



**UNIVERSITY OF TECHNOLOGY**  
**Building and Construction Eng. Dept.**  
**Final Exam- 2015 / 2016 (First Attempt)**

**Subject : Airports Engineering**  
**Branch : Highways & Bridges**  
**Examiner : Asst. Prof. Dr. Karim Al Helo**

**Class: 4<sup>th</sup>**  
**Time : 3 Hours**  
**Date : 14<sup>th</sup>, June, 2016**



**Note: Attempt FIVE of the following questions.**

- Q1: a:** What is the program of Federal Aviation Administration FAA include? (5 marks)
- b:** What are the Revenues and Expenditure in U.S. Airports? (5 marks)
- c:** Show with drawings the influence of aircraft design on cost of travel, absolute power, speed, and seat. Mile/hour. (5 marks)
- d:** The length of the runway is designed to cover FOUR cases of takeoff and landing, What are these cases? (5 marks)

- Q2: a:** What are the weight component of aircraft. (5 marks)
- b:** The demand - Capacity analysis should cover SIX forecasting items, State them briefly. (5 marks)
- c:** Determine the size (diameter), discharge, velocity of water, slope of pipe, and the end level for line segment of **60 acres** drainage; average runoff coefficient equals **0.38**, if you know the following:

$$T_s = \frac{1.48(1.48 - C)(L)^{0.76}}{S^{0.48}}$$

Area	Distance (ft)	Slope %
Over pavement	650	0.8
Over turf	3600	1.2

Use **5 years** curve in Fig. 10.2, assume **n Manning= 0.015**, **c** for turf=**0.30** and **c** for pavement = **0.90**. The inlet level is **(20 ft above the MSL)** and the pipe length =**3,500 ft**.

(10 marks)

- Q3: a:** What are the five principal imaginary surfaces to protect airspace around airport? (5 marks)
- b:** What is the meaning of the VFR and IFR and when they are used? (5 marks)
- c:** An airport pavement to be designed for the traffic mix below. Convert the traffic to equivalent DC-8-61 departures.

**Note:** to convert from dual wheel to dual tandem use factor equals **0.6**

Aircraft wheel configuration	Departure R	Load per wheel lb
CV-880 (dual tandem)	12,000	20,000
DC-9-32 (Dual wheel )	10,000	25,000
DC-8-61 (dual tandem)	1,500	40,000

(10 marks)

- Q4: a:** The nautical mile is the distance equals the length of the arc facing central angle of ..... minute on the latitude line named ..... or latitude number..... The nautical mile equals.....meters.

(5 marks)

**b:** One or more of five conditions requires installing visual approach slope indicator system (VASIS) to the runway, State these conditions. (5 marks)

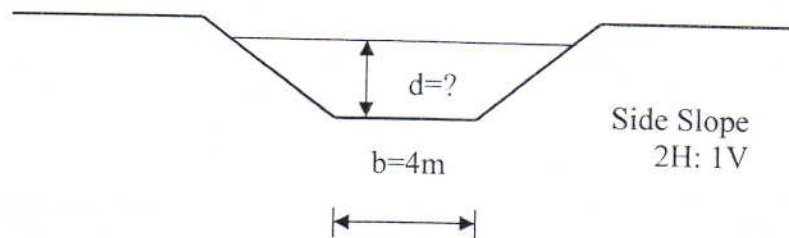
**c:** Use Fig. 10.10 and find the thickness of 1. Sub base, 2. Base, and 3. Pavements for primary traffic area and wheel load of **60K** if you know that the thickness factor equals **1.15** and: CBR for Sub grade = **4**, for Sub base = **10**, and for Base = **34** (10 marks)

**Q5: a:** Draw and describe three types of runway configuration including the direction and numbering of each runway. (5 marks)

**b:** What is the functions of the jointing in the concrete pavement? What are the three various types of joints in rigid pavement (5 marks)

**c:** For the shown trapezoidal channel, find **d** for the cross section to carry a discharge of **9m<sup>3</sup>/sec** at velocity of **0.75 m/sec** if the bed width **b=4m**. Then find the real discharge using the following equation if you know the bed slope is **10cm/km** and **Manning's n =0.015**

$$Q = \frac{A R^{2/3} S^{1/2}}{n}$$



(10 marks)

**Q6: a:** Use figure 10.13 to find the thickness of concrete pavement if the allowable working stress of concrete is 500 psi, the aircraft weight is 150,000 lb. And k value equals 100 pci. (5 marks)

**b:** What are the three functions of subsurface drainage? Show briefly the material used for and the construction method. (5 marks)

**c:** Calculate the discharge (**Q**) for following inlets:

i. Low head of **c=3**, **L=13 ft**, and **H= 0.4 ft**. (5 marks)

ii. High head of **c=0.5**, **A=5 sq .ft**, **H=1.6 ft** and **g=32.2 ft/sec<sup>2</sup>** (5 marks)

(Good Luck)

## Solutions

(1)

Q1: a: The program of federal Aviation administration includes the following:

- 1- Safety regulations
- 2- Research and developments
- 3- Air navigation facilities (construction, maintenance, ...)
- 4- Air space and Air Traffic, Management, Towers, routes ....)
- 5- Airport planning and development programs (types and cost of airport ...)
- 6- Registration and Recordation (engines, aircraft ownership)
- 7- Civil aviation abroad (Technical & training)
- 8- Other programs (technical materials, guarantee program)

4

The length of the runway is designed  
 to cover the following  
 1. To complete a takeoff to 25 ft with  
 all engines operating  
 2. To complete a takeoff to 25 ft with  
 one engine failure  
 3. To stop after aborting a takeoff  
 with one engine failure  
 4. To stop after landing from a high speed

3

Q2

a: The weight components of Aircraft are:

- 1- Empty operating weight is constant.
- 2- Zero fuel weight
- 3- Maximum takeoff weight
- 4- Maximum ramp weight  $>$  max takeoff weight by the weight of fuel required for taxiing
- 5- Maximum landing weight  $<$  max takeoff weight by weight of fuel (burned)

The demand-capacity analysis can be done in the following manner:

1. To find out the demand capacity of a system, the first step is to find out the peak demand of the system.
2. The peak demand of the system is the maximum demand of the system over a period of time.
3. The peak demand of the system is usually found out by using the peak factor method.
4. The peak factor method is a method of finding out the peak demand of a system by using the peak factor.
5. The peak factor is the ratio of the peak demand to the average demand.
6. The peak factor is usually found out by using the peak factor method.
7. The peak factor method is a method of finding out the peak demand of a system by using the peak factor.
8. The peak factor method is a method of finding out the peak demand of a system by using the peak factor.