Total No. of Questions : 10]

SEAT No. :

P4934

[Total No. of Pages : 5

[4959]-1022
B.E. (Civil)
ADVANCED TRANSPORTATION ENGINEERING
(Elective - IV(B))

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) ***Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8, Q.9, or Q.10.***
2) ***Figures to the right indicate full marks.***

Q1) Explain the following models in brief.

a) Fratar model **[5]**

b) Furness model **[5]**

OR

Q2) Explain the gravity model used for trip distribution, in detail. **[10]**

Q3) Compare and contrast between.

a) ARR and IRR **[5]**

b) NPV and B/C ratio **[5]**

OR

Q4) a) Discuss the limitations of the BOT types of projects implemented in the highway sector in Maharashtra. How these limitations can be overcome? **[4+2]**

b) Explain the salient aspects of the proposed Mumbai - Nagpur superfast expressway; including the benefits from the project. **[4]**

Q5) a) Explain with an example the moving vehicle survey method used for determining the journey times as well as the delay times, also for determining the hourly traffic flow. **[10]**

b) Explain grade separated intersection with a neat labelled sketch, highlighting the necessity as well as the salient features. **[6]**

OR

P.T.O.

Q6) Explain the process of :

a) Synchronizing the traffic control signals with the traffic intensity considering mixed flow conditions and the turnings provided. **[6]**

b) Conducting parking surveys and utilizing the data generated for reducing congestion. **[4]**

c) Carrying out traffic studies based on use of modern technology including sensors and automation. **[6]**

Q7) a) Elaborate on the modifications and the provisions made in the IRC - 37, (2012) edition of the guidelines on the design of flexible pavements as compared with the previous edition. **[6]**

b) Design a flexible pavement for the following data and draw a typical cross - section: **[10]**

i) 2 lane single carraigeway

ii) Initial traffic in the year of completion in both directions together - 2000 CVPD.

iii) Traffic growth rate - 4%

iv) Design life - 12 years.

v) Terrain - rolling.

vi) C.B.R. for subgrade varies between 4% to 5%.

OR

Q8) a) Explain the procedure and the computations involved in the conduct of the benkelman beam deflection method as per the IRC codal provisions. What are the advantages and limitations of this method? Elaborate.**[7+3]**

b) Explain the following:

i) AASHTO guidelines **[3]**

ii) Measurement of skid resistance and its importance. **[3]**

Q9) a) Design an overlay as per IRC - 81 for the following data: **[12]**

i) Four lane carriageway.

ii) Initial traffic before start of the construction, considering two way traffic in both directions - 4500 CVPD.

iii) Total construction period - 2 years.

iv) Traffic growth rate - 8%

v) Design life - 10 years

vi) Average annual rainfall - 120 cms

vii) Characterisitic deflection of existing pavement - 0.600mm.

viii) Average temperature - 38°C.

ix) Subgrade soil : clayey.

x) Plasticity index is more than 15 and based on the moisture content and the rainfall value, consider a correction factor of 1.050.

xi) Terrain - rolling.

b) Discuss the advantages of rigid pavements over the flexible pavements. **[6]**

OR

Q10)a) Elaborate on the modifications and the provisions made in the IRC - 58, (2012) edition of the guidelines on the design of rigid pavements as compared with the previous edition. **[6]**

b) Design the tie bars considering plain bars, for the following data: **[8]**

i) Slab thickness - 32 cms.

ii) Lane width - 4 m.

iii) Coefficient of friction - 1.5

iv) Concrete density - 2350 kg/m^3

v) Allowable tensile stress in the plain bar - 1150kg/cm^2

vi) Allowable bond stress in the plain bar - 16 kg/cm^2

vii) Diameter of tie bar - 10 mm

viii) Consider concept of the loss of bond.

