[5254] - 522

B.E. (Civil Engg.)

ADVANCED TRANSPORTATION ENGINEERING (Theory)

(Elective - IV) (End Sem.)

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) *Neat diagrams must be drawn wherever necessary.*

3) *Figures to the right indicate full marks.*

4) *Assume suitable data if necessary.*

Q1) a) Explain the principle behind the Gravity Model of trip distribution. Also state the advantages over growth factor models. **[5]**

b) Estimate the total number of trips using Modesto Model based on the following data. **[5]**

   i) No. of dwelling unit = 1000

   ii) No of cars owned per dwelling unit = 2

   iii) Average number of persons per house = 4

   iv) Social Rank Index = 2

   v) Urbanization Index = 4

OR

Q2) a) Highlight the importance of mass transit system in Mumbai. **[5]**

b) Enumerate the salient features of• Pune Metro'. **[5]**

Q3) Urban Mobility is the toughest challenges cities face today. What are the initiatives that you as transportation planner propose? **[10]**

Q4) a) Describe how the PPP model contributed to the growth of infrastructural sector in India. **[5]**

b) Write a note on Pavement Management System. **[5]**

Q5) a) Explain the necessity and types of grade separated intersections. **[6]**

b) Write a note on 'Level of Service' of a road. **[5]**

c) Describe the various types of on-street parking facilities **[5]**

OR

Q6) a) With reference to household survey, explain the objective. sampling size, procedure and sample questionnaire of such a survey. **[12]**

b) What are the advantages of mechanical methods of conducting traffic surveys over the manual methods. **[4]**

Q7) a) Design a flexible pavement as per IRC 37 - 2001 using the following data : Also draw a typical cross section showing all the basic layers. **[10]**

    i)   Type of road = Dual three lane carriageway

    ii) CVPD in the year 2012 = 1500 (in one direction)

    iii) Expected year of completion = 2016

    iv) Traffic growth rate = 7.5%

    v)   Design life = 10 years

    vi) Vehicle Damage factor = 4.5

    vii) Design CBR = 5%

b) With neat sketches explain any three types of distresses on flexible pavements. **[6]**

OR

Q8) a) Explain the procedure of field data collection during Benkelman Beam Survey, computation of characteristic deflection and the correction for pavement temperature. **[12]**

b) Explain the concept of 'pavement deflection' as a measure of structural evaluation of flexible pavement. **[4]**

Q9) a) The design traffic for a major road with heavy traffic is found to be 77 msa. From the BBD survey, the mean value of deflection (Dm) = 1.28 mm and the standard deviation of deflection = 0.26 mm. The temperature of the pavement during study is 45°C. and the correction factor for seasonal variation in subgrade moisture content = 1.3. Determine the thickness of the overlay if DBM binder course and BC surface course is to be adopted. **[8]**

b) What do you mean by overlay? Enumerate the various type of overlays used in India. **[6]**

c) Write a note on warping stresses developed during the day in cement concrete pavement. **[4]**

OR

Q10) a) Design the tie bars considering plain bars for the following data : **[8]**

    i) Slab thickness = 32 cm

    ii) Lane width – 3.5 m

    iii) Coefficient of friction = 1.5

    iv) Density of concrete = 2500 kg/m^3

    v) Allowable tensile stress in plain bars = 1200 kg/cm^2

    vi) Allowable bond stress = 17 kg/cm^2
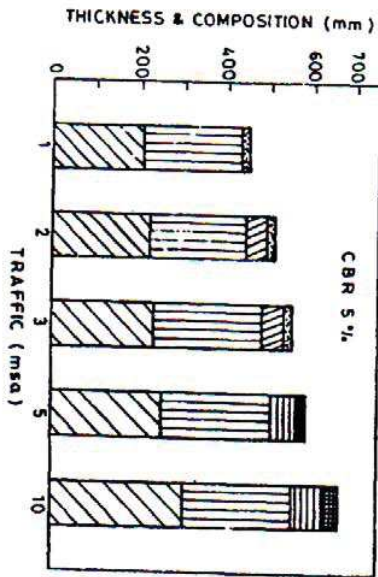
    vii) Diameter of tie bar = 12 mm

b) What is the scope of constructing cement concrete roads in India? **[6]**

c) State the difference between IRC 58 - 2002 and the revised IRC 58 - 2012 **[4]**

