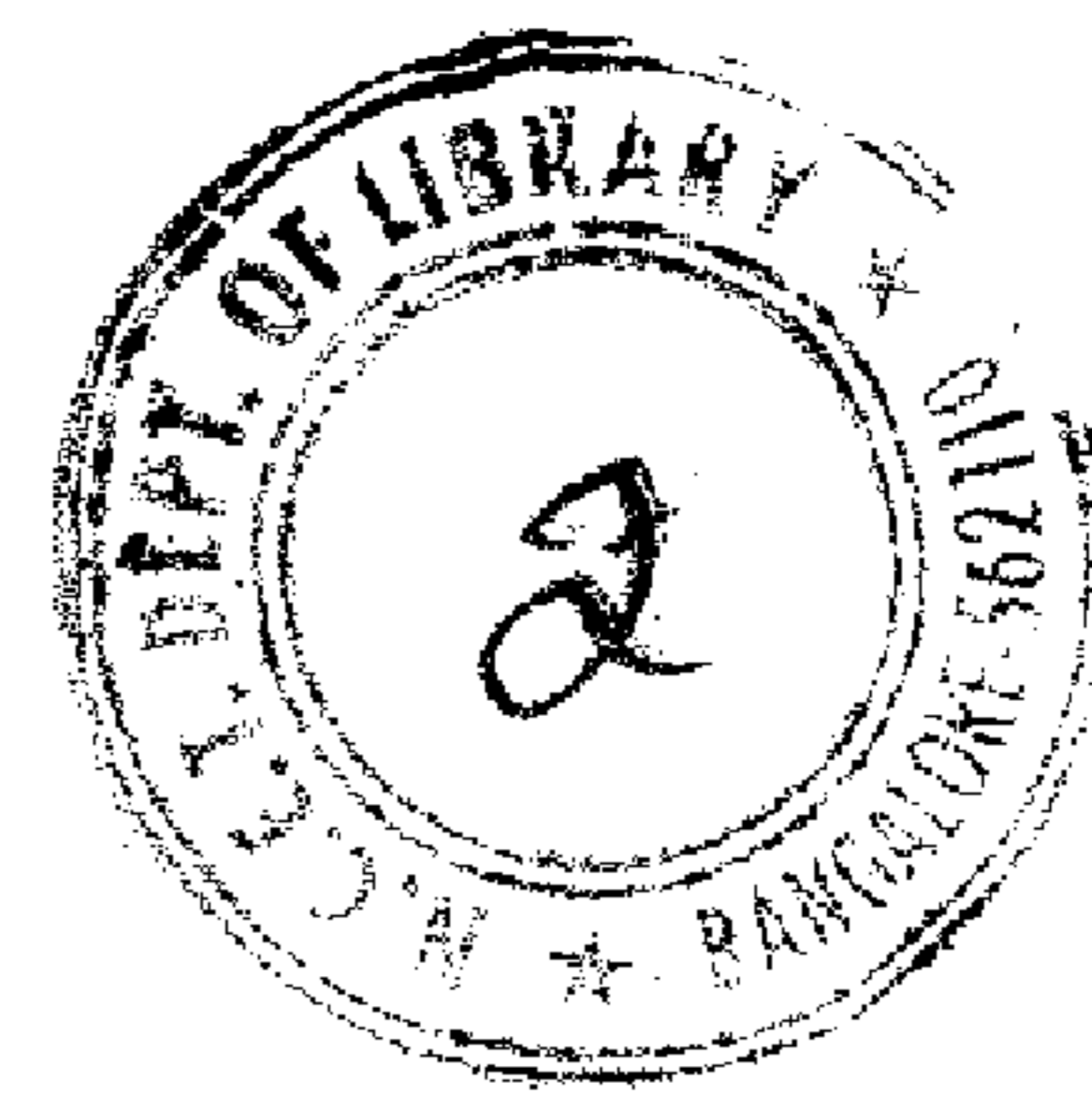


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Fifth Semester B.E. Degree Examination, June-July 2009
Transportation Engineering - I

Time: 3 hrs.

Max. Marks:100

Note: Answer any FIVE full questions selecting at least Two questions from each part.

