BIRLA INSTITUTE OF TECHNOLOGY AND SCIENCE, PILANI
FIRST SEMESTER 2022 - 2023
AIRPORT PLANNING & DESIGN – Mid Semester Exam - Regular

Course No: CE G545 **Date: 04-11-2022 [4:00 PM start]**
Duration: 90 Mins (Closed book) **Max. Marks: 70**

I: Choose the best answers **[10 x 1 = 10 marks]**

1) IATA stands for _____
2) ACDM stands for _____
3) Wet runway generally requires shorter runways than dry runways (True/False)
4) When no data is available**,** _____ is the standard weight suggested by ICAO for a passenger plus its baggage.
5) Density decreases with increase in altitude (True/False)
6) MPPA stands for _____
7) Fixed ballast is the part of aircraft empty weight (True/False)
8) One of the conditions of basic runway length is "no wind is blowing on runway" (True/False)
9) _____ (Technical/Allowable/Acceptable) capacity connected with LoS
10) The length of an aircraft is defined as the distance from the _____ to the back end of the tail section, known as the empennage.

II: Short answers **[10 x 3 = 30 marks]**

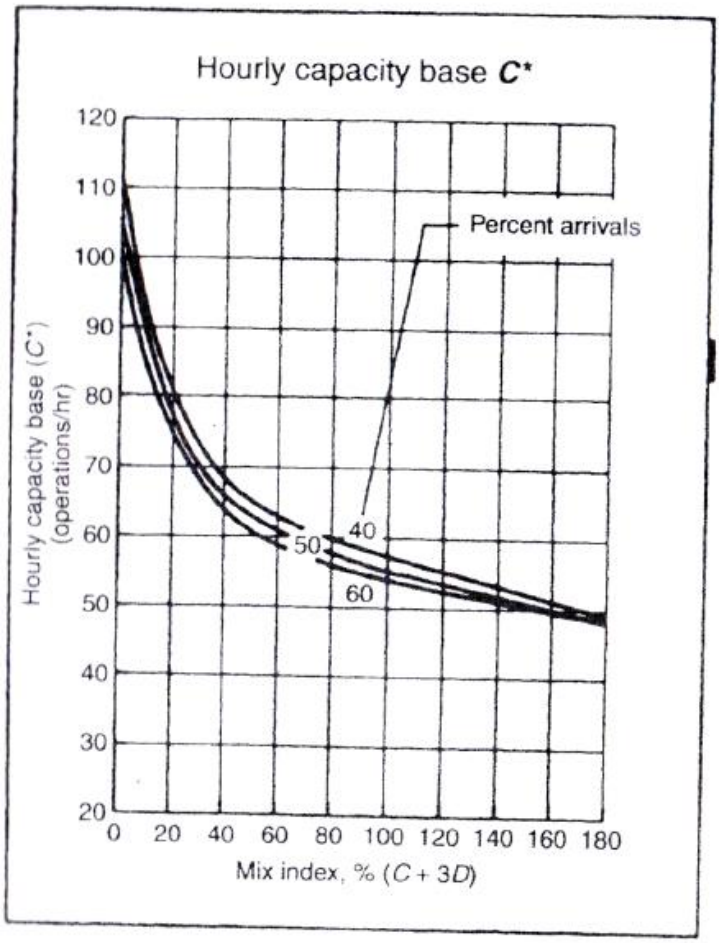
1) Define Good LoS as per Transport Canada.
2) Name few types of decomposition methods.
3) What are the parameters affecting the parking in the arrival forecourt?
4) A flight is travelling from Delhi to New York via Germany and following are the details. Determine the passenger load factor. Assume any other data if required.
Distance from New Delhi to Frankfurt – 6560 kms (Available seats – 30; Revenue Passengers - 20)
Distance from Frankfurt to New York – 6199 kms (Available seats – 25; Revenue Passengers - 20)
5) Determine the mix index as per FAA for the following data.
A – 25%; B – 20%; C – 50%; D – 5%
6) What is the difference between diverted traffic and induced traffic?
7) An airport has 4 gates which are available for all the aircraft. It serves three classes of aircraft having mix and average occupancy time during peak hour as follows.

