Ref. No. : Ex/CON/T/325/2017

Name of the Examinations: B.E. CONSTRUCTION ENGINEERING THIRD YEAR SECOND SEMESTER - 2017

Subject : HIGHWAY AND AIRPORT ENGINEERING

Time :3hr

Full Marks : 100

PART - I

Instructions:

1. Answer any **TWO** questions.
2. Illustrate your answers with neat sketches wherever necessary.
3. Figures to the right indicate full marks.
4. Assume suitable data if necessary.
5. Preferably, write the answers in sequential order.

1. (a) Write briefly about any innovative pavement materials, mention its essential features. (10)

(b) The specific gravities and weight proportions for aggregate and bitumen are as under for the preparation of Marshall mix design

Item	A_1	A_2	A_3	A_4	B
Wt (gm)	825	1200	325	150	100
Sp. Gr.	2.63	2.51	2.46	2.43	1.05

(i)Volume and weight of one Marshall Specimen was found to be 475 cc and 1100gm
(ii)Assuming absorption of bitumen in aggregate is zero
(iii)Find V_v, V_b VMA and VFB (10)

(c) Write short notes on Significance of GI test. (5)

2. (a) What are the innovative pavement materials are being used? Narrate the scheme of accepting a materials as an innovative one prior to put in application? (10)
(b). Describe the factors which should be considered to make a rational approach in the Design of bituminous mixes. (5)

(c) Discuss the application of plate bearing test carried out on sub grade soil? (5)

(d) Compare HOT MIX and COLD MIX. (5)

Q3. (a) What are the main modes of failures of a bituminous mixes? (5)

(b) Write a short note on different types of bituminous mix. (5)

(c) Describe the scope and objective of the CBR test. (5)

(d) Describe the essential features of cold mix technology. (10)

HIGHWAY & AIRPORT ENGINEERING PART- II REF: Ex/CON/T/325/2017

Answer any two questions.

Assume relevant data if required.

Q1. (a) Expected axle load repetitions data as obtained from axle load survey data for a concrete road pavement in Kolkata is 362191 with an axle load class range of 185-195 kN. Find out the stress ratio and fatigue damage against bottom up cracking. Assume the combined modulus of subgrade reaction of subgrade, granular base and DLC subbase as 280 Mpa/m. Consider the thickness of pavement as 200 mm with M 50 grade concrete.

$S = 0.08 + 3.26(\gamma h^2 / k l^2) + 3.13 Ph (k l^4) + 0.0522 \Delta T$ The symbols carry their usual meaning as recommended in IRC-58-2011. (10)

(b)Explain the reasons of Top down and bottom up cracks in Bituminous as well as in concrete road pavement. (10)

(© Explain the principles of subgrade improvement as recommended in IRC-37: 2012. (5)

Q-2. (a) Write notes on the following

(i) Cement treated sub base (ii) Crack relief layer (iii) De-bonding layer (4 X 3= 12)

(b) Design suitable thickness of DBM overlay for a two lane undivided Major District Road in Nadia district. The sub soil PI=21, with a moisture content of 12 % found during field investigation. The Benkelman beam rebound deflection data was collected in a sunny day with a pavement temperature of 40 °C and are following.

2.25, 3.38, 3.4, 2.95, 1.86, 2.69, 2.85, 3.10, 1.78, 1.80, 2.55, 3.18, 3.7, 1.92, 1.88, 2.50, 2.10, 2.75, 2.42, 2.78. (13)

Q-3. (a) Explain the concept of Structural number in flexible pavement design. (8)

(b) Explain the significance of road IRI in relation to quality management of highway pavements. (7)

© Explain the basic principle of falling weight deflection data for estimation of remaining life of road pavements. (10)

FIG-1

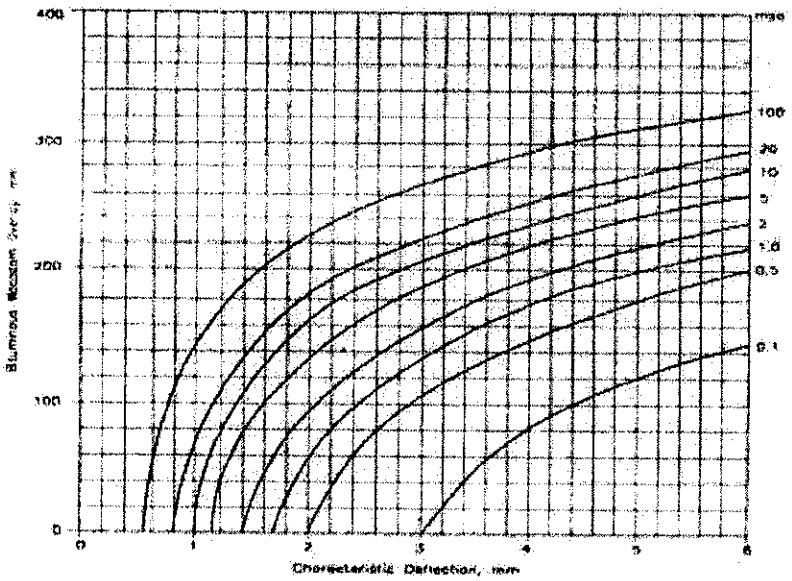
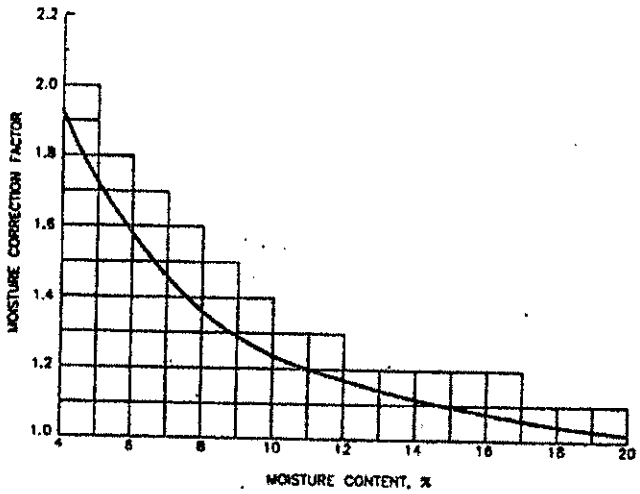


FIG-2



Moisture correction factor for clayey subgrade with high plasticity (PI > 15) for low rainfall areas (Annual rainfall ≤ 1300 mm)