PART - A

- 1
 - a. Discuss the role of transportation in National development. (06 Marks)
 - b. Compare road transportation with other modes of transportation. (06 Marks)
 - c. What is Jayakar committee and what are its recommendations? How is it implemented? (08 Marks)

- 2
 - a. With neat sketches, explain different road patterns. (06 Marks)
 - b. What is saturation system of road planning? How is it used to decide the best proposal among several alternative proposals? (06 Marks)
 - c. The area of certain backward district in India is 18400 KM² and there are 15 towns as per 1981 census. Determine the length of different categories of roads by third road development plan. (08 Marks)

- 3
 - a. Discuss the survey steps to be followed for new highway alignment. (06 Marks)
 - b. Explain briefly any two important surface characteristics influencing highway geometric design. (06 Marks)
 - c. Define right of way. List the factors affecting right of way. With dimensions draw a typical cross section of divided highway in urban area. (08 Marks)

- 4
 - a. List the factors affecting SSD and OSD. (04 Marks)
 - b. The design speed of overtaking vehicle is 60 Km/h. The rate of acceleration of the above vehicle is 3.6 Km/h/sec. The difference in speed between over taking and overtaken vehicle is 20Km/h. Calculate OSD as per IRC guidelines for a lane with two way traffic. (08 Marks)
 - c. Calculate the length of transition curve for a plain and rolling terrain for the following data: Design speed = 80 Km/h, Radius of curve = 250m, Road width = 7.0m, Maximum allowable rate of super elevation 1 in 150, Super elevation maximum restricted to 0.07. Assume pavement is rotated with respect to centerline. (08 Marks)

PART - B

- 5
 - a. Explain the desirable properties of good sub grade soil. (08 Marks)
 - b. Distinguish between bitumen and tar. (06 Marks)
 - c. A plate load test is conducted in the field and the following are the results obtained after the test. Find the modulus of sub grade reaction if the radius of contact plate is 150 mm. (06 Marks)

Load (KN)	0	1	5	10	15	20	25	30	35	40
Mean Settlement (mm)	0.00	0.05	0.20	0.60	0.80	1.05	1.15	1.30	1.40	1.50

- 6
 - a. Compare flexible pavement with rigid pavement. (04 Marks)
 - b. Design the flexible pavement as per IRC 37 – 2001 for construction of new highway for the following data: Number of commercial vehicle as per last count = 1200 CV, period of construction = 3 years, Annual growth rate = 7.5%, Design CBR of soil = 10%. Category of road = NH Two lane carriage way, Design life = 15 years. VDF = 3.5, LDF = 75%. Calculate the over all thickness and individual layer thickness using pavement design catalogue given in table 6(b). (08 Marks)

Table 6(b). Pavement Design Catalogue
Recommended design for Traffic Range 10-150 msa
CBR 10%

Cumulative Traffic (msa)	Total Pavement Thickness (mm)	Pavement Composition		
		Bituminous Surfacing		Granular Base and Sub Base (mm)
		BC (mm)	DBM (mm)	
10	540	40	50	Base = 250
20	565	40	75	
30	580	40	90	
50	600	40	110	Sub-base = 200
100	630	50	130	
150	650	50	150	

- c. Design the pavement slab thickness by IRC 58 – 2002 method for the following data. $K = 8 \text{ kg/cm}^3$, present traffic intensity = 1000 cvd, $P = 5100 \text{ kg}$, Radius of contact = 15cm, Flexural strength of concrete = 45 kg/cm^2 , $E = 3 \times 10^5 \text{ kg/cm}^2$, $\mu = 0.15$, $\alpha = 10 \times 10^{-6} / ^\circ\text{C}$, Rate of traffic increase = 7.5%, Temperature differential of the given location = 17.6°C . When $\frac{L}{l} = 5$, $C = 0.720$; $\frac{L}{l} = 6$, $C = 0.920$. The load stress chart for edge stress is provided in fig.6(c). (08 Marks)