c) Explain PCR and its importance in distress surveys. **[4]**

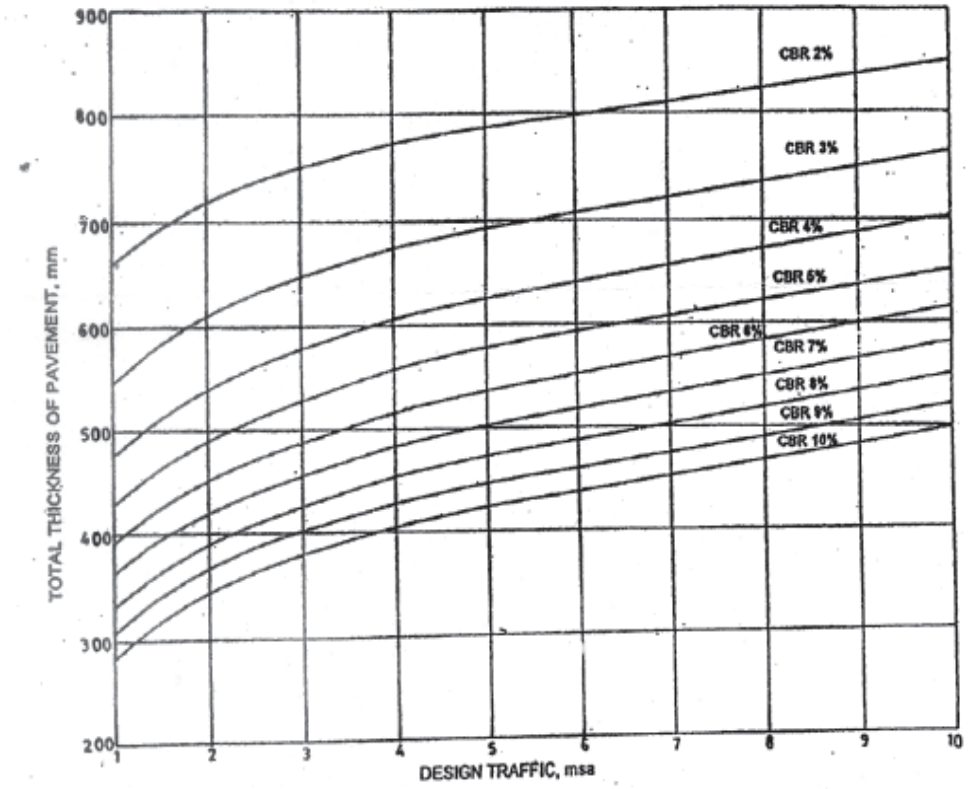

Fig. 1. Pavement Thickness Design Chart for Traffic 1-10 msa

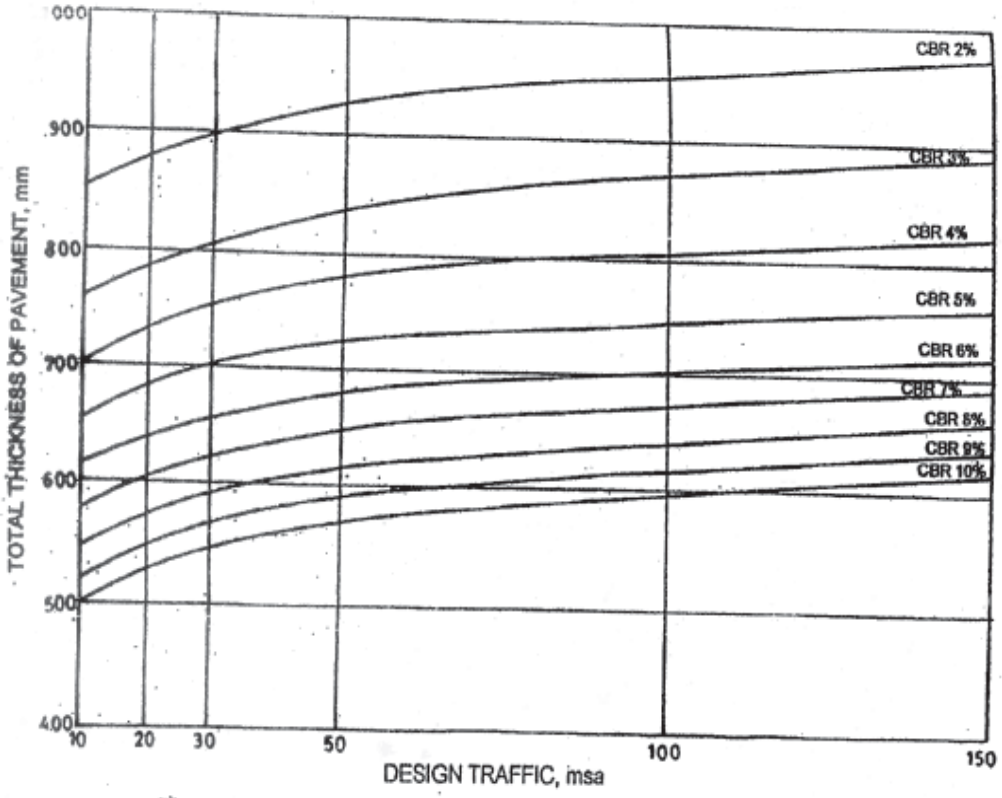

Fig. 2. Pavement Thickness Design Chart for Traffic 10-150 msa

IRC:37-2001

$$h = R \log_{10} \frac{\Delta_0}{\Delta}$$

Where h = thickness of granular overlay (WBM) in mm

Δ_0 = Characteristics deflection,

Δ = allowable deflection

R = Constant, whose value may be taken as 550.

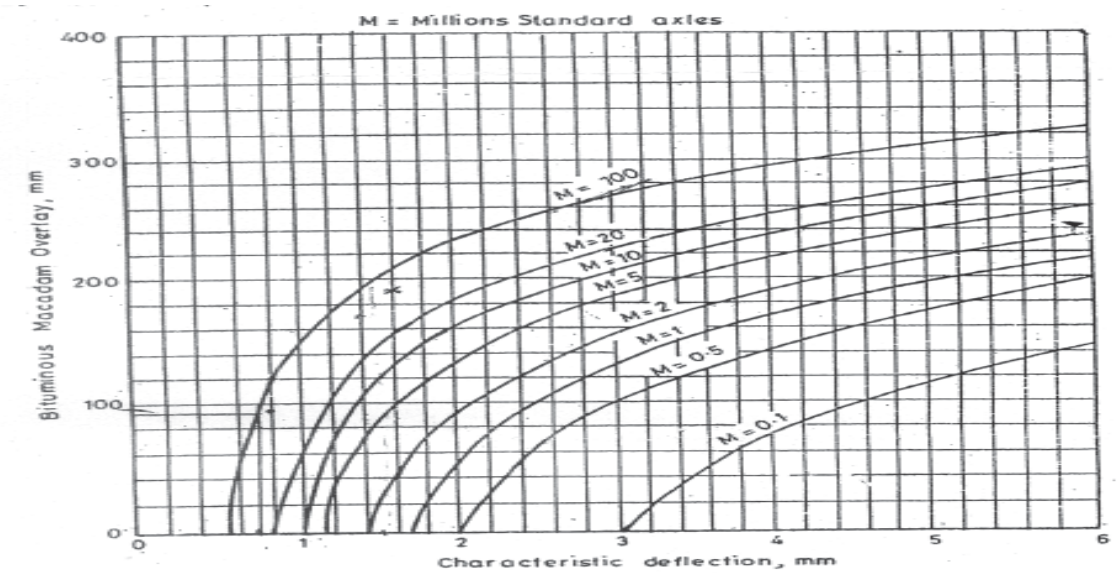

Fig. 25.1. Overlay thickness design curves (IRC).

The latest, IRC guidelines (1997) (Ref.1), does away with the above equation (25.4) and on the other hand, gives a set of curves for determining the overlay thickness. These curves are given in fig. 25.1 The thickness is in terms of bituminous macadam construction. In case other materials are used, the following conversion factors are adopted:

1 cm of bituminous macadam = 1.5 cm of WBM/ WMM/BUSG

= 0.7 cm of Dense Bituminous Macadam/

Bituminous concrete/Semi- Dense Bituminous concrete.

25.3.3 TRRL procedure

A detailed procedure for overlay design has been developed by TRRL (Ref.2.) The method is based on extensive measurements of surface deflection and their relationship with.