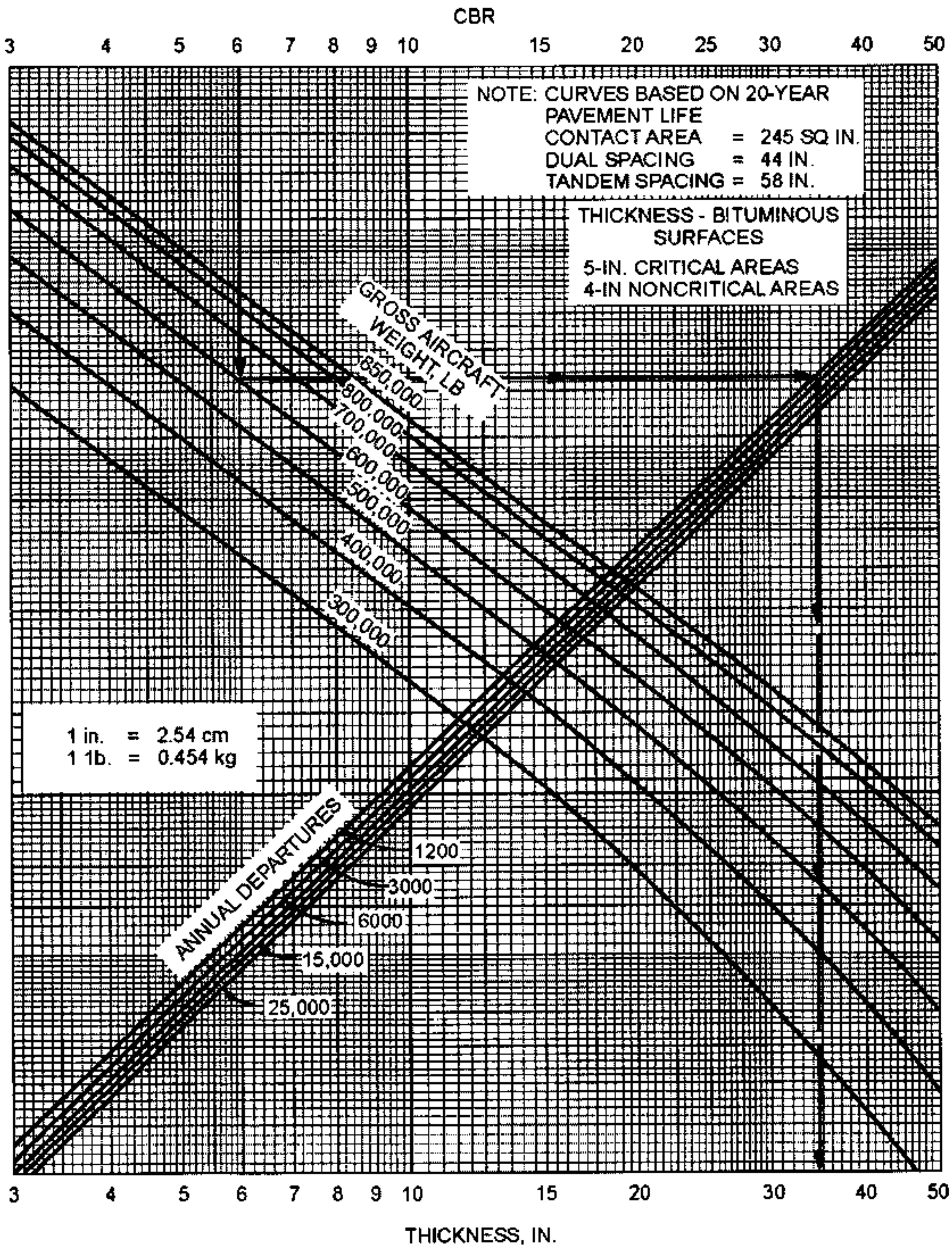

FIGURE Q2(c): Graph of flexible pavement thickness for Boeing 747-100

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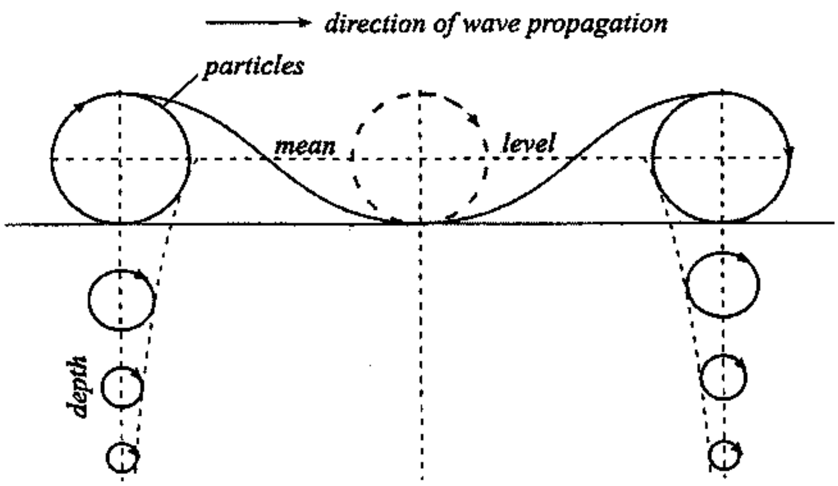