Aircraft Class	Mix (%)	Average occupancy time in minutes
1	40	60
2	30	45
3	30	30

If the maximum gate utilization factor is 60%, find the capacity of the gates at this airport to process the aircraft.
8) What is meant by tare weight?
9) What are block hours?
10) Define Aeroplane reference field length

III: Long answers: **[3 x 10 = 30 marks]**

Determine the hourly capacity of a single runway (10000 ft. long) in VFR under the following conditions.
Aircraft mix: 35%; 30% B; 30% C; and 5% D
Percent arrivals: 40%; Percent Touch and Go: 15%; Exit taxiway locations: 4500 and 5000 ft. from arrival threshold. Assume any missing data if required.



Percent Touch & Go	Mix Index	Tough & Go Factor
0	0 to 180	1.00
1 to 10	0 to 70	1.04
11 to 20	0 to 70	1.10
21 to 30	0 to 40	1.20
31 to 40	0 to 10	1.40

Mix Index	Exit Range	40% Arrivals			50% Arrivals			60% Arrivals		
		N=0	N= 1	N= 2/3	N=0	N= 1	N= 2/3	N=0	N= 1	N= 2/3
0 – 20	2000 - 4000	0.72	0.87	0.94	0.70	0.86	0.94	0.67	0.84	0.91
21 – 50	3000 - 5500	0.79	0.86	0.94	0.76	0.84	0.93	0.72	0.81	0.90
51 – 80	3500 - 6500	0.79	0.86	0.92	0.76	0.83	0.91	0.73	0.81	0.90
81 – 120	5000 - 7000	0.82	0.89	0.93	0.80	0.88	0.94	0.77	0.86	0.93
121 – 180	5500 - 7500	0.86	0.94	0.98	0.82	0.91	0.91	0.79	0.91	0.97

2) Determine the actual length of the runway required for take-off (as per ICAO guidelines) if the length required for landing and take-off under standard atmospheric conditions at sea level are 1900 m and 1600 m respectively. The airport elevation can be can be taken as 100 m and the airport reference temperature is 20 deg C. The effective gradient can be taken as 1%.

3) A runway is to service arrivals and departures. The common approach path is 6 mi long for all aircraft. During a particular interval of time the runway is serving only two types of aircraft, a type A with an approach speed of 80 mi/h and a type B with an approach speed of 100 mi/h. Each arriving aircraft will be on the runway for 30 s before exiting the runway. During the period of time to be analyzed five aircraft in an ordered arrival queue of a B, A, A, B, and A aircraft approach the runway. An identical ordered departure queue of aircraft is awaiting clearance to takeoff. Draw a time-space diagram to service these aircraft assuming the first arrival is at the entry gate at time 0 and arrivals are given priority over departures.

Note: Calculate the capacity only considering the arrivals and draw the time-space diagram also only considering the arrivals.

Operational Sequence	Air traffic Rules
Arrival – Departure	Clear runway
Departure – Arrival	Arrival at least 2 miles from arrival threshold
Departure – Departure	120 s
Arrival – Arrival	Miles: Lead A B; Trailing A [4 3]; B [5 3]

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Few details:

Approach Category	Approach speed, Knots	Airport category
A	<91	Utility airport
B	91 – 120	Utility airport
C	121 – 140	Transport airport
D	141 – 165	Transport airport
E	166 or greater	Transport airport

Few notes:

ICAO has recommended that the basic length selected for the runway should be increased at the rate of 7 percent per 300 m rise in elevation above the mean sea level

Standard temperature at the site can be determined by **reducing the standard sea level temperature of 15 deg C** at the rate of **6.5 deg C per 1000 m rise in elevation.**

Correction for temperature is one percent increase for one-degree difference between Airport Reference Temperature and Standard Temperature.

10% increase for each 1% of the effective runway gradient.