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Universiti Tun Hussein Onn Malaysia

UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER I
SESSION 2021/2022

COURSE NAME	:	TRANSPORTATION ENGINEERING
COURSE CODE	:	BFT 40303
PROGRAMME CODE	:	BFF
EXAMINATION DATE	:	JANUARY / FEBRUARY 2022
DURATION	:	3 HOURS
INSTRUCTION	:	1. ANSWER **ALL** QUESTIONS. 2. THIS FINAL EXAMINATION IS AN **ONLINE** ASSESSMENT AND CONDUCTED VIA **CLOSE BOOK**.

THIS QUESTION PAPER CONSISTS OF **SIX (6)** PAGES

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Q1 (a) Explain briefly **THREE (3)** main components of Transportation System.

(9 marks)

(b) Due to pandemic COVID-19 and the implementation of Movement Control Order (MCO) since year 2020, many important sectors are affected including transportation sector. Hence, Intelligent Transportation Systems (ITS) seems a good strategy in optimization and is an efficient tool to be used in this situation. Justify, why ITS should be an important element in transportation sector during this pandemic and MCO.

(9 marks)

(c) Sustainable Transport System is basic access needs of individuals and societies that should be affordable, safe, operates efficiently, offer choice of transport mode, limit emissions, minimize energy consumption, minimize land use, produce low noise, and support a vibrant economy. Propose a concept using the sustainable transport system that can be used for non-motorised mode especially for cycling activity.

(7 marks)

Q2 (a) A new High-Speed Rail (HSR) railway track that will requires superelevation on a curve with a radius between 1200 to 1300 m is to be proposed to accommodate a new design speed range of 150 to 350 km/h.

(i) Check if the existing superelevation is adequate.

(8 marks)

(ii) Determine the minimum length of spiral curve that is required to connect a tangent to the horizontal curve on the upgraded track.

(5 marks)

(b) The distance between the Points of Vertical Intersection (PVIs) of two vertical curves, a crest curve followed by a sag curve, on an urban rail transit main line track is 1500 m. The grade of the approaching tangent of the crest curve is 5% and that of the departing tangent of the sag curve is 3%. Determine the desired, preferred minimum and absolute minimum lengths of each of these curves if the design speed of the track is 90 km/h.

(12 marks)

Q3 (a) Illustrate the dimensional standards of an aircraft characteristics.

(7 marks)

(b) An airport will be constructed at 1200 m above sea level, where the normal maximum temperature is 21.1°C. The difference in centerline elevation between the high and low points of the runway is 4.0 m. The airport will serve 100% fleet and 60% useful load of a family of airplanes having a maximum certificated load of 270,000 N.

(i) Determine the unadjusted minimum primary runway length.

(2 marks)

(ii) Calculate the minimum primary runway length, considering wet and slippery conditions during aircraft landing, and difference in centerline elevation during aircraft take-off.

(6 marks)

(ii) Estimate the minimum required length for the crosswind runway.

(4 marks)

(b) An aircraft is approaching a runway at speed range between 125 to 145 knots. Given that the crosswind range between 30 to 35 knots, determine:

(i) the Crab angle required to safely land the aircraft.

(2 marks)

(ii) Aircraft's true airspeed and groundspeed along the track.

(4 marks)

Q4 (a) Water transportation cost less compared to air transportation and is popular for transcontinental shipping, short sea shipping and ferrying.

(i) Explain **THREE (3)** types of oversea shipping that are typically used in water transportation.

(6 marks)

(ii) Differentiate between Cruise Ships and Ferries that are known as passenger ships.

(4 marks)

(b) A ferry docking at a berth in a ferry terminal has a 45-person capacity and one doorway. The berth has ticket machines located on-shore, a single channel gangway and a sloped walkway 12 m in length that ends in a pair of free-swinging gates. Tickets are collected manually at the gangway. The following were observed.

Capacity for ticket collection (C_f)	:	25 passengers/min
Capacity for walkway exit gate (C_x)	:	30 passengers/min/channel
Capacity for gangway (C_g)	:	40 passengers/min/channel
Passenger walking speed (v_e, v_d)	:	1.24 m/s
Clearance time (t_c)	:	5 min
Operating margin (t_{om})	:	3 min

Assuming that passenger volume is at maximum during peak hours,

(i) Calculate the embarking capacity (C_e) and disembarking capacity (C_d).

(10 marks)

(ii) Determine the total embarking and disembarking time (t_{ed}).

