Total No. of Questions: 6 *Total No. of Printed Pages:3*

Enrollment No.....

Faculty of Engineering

End Sem (Even) Examination May-2019

CE3CO09 / OE00026 Transportation Engineering

Programme: B.Tech. Branch/Specialisation: All

Duration: 3 Hrs. **Maximum Marks: 60**

Note: All questions are compulsory. Internal choices, if any, are indicated. Answers of Q.1 (MCQs) should be written in full instead of only a, b, c or d.

Q.1 i. The design of horizontal and vertical alignments, super elevation, gradient is most affected by **1**

(a) Length of vehicle (b) Width of vehicle

(c) Speed of vehicle (d) Height of vehicle

ii. The shape of camber, best suited for concrete pavements, is: **1**

(a) Parabolic

(b) Straight line

(c) Elliptical

(d) Combination of straight line and parabolic

iii. The stress strain approach is used in **1**

(a) Empirical method (b) Semi –Empirical method

(c) Theoretical method (d) CBR method

iv. CBR is a **1**

(a) Measure of soil strength

(b) Flexible pavement design method

(c) Rigid pavement design method

(d) Measure of soil characteristics

v. The first thickness assumed in pavement is called **1**

(a) IRC thickness (b) MORTH thickness

(c) Trial thickness (d) Estimated thickness

vi. The minimum factor of safety for rigid pavement is **1**

(a) 1 (b) 1.1 (c) 1.5 (d) 1.7

P.T.O.

vii. The existing strength of pavement can be made stronger by **1**
(a) Construction from sub grade
(b) Construction from sub base
(c) Construction from base
(d) Overlay

viii. When the bituminous surfacing is done on the already existing black top road or over existing cement concrete road, the types of treatment to be given is: **1**
(a) Seal coat (b) Tack coat (c) Prime coat (d) Spray of emulsion

ix. As per ICAO recommendation, minimum width of safety area for instrumental runway should **1**
(a) 78 m (b) 150 m (c) 300 m (d) 450 m

x. The bearing of the longest line of a wind rose is *S* 45° *E*, the bearing of the runway will be: **1**
(a) 135° (b) 13° (c) 31° (d) Both (b) and (c)

Q.2 i. (a) Write the various geometric elements to be considered in highway design? **4**
(b) Explain total reaction time according to PIEV THEORY.

ii. A radius of a horizontal circular curve is 100 m. The designed speed is 50 KMPH and the design coefficient of lateral fraction is 0.15 **6**
(a) Calculate the super elevation required, if full lateral friction is assumed to develop.
(b) Calculate the coefficient of fraction needed, if no super elevation is provided.

OR iii. Derive an expression for finding the extra widening required on horizontal curve. What are the factors on which the design of widening depends? **6**

Q.3 i. What is hot mix and cold mix method of bituminous road construction. **2**

ii. Discuss the desirable properties of bitumen. Compare tar and bitumen. **8**

OR iii. What are the different types of bituminous materials used in road construction? Under what circumstances each of these materials is preferred? **8**

Q.4 i. Explain ESWL and the concept in the determination of the equivalent wheel load. **3**

ii. Discuss the design details of Dowel Bars. **7**

OR iii. Explain the IRC recommendations for determining the thickness of cement concrete pavement. **7**

Q.5 i. What are the general causes of pavement failures? **4**

ii. Explain the principle and uses of Benkelman Beam test. **6**

OR iii. Write short notes on: **6**
(a) Map (alligator) cracking (b) Skidding of pavement surfaces

Q.6 Attempt any two:

i. How Orientation of Runway is done? **5**

ii. What is Wind Rose Diagram? Explain different features of Wind Rose Diagram **5**

iii. Discuss the different factors affecting Airport Site Selection. **5**

******

Marking Scheme

CE3CO09 / OE00026 Transportation Engineering

Q.1 i. The design of horizontal and vertical alignments, super elevation, gradient is most affected by **1**
(c) Speed of vehicle

ii. The shape of camber, best suited for concrete pavements, is: **1**
(b) Straight line

iii. The stress strain approach is used in **1**
(b) Semi –Empirical method

iv. CBR is a **1**
(b) Flexible pavement design method

v. The first thickness assumed in pavement is called **1**
(c) Trial thickness

vi. The minimum factor of safety for rigid pavement is **1**
(b) 1.1

vii. The existing strength of pavement can be made stronger by **1**
(d) Overlay

viii. When the bituminous surfacing is done on the already existing black top road or over existing cement concrete road, the types of treatment to be given is: **1**
(b) Tack coat

ix. As per ICAO recommendation, minimum width of safety area for instrumental runway should **1**
(c) 300 m

x. The bearing of the longest line of a wind rose is *S* 45° *E*, the bearing of the runway will be: **1**
(d) Both (b) and (c)

Q.2 i. (a) Geometric elements to be considered in highway design **4**
2 marks
(b) Total reaction time according to PIEV THEORY
2 marks

ii. (a) Calculate the super elevation required, if full lateral friction is assumed to develop. **6**
3 marks
(b) Calculate the coefficient of fraction needed, if no super elevation is provided.
3 marks

OR iii. Derive an expression for Extra widening 3 marks **6**
Factors 3 marks

Q.3 i. Hot mix and cold mix method of bituminous road construction. **2**
Hot mix method 1 mark
Cold mix method 1 mark

ii. Desirable properties of bitumen **8**
1 mark for each property (1 mark *4) 4 marks
Comparison tar and bitumen.
1 mark for each comparison (1 mark *4) 4 marks

OR iii. Types of bituminous materials **8**
1 mark for each type (1 mark * 4) 4 marks
Conditions for preferred
1 mark for each type (1 mark * 4) 4 marks

Q.4 i. Definition of ESWL 1 mark **3**
Explanation 2 marks

ii. Design criteria 1 mark each step (1 mark * 3) 3 marks **7**
Formulas 2 marks
Diagram 1 mark each (1 mark * 2) 2 marks

OR iii. IRC recommendations for determining the thickness of cement concrete pavement. **7**
Design steps for slab thickness 1 mark for each steps (1 mark * 7)

Q.5 i. Causes of pavement failures **4**
0.5 mark for each feature (0.5 mark * 8)

ii. Benkelman Beam test. **6**
Principle 3 marks
Uses 1 mark for each (1 mark * 3) 3 marks

OR iii. Write short notes on: **6**
(a) Map (alligator) cracking 3 marks
(b) Skidding of pavement surfaces 3 marks

Q.6 Attempt any two:

i. Orientation of Runway **5**
1 mark for each points (1 mark * 5)

ii. Wind Rose Diagram 2 marks **5**
Features of Wind Rose Diagram
1 mark for each point (1 mark * 3) 3 marks

iii. Factors affecting Airport Site Selection. **5**
1 mark for each factors (1 mark * 5)

******