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B.Tech.
FIFTH SEMESTER EXAMINATION, 2016-17
TRANSPORTATION ENGINEERING-I

[Time: 3 Hours] [Total Marks: 100]

Note: Attempt ***ALL*** questions. Assume suitable data, if required. All question carry equal marks.

1. Attempt any *FOUR* parts of the following:- **(5x4=20)**

(a) Discuss the Third 20 year road development plan (1981-2001) and its salient features in brief.

(b) What are the different types of road patterns. Describe with the help of neat sketches.

(c) Write a note on road development in India during the 21st century.

(d) How the roads were classified as per Nagpur road Plan. Explain the various categories of roads, as per Nagpur Road Plan.

(e) What was the recommendation of Jaykar committee and how it was implemented?

(f) Give the salient features of Bombay Road Development Plan.

2. Attempt any *TWO* parts of the following:- **(10x2=20)**

(a) Calculate the Overtaking Sight Distance for a two lane both directional traffic flow, for the Design Speed of 100kmph. Assume all data suitably. Take reaction time 2.5 sec, and max overtaking acceleration as 0.53 m /sec^2.

(b) A valley curve is formed by a descending grade of 1in 25 meeting an ascending grade of in 30.Design the length of valley curve to fulfill both comfort condition and head light sigh distance requirement condition for a design speed of 80 kmph. Take C= 0.6 m/s^3.

(c) Calculate the length of transitition curve for design speed of 65 kmph, radius of circular curve 220m, and pavement width including extra widening 7.5m. The pavement is rotated about the central line and the allowable rate of introduction of superelevation is 1 in 150.

3. Attempt any *TWO* parts of the following:- **(10x2=20)**

(a) What are the various types of road intersection? Describe in brief with simple sketches.

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(b) Spot speed studies were carried out at a certain stretch of a highway. With mixed traffic flow and the consolidated data are given below. Determine the upper and lower values or speed limit for installing speed regulation signs at this road stretch and the design speed for checking the geometric design elements of the highway.

Speed Range (KMPH)	00 - 10	11 - 20	21 - 30	31 - 40	41 - 50	51 - 60	61 - 70	71 - 80	81 - 90	91 - 100
No of Vehicle observed	12	18	68	89	204	255	119	43	33	9

(c) Show the relationship between speed and travel time, speed and density, speed and volume, and density and volume through graphical presentation and discuss.

4. Attempt any *TWO* parts of the following:- **(10x2=20)**

(a) What are the various tests carried out on bitumen? Explain the procedure of determining the penetration Value.

(b) Determine the warping stresses at interior, edge, and corner of a 25 cm thick CC pavement slab with a transverse joints at 5.0m interval and longitudinal joints at 3.6m intervals. The modulus of subgrade reaction, K is 6.9 kg / cm^3 and radius of loaded area is 15 cm. Assume maximum temperature differential during day to be 0.6 ^{0}C per cm slab thickness (for warping stresses at interior and edge) and maximum temperature differential of 0.4^{0}C per cm slab thickness during the night (for warping stress at the corner). Additional data are given below.

e=10X10^{-6} per ^{o}C E= 3X10^5 kg/cm^2 μ = 0.15. Use Fig-1.

(c) The initial traffic after completion of construction of a four lane divided highway is estimated to be 3500 cv per day. Design the flexible pavement for a life of 15 years using the data given below.

Deign CBR Value = 8%, Growth rate of cv = 6.5% p a, Average VDF value of cv = 4.0. Use Fig 2 and Table 1.

5. Attempt any *TWO* parts of the following:- **(10x2=20)**

(a) Write the construction procedure of CC roads.

(b) What do you understand by bitumen surface dressing? Write the construction steps of bitumen surface dressing.

(c) Write short notes on construction of contraction joint without a dowel bar.

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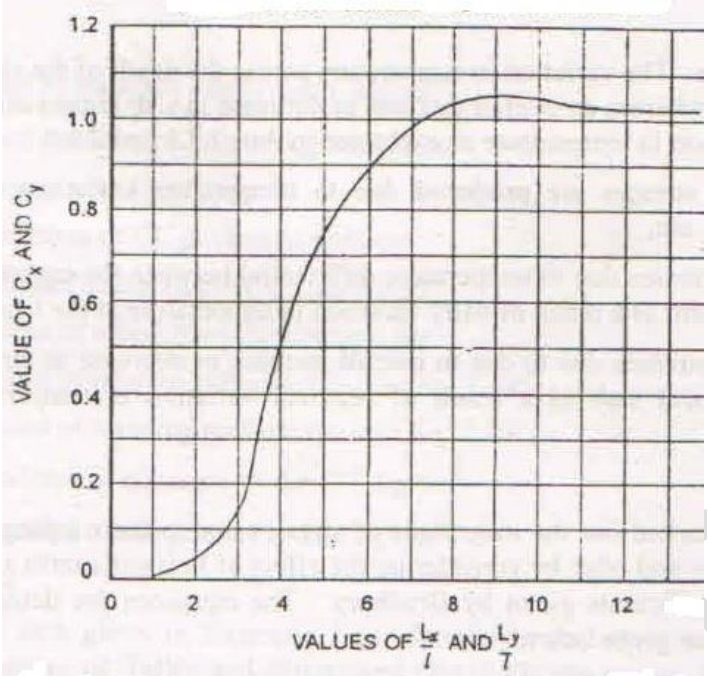