FIGURE Q3(a): Large depth/Short wave

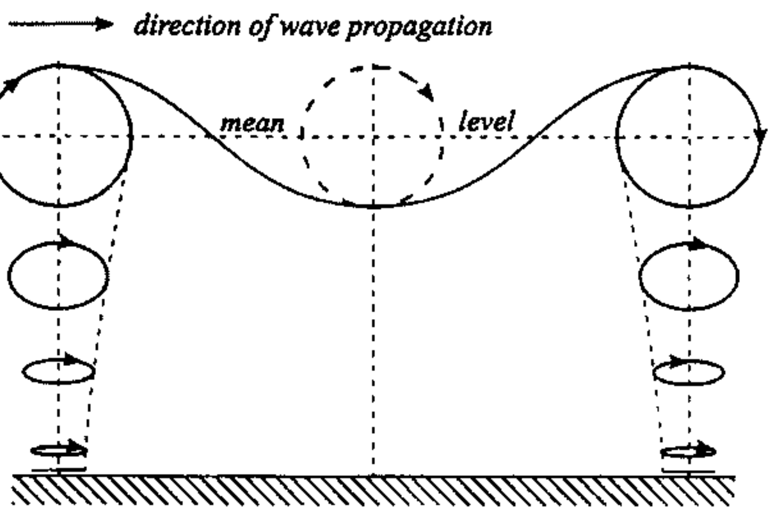

FIGURE Q3(b): Small depth/Long wave

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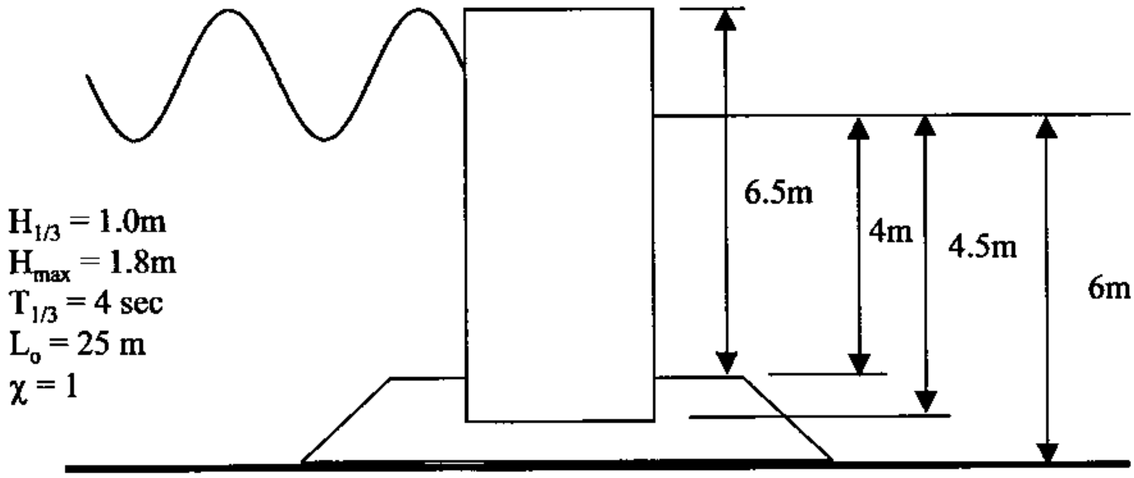

FIGURE Q4(a): Shallow mound breakwater

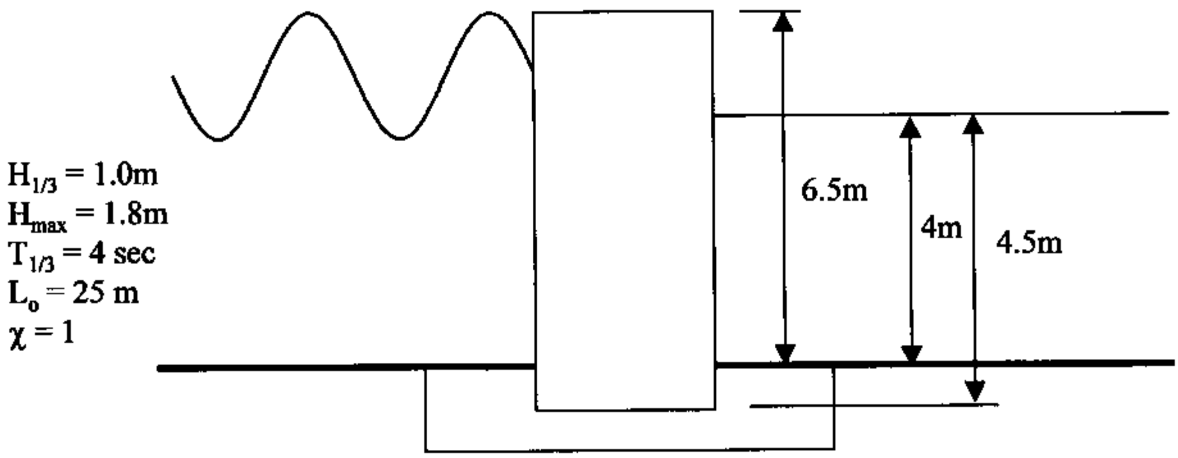

FIGURE Q4(b): No shallow mound breakwater

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Table Q2(a): Data average annual departures and maximum take-off weight of each aircraft

Aircraft	**Gear type**	**Average annual departures**	**Max Take-Off Weight (lb)**
727-200	Dual	9100	190,000
737-200	Dual	2625	115,500
747-100	Double dual tandem	80	700,000

Table Q2(b): Conversion factors for converting from one aircraft type to another

To convert from	**To**	**Multiply departures by**
Single wheel	Dual wheel	0.8
Single wheel	Dual tandem	0.5
Dual wheel	Single wheel	1.3
Dual wheel	Dual tandem	0.6
Dual tandem	Single wheel	2.0
Dual tandem	Dual wheel	1.7
Double dual tandem	Dual tandem	1.0
Double dual tandem	Dual wheel	1.7