T.E VI Civil
CBGS.

28.5.15

QP Code : 4980

Trans. Engg -II

(3Hours) [Total marks : 80

N.B (1)Question **No. 1 is compulsory**.
(2)Attempt any **Three** out of remaining **Five**
(3) Assume any other **data** if **required.**
(4) Illustrate your answers with neat **sketches** wherever **required.**

1. Attempt any **four.** **20**

(a) In a certain project of highway construction the reconnaissance survey has identified three possible alignments. State the important facts that would effect the choice of one particular way in preference to the other.

(b) What do you mean by 'scouring' and how "scour depth" is determined?

(c) Draw a typical cross section of a highway on embankment and show the various flexible pavement layers.

(d) Observation were recorded in a 100m stretch of the road, the travel time for vehicles to ply this section is as follows:

Vehicles	Travel time(sec)
10	12
07	03
30	15

What would be Time mean speed and Space mean speed.

(e) Differentiate between Radius of relative stiffness and equivalent radius of resisting section.

2. a. Calculate the ESWL for a wheel load of 2050kg in a dual wheel axle to be applied on a road of 300mm thick. The distance between centres of wheel to be taken as 250mm and the edge distance between tyres as 120mm. **08**

b. Why is it important for a highway engineer to study the properties and behavior of soil, aggregate and bituminous materials? State their desirable properties. **12**

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3. a. What are the requirements of good joints? Why are joints provided in cement concrete roads? **08**

b. Show that the design thickness of a concrete pavement slab is safe for combined load and temperature stresses for edge loading conditions given the following data **12**

Design thickness=20cm, Impact factor=10%, Maximum wheel load=4080kg, Modulus of elasticity of concrete=3×10^5kg/cm^2,Modulus of subgrade reaction=6kg/m , , Tyre pressure=7kg/cm^2

Poisson's ratio of concrete=0.2Slab dimensions=4.5×3.8m, Thermal co-eff. Of concrete=8×10^{-6}/°C,Temperature difference during the day=0.5°C/cm

Allowable flexural strength of concrete=35kg/cm^2

L/l (or) W/l	C	L/l (or) W/l	C
1	0.000	7	1.030
2	0.040	8	1.077
3	0.175	9	1.080
4	0.440	10	1.075
5	0.720	11	1.050
6	0.920	12	1.000

4. a. Speed and delay studies are conducted on a stretch of road measuring 4km in NS direction. From this data determine Journey speed and running speed of traffic stream in either direction. Determine average values of volume too. **15**

Trip No.	Direction	Journey time		Delay time		Vehicles		
		min	sec	min	sec	Overtaking	Overtaken	From opposite direction
1	N-S	6	35	1	30	5	9	250
2	S-N	7	00	1	40	6	3	180
3	N-S	6	50	1	30	5	3	280
4	S-N	7	50	1	30	2	1	200
5	N-S	6	00	1	00	3	4	230
6	S-N	8	15	2	20	2	2	150
7	N-S	6	25	1	30	2	5	300
8	S-N	7	30	1	40	3	2	160

b. Explain the term traffic volume. Indicate how the traffic volume data are presented and the results used in traffic engineering **05**

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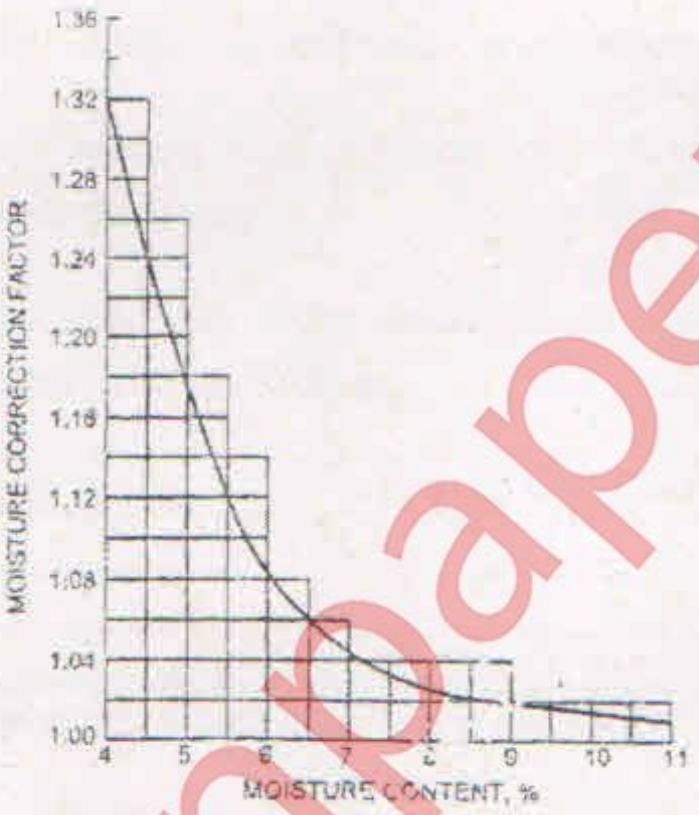
5. a. Benkelman beam deflection studies were carried out on a highway pavement with 50mm thick bituminous surface course, when the mean pavement surface temperature was 40°C and the field moisture content of subgrade soil was 5.5%. The soil is found to be sandy and the annual rainfall of the region is 950mm. The characteristic deflection value of the selected sub stretch is found to be 1.32mm. Determine the corrected deflection value after appling the corrections for temperature and variation in subgrade moisture. 10



Sandy / Gravelly Soil for Low Rainfall Areas (Annual rainfall < 1300 mm)

b. Enumerate the broad classification of maintenance activities. 10

6. a. State the importance of extra widening required on a horizontal highway pavement. Calculate extra widening required for a pavement of 7.5m on a horizontal curve of radius 300m if the longer wheel base of vehicle on the road is 6.5m. Design speed is 100km/h. Compare the value obtained with IRC recommendations. 10

b. What is grade compensation in geometric design of highways? Why is it essential on curves? While aligning a hill road with a ruling gradient of 6%, a horizontal curve of radius 60m is encountered. Find the grade compensation and the compensated gradient at curve. 10