

Roll No



**PRESIDENCY UNIVERSITY
BENGALURU**

SET B

**SCHOOL OF ENGINEERING
END TERM EXAMINATION - JAN 2024**

Semester : Semester III - 2022

Course Code : CIV2016

Course Name : Transportation Engineering

Program : B.Tech.

Date : 0J-JAN-2024

Time : 9:30AM - 12:30 PM

Max Marks : 100

Weightage : 50%

Instructions:

- (i) Read all questions carefully and answer accordingly.
- (ii) Question paper consists of 3 parts.
- (iii) Scientific and non-programmable calculator are permitted.
- (iv) Do not write any information on the question paper other than Roll Number.

PART A

ANSWER ALL THE QUESTIONS

4 X 5M = 20M

1. An airport has 5 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	30	60
2	50	45
3	20	30

If the maximum gate utilization factor is 60%, find the capacity of the gates at this airport to process the aircraft.

(CO3) [Knowledge]

2. A national highway passing through rolling terrain in heavy rain fall area has a horizontal curve of radius 500 m.

- Design the length of transition curve using the following data:
- Design speed of vehicle= 80 kmph
- Allowable rate of superelevation= 1 in 150
- Pavement rotated about the inner edge of the payment.
- Pavement width excluding extra widening= 7 m.

(CO2) [Knowledge]

3. Explain briefly the purpose of the following components of Airport:
(i) Runway (ii) Taxiway (iii) Apron (iv) Control Tower (v) Hanger
(CO3) [Knowledge]
4. Calculate the number of sleepers required for 700 m length of railway track, if sleeper density is $(n + 5)$ for broad gauge and the length of one rail for a broad gauge is 13 m.
(CO3) [Knowledge]

PART B

ANSWER ALL THE QUESTIONS

5 X 10M = 50M

5. Strength, Hardness and resistance to weathering action are important properties for aggregates to be use in road. Identify and explain the tests to be carried out for determining these properties.
(CO1) [Comprehension]
6. A vertical summit curve is to be designed when two grades, $+1/50$ and $-1/80$ meet on a highway. The SSD and OSD required are 180 and 640 m respectively. But due to the site conditions the length of the vertical curve has to be restricted to a maximum value of 500 m if possible. Calculate the length of the summit curve needed to fulfil the requirements of SSD , OSD or atleast ISD
(CO2) [Comprehension]
7. The Marshall stability test is a performance prediction measure for bituminous mixes. It's used in routine test programs for paving jobs. The weight and specific gravities for the ingredients required for one trial specimen of the Marshall test are as given below:

Item	Coarse Aggregate - 1	Coarse Aggregate - 2	Fine Aggregate	Filler	Bitumen
Weight (gm)	800	1200	300	180	150
Specific Gravity	2.60	2.56	2.45	2.40	1.05

The volume and weight of one Marshall specimen was found to be 450cc and 1000gm.

What properties of Marshall stability test can be determined from the data given above. Determine the requisite properties if the absorption of bitumen in aggregate is assumed to be zero.

- (CO1) [Comprehension]
8. Determine the minimum and desired length of the overtaking zone to be provided for a two-lane undivided pavement with a design speed of 60kmph. Also, sketch the overtaking zone. The acceleration during overtaking may be assumed to be 0.85 m/s^2
(CO2) [Comprehension]
9. The rails are the top most component track structure. The wheels of Rolling Stocks run on rails and transmit various forces through them to the other components of track structure/rack foundation down below. Hence, it is very important to provide an ideal rail section. In this context, discuss about the requirements of an ideal rail section
(CO3) [Comprehension]

PART C

ANSWER ALL THE QUESTIONS

2 X 15M = 30M

10. Determine the superelevation required for a horizontal curve of radius 150m and design speed of 80kmph. Also, calculate the extra widening required at the curve if the width of pavement is 7.5m and the longest wheel base of the vehicle expected on the road is 7m. If this road is on a ruling gradient of 5%, determine the compensated gradient at the curve

(CO2) [Application]

11. The actual runway length is arrived by applying corrections to the basic runway length. What are these corrections? List and briefly explain the corrections to be applied. Based on the above explanation, determine the actual runway length to be provided for an ariport with features as listed below:

1. Airport elevation (RL) = 150m
2. Airport reference temperature: 27°C
3. Basic runway length = 650m
4. RL of Highest point along the length of runway = 98.0 m
5. RL of Lowest point along the length of runway = 94.5 m

(CO3) [Application]