(c) It is proposed to construct a new National Highway with Four lane dual carriageway. The initial traffic at the year of completion of construction is 1200 CVPD. The given site is having moderate quality of soil with CBR of 6%. Design the flexible pavement for the analysis period of 15 years as per IRC-37:2001. Assume the rate of growth of traffic, Vehicle Damage Factor and lane distribution factor as 7.5% per year, 4.5 and 0.45 respectively. [3]

4. (a) List the different kinds of distresses in flexible pavements and discuss any two of them. [4]

(b) Describe the procedure for construction of joints in rigid pavements. [4]

(c) A cement concrete pavement of two lanes, each 3.5 m with a longitudinal joint along the centre has been proposed for the construction of a new road. Design the dimensions of tie bars from the following data as per IRC 58: 2002 guidelines. [3]

Slab thickness	= 25 cm
Radius of relative stiffness	= 80 cm
Design wheel load	= 5000 kg
Allowable stresses in steel (for flexure)	= 1400 kg /cm^2
Allowable stresses in steel (for shear)	= 1000 kg /cm^2
Allowable bearing stresses in concrete	= 120 kg/ cm^2

(d) Also design the dowel system with the help of above data. Assume load capacity of the dowel system and diameter of the dowel bar as 40% of the design wheel load and 2.5 cm respectively. Assume width of joint as 2.0 cm. [4]

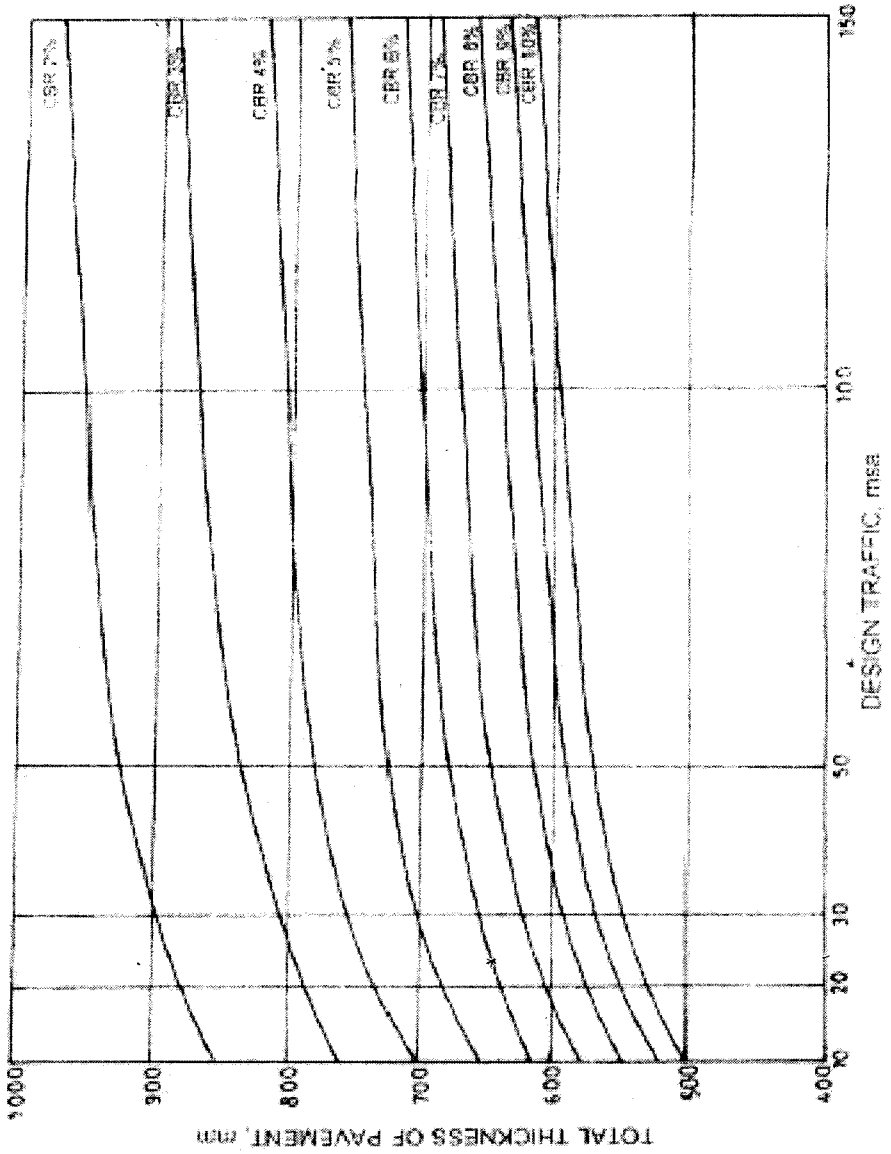
5. A Cement Concrete Pavement is to be designed for a two-lane two-way National Highway in Kerala State. The total two-way traffic is 3000 CVPD at the end of construction period. Design the rigid pavement for the traffic and check for the temperature stress and corner stress. The design parameters are: [6]

Flexural strength of cement concrete	= 45 kg/cm^2
Effective modulus of subgrade reaction of the DLC subbase	= 8 kg/cm^3
Elastic modulus of concrete	= 3 x 10^5 kg/cm^2
Coefficient of thermal expansion of concrete	= 10 x 10^{-6}/°C
Tyre pressure	= 8 kg/cm^2
Rate of traffic increase	= 7.5%
Width of the slab	= 3500 mm
Trial thickness of the slab	= 33cm

The axle load spectrum obtained from axle load survey and corresponding flexural stresses from charts are given below:

Axle load Class, kg	Percentage of Axle loads	Flexural Stress, kg/cm^2 (from charts)
19000 – 21000	1.5	24.10
17000 – 19000	1.5	22.00
15000 – 17000	5.0	19.20
13000 – 15000	12.0	17.64
11000 – 13000	25.0	14.50
9000 – 11000	25.0	12.50
Less than 9000	30.0	12.50

****


CBR 3%
CBR 4%
CBR 5%
CBR 6%
CBR 7%
CBR 8%
CBR 9%
CBR 10%
1000
900
800
700
600
500
400
2
5
10
20
50
100
150
TOTAL THICKNESS OF PAVEMENT, mm
DESIGN TRAFFIC, msa