PLATE 1 – RECOMMENDED DESIGNS FOR TRAFFIC RANGE 1-10 msa

PAVEMENT DESIGN CATALOGUE

CBR 5%

Cumulative Traffic (msa)	Total Pavement Thickness (mm)	PAVEMENT COMPOSITION			
		Bituminous Surfacing		Granular Base (mm)	Granular Sub-base (mm)
		Wearing Course (mm)	Binder Course (mm)		
1	430	20 PC		225	205
2	490	20 PC	50 BM	225	215
3	530	20 PC	50 BM	250	230
5	580	25 SDBC	55 DBM	250	250
10	660	40 BC	70 DBM	250	300

THICKNESS & COMPOSITION (mm)

CBR 5%

TRAFFIC (msa)

Legend: GSB, GB, DBM, BM, BC, SDBC, PC

Contd.

PLATE 1 – RECOMMENDED DESIGNS FOR TRAFFIC RANGE 1-10 msa

PAVEMENT DESIGN CATALOGUE

CBR 6%

Cumulative Traffic (msa)	Total Pavement Thickness (mm)	PAVEMENT COMPOSITION			
		Bituminous Surfacing		Granular Base (mm)	Granular Sub-base (mm)
		Wearing Course (mm)	Binder Course (mm)		
1	390	20 PC		225	165
2	450	20 PC	50 BM	225	175
3	490	20 PC	50 BM	250	190
5	535	25 SDBC	50 DBM	250	210
10	615	40 BC	65 DBM	250	260

THICKNESS & COMPOSITION (mm)
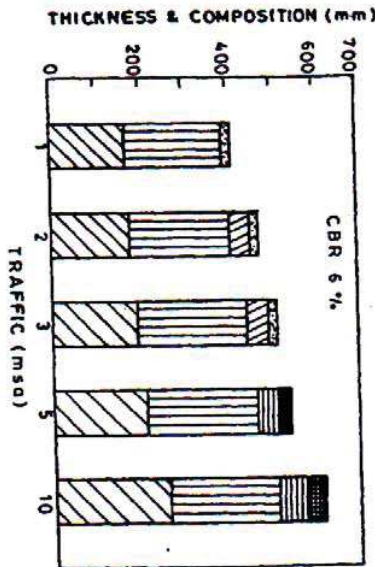
CBR 6%

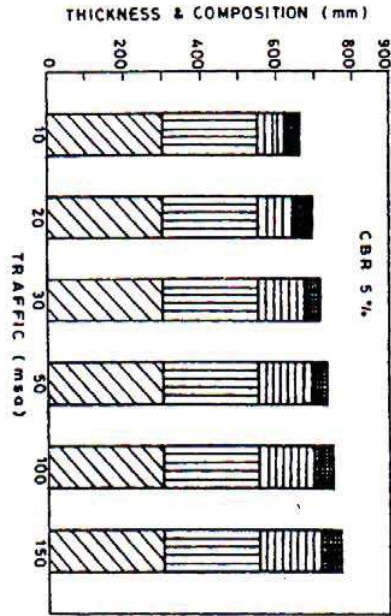TRAFFIC (msa)

Legend: GSB, GB, DBM, BM, BC, SDBC, PC

Contd.

PAVEMENT DESIGN CATALOGUE
PLATE 2 – RECOMMENDED DESIGNS FOR TRAFFIC RANGE 10-150 msa

CBR 5%

Cumulative Traffic (msa)	Total Pavement Thickness (mm)	PAVEMENT COMPOSITION		Granular Base & Sub-base (mm)
		Bituminous Surfacing		
		BC (mm)	DBM (mm)	
10	660	40	70	
20	690	40	100	
30	710	40	120	Base = 250
50	730	40	140	
100	750	50	150	Sub-base = 300
150	770	50	170	

THICKNESS & COMPOSITION (mm)

