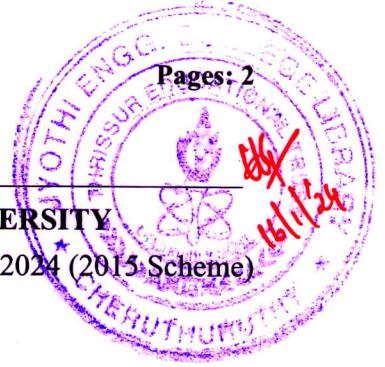Reg No.:_____ Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

B.Tech Degree S6 (S, FE) / S6 (PT) (S, FE) Examination January 2024 (2015 Scheme)

Course Code: CE308
Course Name: TRANSPORTATION ENGINEERING - I

Max. Marks: 100   Duration: 3 Hours

PART A
Answer any two full questions, each carries 15 marks.

Marks

1 a) Briefly outline the modified classification of road system in India as per Third Twenty Year Road Development Plan. (7)

   b) What are obligatory points? With examples, explain how obligatory points control the alignment of highways. (8)

2 a) What is meant by design speed? Explain the significance of design speed in geometric design of highways. (5)

   b) A vehicle is travelling along a national highway with design speed 100 kmph under the following conditions: (6)
       a) A level surface
       b) Upward gradient of 3%
   Determine the safe stopping sight distances in both the cases. Also determine the intermediate sight distance when the vehicle is travelling along the level road. Assume coefficient of longitudinal friction between vehicle tyres and road surface equal to 0.35.

   c) Define super-elevation. Why is super-elevation required on horizontal curves? (4)

3 a) State the reasons for providing transition curves in horizontal alignment of highways. (5)

   b) An ascending gradient of 1 in 50 meets a descending gradient of 1 in 80. (10)
       Determine the length of summit curve for a design speed of 100 kmph to provide
       a) Stopping sight distance and
       b) Over taking sight distance

PART B
Answer any two full questions, each carries 15 marks.

4 a) What is the significance of stripping value of aggregates in flexible pavement performance? How is this property tested in laboratory? (7)

   b) State the desirable properties of bitumen as a pavement material. (5)

c) Define modulus of subgrade reaction of soil subgrade. Name the test which is conducted to find this property. (3)

5 a) Draw a sketch showing typical layers of a flexible pavement. Enumerate the functions of each layers. (7)

b) Design a new flexible pavement as per guidelines of IRC:37- 2001 for a two lane undivided carriageway using the following data:

Design CBR value of subgrade soil = 8%, Initial traffic on completion of construction of road in both directions = 1800 CVPD, Average growth rate of commercial vehicles = 6% per year, Design life = 15 years, VDF value = 2.5. (8)

6 a) What is meant by performance grade bitumen? Why is performance grading of bitumen is superior to that of the conventional grading? (5)

b) Briefly explain the types and causes of failures in flexible pavements. (10)

PART C
Answer any two full questions, each carries 20 marks.

7 a) Distinguish between at grade and grade separated intersections with examples. (7)

b) What are the requirements of traffic control devices? (5)

c) Two roads A and B meet at right-angles. The normal flow and saturated flow on road A are 800 PCU/hr and 3000 PCU/hr respectively. On road B normal flow is 500 PCU/hr and saturated flow is 2500 PCU/hr. The all red time is 12 sec. Design a two-phase isolated traffic signal for the intersection. (8)

8 a) With the aid of a sketch, briefly explain the various components of an airport. (8)

b) Write notes on (i) Runway orientation (ii) Wind rose diagram (iii) Wind coverage (iv) Calm period (12)

9 a) The length of runway at sea level, standard atmospheric conditions and zero gradient is 1500 m. The airport site has an elevation of 900 m and the airport reference temperature is 20°C. If the proposed runway grading permits an effective gradient of 0.2%, determine the actual runway length required at site. (10)

b) What are the principles of design of an exit taxiway connecting the runway and a parallel taxiway? (5)

c) Describe the need for air traffic control. (5)

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