EX/CON/T/325/2018

B.E. CONSTRUCTION ENGINEERING THIRD YEAR SECOND SEMESTER EXAM 2018

Subject: **HIGHWAY AND AIRPORT ENGINEERING**

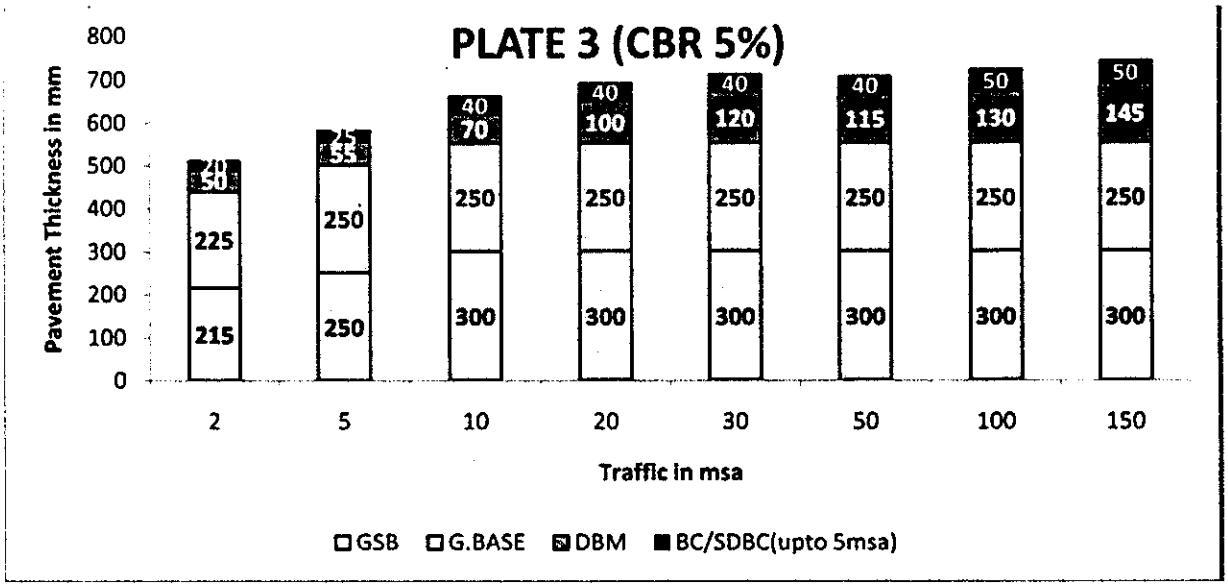
Time: Three hours

Full Marks : 100

Different parts of the same question should be answered together.

PART-I

CO4 [23]	Answer all questions in this block 1. (a) A three layered pavement with 100 mmm bituminous base followed by a granular base of 200 mm and a granular sub base of 250 mm resting on subgrade with 4.0 % CBR . Find out the resilient modulus of granular layer and sub grade. (5) (b) Design a two lane undivided road pavement in Maldah with present traffic of 1600 CVPD for a period of 20 years resting on a subgrade with 5.0% CBR. If the road is widened as 4 lane divided carriageway, then find out the change in design thickness for the same traffic. (13) (c) Describe the basic principles of pavement design as laid down in IRC-37-2012. (5) OR 2. An existing bituminous rural road section passing through Howrah district in west Bengal with present traffic of 400 CVPD has to be transformed in to a concrete road then determine thickness of pavement with the following data . (22) K value of subgrade = 60 MPa/ m Temperature differential in slab = 16.4 ^{0} C Bradbury's coefficient (L / l) 0 1 0.040 2 0.175 3 0.440 4 0.720 5 Assume other relevant data required for design
CO3[12]	3.Benkelman rebound deflection data found from a survey conducted on a 2 lane state highway and the results are as following 1.75, 2.0, 2.25, 1.42, 1.58, 2.68, 3.3, 3.1, 2.96, 2.40, 2.15, 2.70, 2.21, 3.16, 3.8, 3.0, 1.40, 1.75, 2.45, 1.95 in a sunny day with air temperature 40 degree centigrade. If the moisture correction factor is 1.18, then find the thickness of overlay required. (12)
CO1[15]	4.(a) What is the strength requirements of cement treated base. (4) (b) What is SAMI ? Where and why it is used? (4) © Briefly explain the functions of granular sub base . Or the effect of overloading on road pavement. (4) (d) Write notes on aggregate crack relief layer. (3) OR Recycled aggregate pavement



CO1: Describe different Road Construction Materials and their applications in construction of flexible pavements (K2, A1).
CO2: Illustrate design of bituminous mix for use in flexible pavement. (K3).
CO3: Use Indian Standard Guidelines for obtaining thickness of overlay. (K3).
CO4: Use Indian Standard Guidelines for solving problems on Flexible and Rigid Pavements design (K3).

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Time: Three hours Subject: HIGHWAY AND AIRPORT ENGINEERING
PART-II
Different parts of the same question should be answered together. Full Marks: 50

CO1 [25]

Answer all questions in this block

[1] (a) Describe the essential features of cold mix technology. **OR** Compare between HOT MIX and COLD MIX.

(b) List few modern materials used in pavement construction with its impact on pavements.

© Explain the significance of VG grade bitumen over Penetration grade bitumen? **OR** Describe the scope and objective of the CBR test.

(d) Short note on Mastic Asphalt.

(e) Briefly narrate Plate Load test. **OR** Narrate the methodology of accepting a materials as an innovative road construction materials prior to put in application? [5+5+5+5+5]

CO2 25]

Answer all questions in this block

2. (a) Describe how the samples were initially prepared. Discuss why the stability is important and the significance of what the data from the Marshall stability and flow test provides. What are the essential properties of bituminous mixes? **OR** Derive the relationships of these test properties which are used to design the bituminous mixes by Marshall testing method? (10)

(b) The results of a Marshall test is listed below. (i) Find V_v, V_b VMA and VFB (ii) what will be the optimum bitumen content? (Assume relevant data if required) (15)

Bitumen (%)	Weight in Air (gm)	Weight in water (gm)	Weight after wax coating (gm)	Volume(g/cm^3)	Stability Value (kg)	Flow Value (mm)
3.5	1228.40	678.56	1238.80	534.1	370.69	1.9
4	1250.88	691.50	1262.85	534.1	521.44	2.10
4.5	1241.44	687.49	1253.53	534.1	588.74	2.5
5	1243.73	679.55	1254.39	534.1	534.22	2.6
5.5	1244.85	681.74	1257.84	534.1	228.95	2.90

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