(5 marks)

- END OF QUESTIONS -

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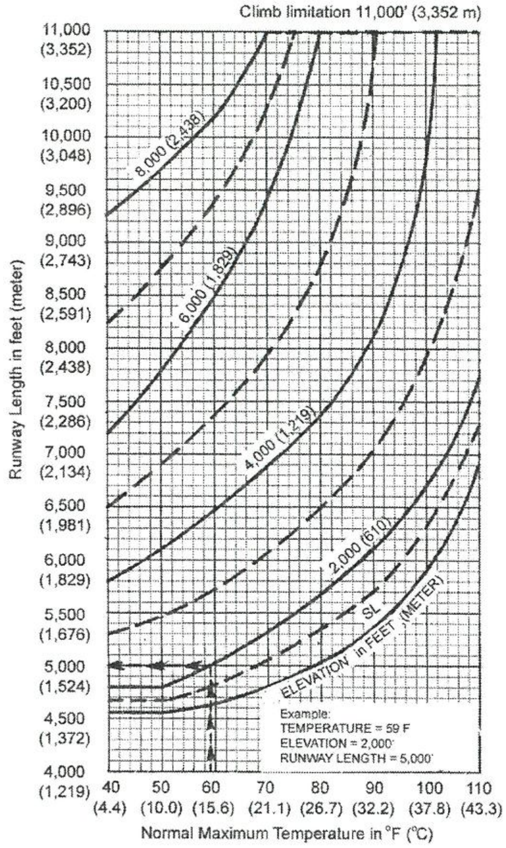
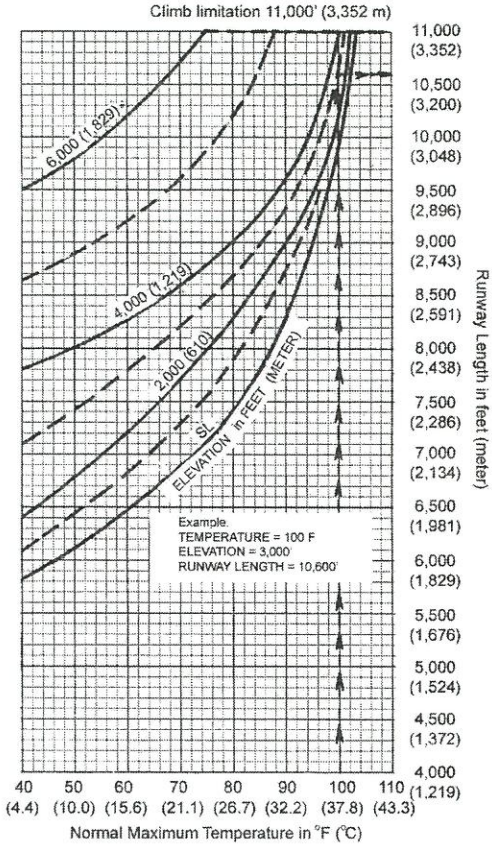
Appendix A: Design Charts

I. Runway length to serve 100% of large planes of 272,000 N or less



100% FLEET 60% USEFUL LOAD



100% FLEET 90% USEFUL LOAD

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Appendix B: Design Formulas

The following information may be useful. The symbols have their usual meaning.

$$LVC_{des} = 60A \qquad LVC_{min\,pref} = 30A \qquad LVC_{min\,abs(crest)} = \frac{Au^2}{212}$$

$$LVC_{min\,abs(sag)} = \frac{Au^2}{382} \qquad R = \frac{1718.89}{D_c} \qquad e_a = 0.79\left(\frac{u^2}{R}\right) - 1.68$$

$$e_q = e_a + e_u \qquad e_q = 0.00068u^2 D_c$$

$$L_{min\,spiral} = 0.122 e_u u \quad \text{to satisfy unbalanced acceleration}$$

$$L_{min\,spiral} = 7.44 e_a \quad \text{to satisfy racking and torsional forces}$$

$$A_{max} = sin^{-1}\left(\frac{d}{R}\right) \qquad L = d * ln\left[\frac{4d\,tan\left(\frac{A_{max}}{2}\right)}{W - u - 2M}\right] - d$$

$$B_{max} = tan^{-1}\left[\left(\frac{w}{d}\right) tan\,A_{max}\right] \qquad F = \left(R^2 + d^2 - 2Rd\,sin\,A_{max}\right)^{0.5} - 0.5u - M$$

$$C_d = min\begin{Bmatrix} C_g N_{cg} \\ C_x N_{ce} \end{Bmatrix} \qquad C_e = min\begin{Bmatrix} C_g N_{cg} \\ C_g N_f / t_f \\ C_x N_{ce} \end{Bmatrix} \qquad t_{ed} = 60\left(\frac{P_d}{C_d} + \frac{L_w}{v_d} + \frac{P_e}{C_e} + \frac{L_w}{v_e}\right)$$

$$t_v = t_{ed} + t_c + t_{om} \qquad V_b = \frac{3600}{t_v}$$