Register Number.....

B.E. DEGREE EXAMINATIONS: APRIL / MAY 2010

Fifth Semester

CIVIL ENGINEERING

U07CE504: Highway Engineering

Time: Three Hours **Maximum Marks: 100**

Answer ALL the Questions:-

PART A (10 x 1 = 10 Marks)

1) The construction of " express way" was planned for first time by

A. Jayakar committee B. Bombay plan C. Nagpur plan D. Lucknow plan

2) Which one of the following is the chronological sequence in regard to road construction

A. Telford, Tresaguet, C.B.R, Macadam B. Telford, Tresaguet ,Macadam ,C.B.R

C. Macadam ,C.B.R ,Tresaguet ,Telford D. Tresaguet ,Macadam ,Telford ,C.B.R

3) The best method of attaining super elevation in flat terrain is by rotating

A. centre line B. inner edge C. outer edge D. none

4) While designing the super elevation of a highway, its maximum value is fixed considering the need to

A. avoid toppling of slow moving vehicles in mixed traffic flow

B. avoid transverse skidding

C. provide drainage

D. counteract centrifugal force due to 75 % of design speed

5) Flexible pavement distributes the wheel load

A. through slab action B. by grain to grain transfer through point of contact

C. directly to subgrade D. none of the above

6) The main draw back of C.B.R method is that

A. gives total thickness which remains the same irrespective of the quality

B. does not consider the strength parameters of the soil

C. it is a complex method

D. none of the above

7) Los Angels abrasion test is actually

A. a abrasion test only B. abrasion cum impact test

C. strength test also D. none

8) The maximum permissible aggregate impact value to be used in base course is

A.10% B. 20% C. 35% D. 45%

9) 'Reflection cracking' is observed in

A. flexible pavement B. rigid pavement

C. bituminous overlay over rigid pavement D. rigid overlay over rigid pavement

10) In cement concrete pavements, tie bars are installed in

A. expansion joints B. contraction joints C. warping joints D. longitudinal joints

PART B (10 x 2= 20 Marks)

11) Write down the recommendations of Jayagar committee

12) What is the ruling design speed and minimum design speed for NH passing in plain terrain ?

13) Calculate the stopping sight distance on a highway at a descending gradient of 2% for a design speed of 80 Kmph. Assume t = 2.5 sec and f = 0.4

14) Calculate the value of ruling minimum radius of horizontal curve of a NH in plain terrain by taking ruling design speed as 100 Kmph

15) Define 'equivalent single wheel load'

16) Calculate the radius of relative stiffness of 15 cm thick cement concrete slab with μ = 0.13 E = 2,10,000 Kg / sq.cm and K = 3 Kg / cu.cm

17) What are the preferable properties of bitumen for road construction ?

18) Differentiate 'abrasion and attrition'

19) What are the reasons for map cracking ?

20) Differentiate scaling and spalling ?

PART C (5 x 14 = 70 Marks)

21) a) Explain Bombay Road Plan with salient features.

(OR)

b) Explain various road patterns with neat sketch.

22) a) Calculate the safe OSD for two way traffic road with design speed of 96 Kmph. Assume all other data suitably. Take A = 2.5 Kmph / sec. Draw a neat sketch of overtaking zone with sign posts

(OR)

b) i) Calculate the extra widening required for a pavement of width 7m on a horizontal curve of radius 250m , if the wheel base length is 7m. Design speed is 75 Kmph. (4)

ii) Calculate the transition curve length and shift using the following data. (10)

Design speed = 65 Kmph , R = 220m, pavement width including extra widening = 7.5m Allowable rate of introduction of super elevation(pavement rotated about centre line) = 1 in 150

23) a) Explain design factors to be considered for flexible pavement, in detail.

(OR)

b) Calculate the wheel load stresses at interior, edge and corner regions of cement concrete pavement using Westergaard's stress equations. Take the following data.

i) Wheel load, P = 5100 Kg

ii) Pavement thickness, h = 18 cm

iii) Modulus of elasticity of cement concrete, E = 3,00,000 Kg / sq.cm

iv) Radius of contact, a = 15 cm.

v) Subgrade modulus, k = 6 Kg / cu. m and $\mu = 0.15$

24) a) Explain plate bearing test in detail.

(OR)

b) The load penetration values of C.B.R test conducted on a soil specimen is given below. Determine the C.B.R value of the soil,if 100 divisions of the load dial represents 190 Kg load in the calibration chart of the proving ring.

Penetration of plunger (mm)	0	0.5	1.0	1.5	2.0	2.5	3.0	4.0	5.0	7.5.	10	12.5
Load dial readings (divisions)	0	8	15	23	29	34	37	43	48	57	63	67

25) a) Explain various typical failures with flexible pavements.

(OR)

b) Benkelman beam deflections studies were carried out on 15 selected points on a stretch of flexible pavement during summer season using a dual wheel load of 4085 Kg, 5.6 Kg / sq.cm pressure. The deflection values obtained in mm after making the necessary lag corrections are given below. If the present traffic consists of 750 commercial vehicles per day, determine the thickness of bituminous over lay required, if the pavement temperature during the test was 30 degree C and the correction factor for subsequent increase in subgrade moisture content is 1.3. Assume annual growth rate of traffic as 7.5 % . Adopt IRC guide lines.

1.4, 1.32, 1.25, 1.35, 1.48, 1.60, 1.65, 1.55, 1.45, 1.40, 1.36, 1.46, 1.50, 1.52 and 1.45 mm

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