

**THAPAR INSTITUTE OF ENGINEERING & TECHNOLOGY**  
End Semester examination  
CE-041, Transportation engineering

Time: 3hrs

M.M: 72

**Note: Attempt any four questions from first five questions . Q No.6 is compulsory.**

1a) The area of Orissa is 1,74,000 sq. km. According to the 1981 census the number of villages was 29,390. Calculate the total road length of various categories as per the 1981-2001 Road Development plan.

b) What are the various requirements of an ideal highway alignment. What are the various factors controlling the alignment of roads? (7,7)

2a) State factors on which OSD depends. Derive an expression for calculating OSD on a highway

b) A two lane NH passing through a flat terrain has a horizontal curve of radius 300m. If the design speed is 100kmph, calculate absolute minimum sight distance, superelevation, extra widening and length of transition curve. Assume necessary data suitably. (6,8)

3a) The table gives the data collected from speed and delay studies by floating car method on a stretch of urban road of length 4.0 km, running N-S. Determine the average values of volume, journey speed and running speed of traffic stream along either direction.

Trip no.	Direction of trip	Journey time m-sec	Total stopped delay m-sec	No. of vehicles overtaking	No. of vehicles overtaken	No. of vehicles from opposite direction
1	N-S	7-10	1-00	4	8	342
2	S-N	8-14	2-00	6	6	235
3	N-S	6-15	1-40	2	7	132
4	S-N	8-10	2-15	8	4	321
5	N-S	7-20	1-00	6	8	300
6	S-N	6-28	2-20	9	5	211
7	N-S	7-30	1-30	5	7	175
8	S-N	8-40	1-30	7	2	236

b) How are spot speed studies carried out? (8,6)

4a) Explain 'Flexible and Rigid' pavements and bring out the points of difference.

b) The C.B.R test carried out on a subgrade soil gave the following readings

Penetration, mm	Load, kg	Penetration, mm	Load, kg
0.0	0.0	3.0	58.0
0.5	4.0	4.0	70.0
1.0	14.0	5.0	77.5
1.5	30.0	7.5	93.2
2.0	41.0	10.0	102.5
2.5	50.0	12.5	110.8

What will be the CBR value of the subgrade? (6,8)

5a) Specify the materials required for construction of WBM roads. What are the uses and limitations of this type of road? Briefly explain the construction of WBM road.

b) Explain with sketches how the subsurface drainage system is provided to lower the water table and control seepage flow. (8,6)

6. Write short notes on any four

- Mastic Asphalt
- Highway economics
- Pavement maintenance
- Bitumen surface treatment
- Wheel load stresses in C.C pavement

(16)