CBR 5%

TRAFFIC (msa)
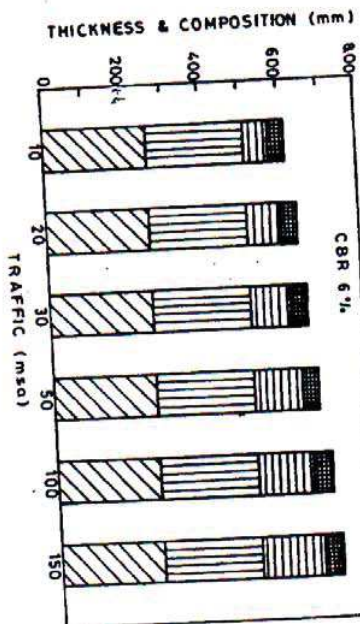
GSB   GB   DBM   BC

32

Contd.

PAVEMENT DESIGN CATALOGUE
PLATE 2 – RECOMMENDED DESIGNS FOR TRAFFIC RANGE 10-150 msa

CBR 6%

Cumulative Traffic (msa)	Total Pavement Thickness (mm)	PAVEMENT COMPOSITION		Granular Base & Sub-base (mm)
		Bituminous Surfacing		
		BC (mm)	DBM (mm)	
10	615	40	65	
20	640	40	90	
30	655	40	105	Base = 250
50	675	40	125	
100	700	50	140	Sub-base = 260
150	720	50	160	

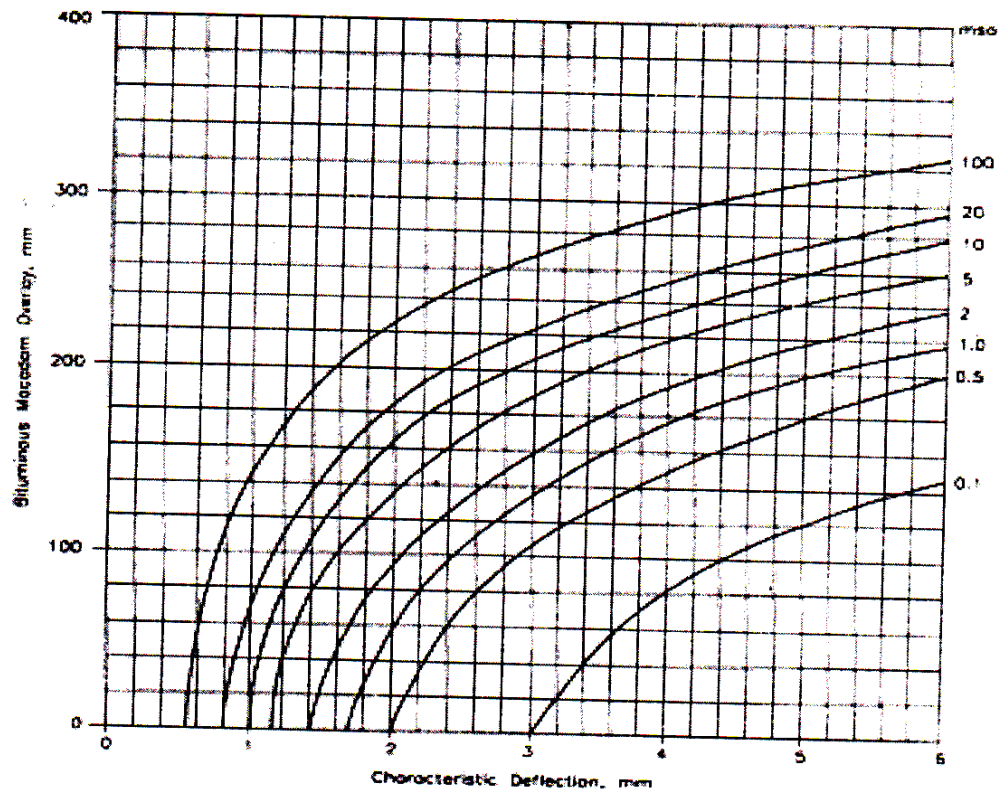THICKNESS & COMPOSITION (mm)

CBR 6%

TRAFFIC (msa)

GSB   GB   DBM   BC

33

Contd.

Fig. 9. Overlay Thickness Design Curves

19

♦♦♦♦