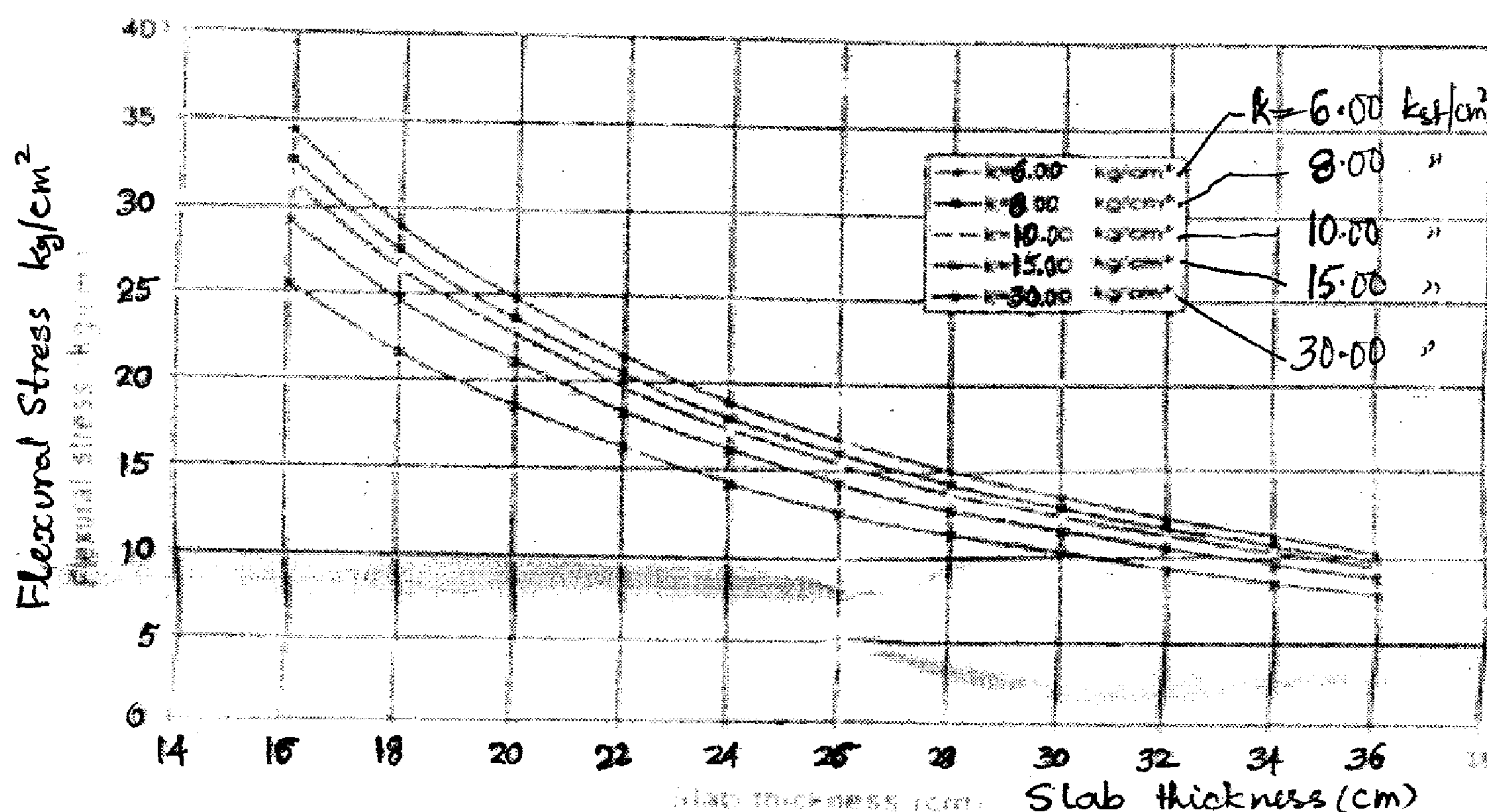


Fig.6(c). Stresses in Rigid pavements (Single Axle Load = 10 tons)

- 7 a. Explain the construction steps of i) Water bound Macadam; ii) Cement concrete pavement. (12 Marks)
- b. Explain the important design steps for longitudinal drains of a road to drain off surface water. (08 Marks)
- 8 a. Explain briefly BOT and BOOT. (06 Marks)
- b. Explain the causes and remedies for i) Rutting; ii) Corrugations. (06 Marks)
- c. It is proposed to widen a stretch of a single lane road of length 40 Km to two lanes at a total cost of Rs.6.5 lakhs per km. The rate of interest is 10% per year. The annual cost of maintenance of the existing single lane road is Rs.7000 per km and that of improved two lane road is Rs.9000 per km. The average VOC on the existing road is Rs.1.30 per vehicle – km and that on the improved road is estimated to be Rs.1.15 per vehicle – km. If the present traffic is 2000 motor vehicles/day, by the end of 15 years of design period the traffic is estimated to be doubled. Determine whether the investment on the improvement of road is economically viable, during the 15 years period. (08 Marks)