Warping stress coefficient chart

Fig-1

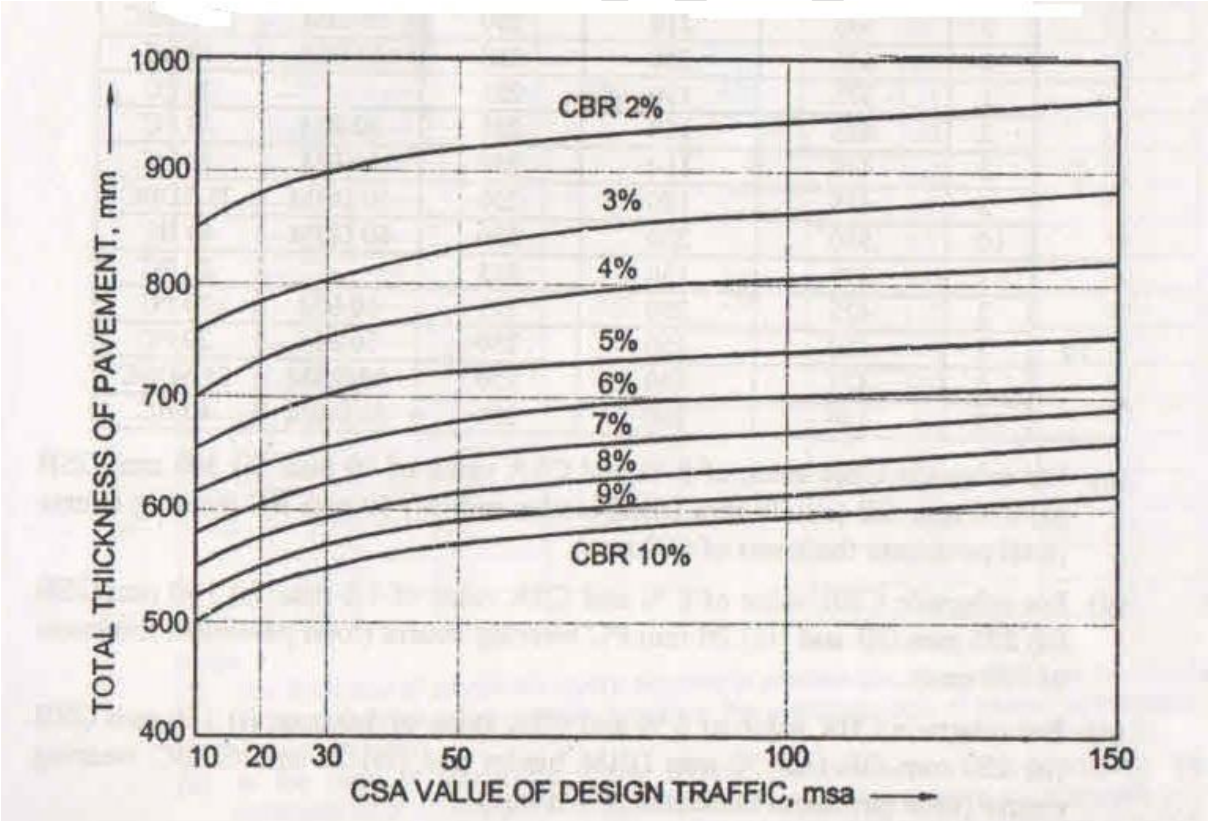

Fig. 2 CBR design chart for determination of total pavement thickness for traffic with CSA of 10 to 150 msa

Table 1 Pavement design with recommended component layers for cumulative traffic range 10 to 150 msa

CBR, %	CSA, msa	Total pavement thickness, mm	Granular sub-base, mm	Granular base, mm	Dense bituminous Macadam binder course, mm	Bituminous concrete surface course, mm
3	10	760	380	250	90	40
	20	790			120	40
	30	810			140	40
	50	830			160	40
	100	860			180	50
	150	890			210	50
4	10	700	330	250	80	40
	20	730			110	40
	30	750			130	40
	50	780			160	40
	100	800			170	50
	150	820			190	50
6	10	615	260	250	65	40
	20	640			90	40
	30	655			105	40
	50	675			125	40
	100	700			140	50
	150	720			160	50
8	10	550	200	250	60	40
	20	575			85	40
	30	590			100	40
	50	610			120	40
	100	640			140	50
	150	660			160	50
10	10	540	200	250	50	40
	20	565			75	40
	30	580			90	40
	50	600			110	40
	100	630			130	50
	150	650			150	50

Notes:

(1) The thickness of pavement layers adopted in practice should be based on the mix design of the pavement layer material including the maximum size of coarse aggregates used and its gradation.

(2) In the case of bituminous binder course, the thickness of layers adopted may be preferably 50 or 75 mm and in multiples of these values depending on the aggregate gradation adopted in the mix. In practice the generally maximum thickness of DBM layer is limited to 75 mm; however even 100 mm thick layer may be laid if appropriate equipment are made use of.

(3) In the case of bituminous concrete surface course, the minimum recommended thickness is 40 mm for moderate traffic and 50 mm for heavy traffic roads. It is suggested that other odd thickness values like 35 or 45 mm are not to be recommended.

(c) For subgrade CBR value of 8 % and CSA value of 150 msa: (i) 200 mm GSB (ii) 250 mm GB (iii) 160 mm DBM binder and (iv) 50 mm BC surfacing (total pavement thickness of 660 mm)

(d) For subgrade CBR value of 10 % and CSA value of 50 msa: (i) 200 mm GSB (ii) 250 mm GB (iii) 110 mm DBM binder and (iv) 40 mm BC surfacing (total pavement thickness of 600 mm)