Original

Reg. No.										

MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL

(A constituent unit of MAHE, Manipal)

III SEMESTER B.TECH (CIVIL) END SEMESTER EXAMINATIONS

FEB 2021

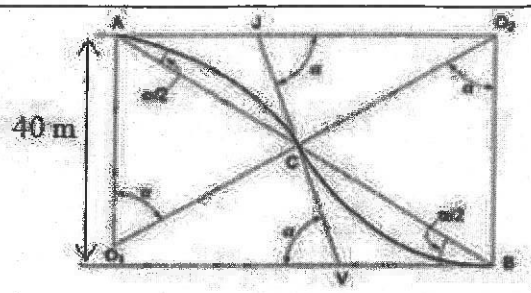
SUBJECT: HIGHWAY ENGINEERING [CIE 2152]

Date of Exam: Time of Exam: Max. Marks: **50**

Instructions to Candidates:

- Answer ALL the questions & missing data may be suitably assumed

1A.	A horizontal curve of radius 425m was necessary for highway alignment in built-up area. Also, the design speed = 75kmph, length of wheel base of largest truck = 6.0m and width of pavement is 10.5m. Design the following geometric features from given data (a) super elevation, (b) extra widening of pavement, (c) length of transition curve.	**5**
1B.	Evaluate the safe stopping sight distance on level road stretch for design speed of 60kmph (a) 2 way traffic on two lane road (b) two way traffic on a single lane road. Assume standard suitable data (g = 9.8)	**3**
1C.	Write a short note on functions of road shoulder	**2**
2A.	The overtaking and overtaken vehicle speeds are 60kmph and 30kmph respectively on a two way traffic road. (i) Calculate the safe overtaking sight distance, (ii) what is the minimum length of overtaking zone, (iii) Draw a neat sketch of the overtaking zone and show the positions of the sign posts (a = 0.99 m/sec^2).	**5**
2B.	Design the sag curve to satisfy both comfort condition and head light sight distance requirements for design speed of 70kmph. Assume allowable rate of change of centrifugal acceleration C= 0.6 m/sec^3, n1= - (1/20) and n2= (1/25)	**3**
2C.	Write a short note on road kerbs.	**2**
3A.	Explain in detail with a neat figure the method of setting out a simple circular curve by Rankine's method of deflection curve.	**4**
3B.	Calculate all the data required to set out a simple curve of 8° by the method of i) Perpendicular offsets ii) Radial offsets from tangent, take the chain of length as 20m with peg interval of 5m (at least 4 offsets)	**4**
3C.	A reverse curve ABC is to be set out between two parallel straights 40m apart. If R1 = R2 and the distance ACB is 150m. Calculate the radius and deflection angle α.	**2**



4A. The data collected from the floating car method is given below. Determine journey time, average values of volume, journey speed and running speed in both the direction of the traffic stream. The test run was carried out for a distance of 5km. **5**

Trip No	Direction of trip	Journey Time		Total stopped delay		No. of vehicles		
		Min.	Sec.	Min.	Sec.	Over-taking	Over-taken	Opp. direction
1	N-S	18	30	2	40	11	16	364
2	S-N	16	10	3	40	16	14	320
3	N-S	15	45	3	30	8	7	310
4	S-N	17	40	4	10	6	10	510
5	N-S	13	10	5	30	8	15	350
6	S-N	20	15	5	15	6	25	415
7	N-S	16	35	6	20	4	15	280
8	S-N	20	15	3	40	6	12	250

4B. The speeds of six vehicles were measured (with LIDAR) at the midpoint of a 1km section of roadway. The speeds for vehicles were 42, 52, 45, 49, 62 and 56kmph, respectively. Assuming all vehicles were travelling at a constant speed over this roadway section, calculate the time-mean and space-mean speeds. **2**

4C. What are the objectives of traffic volume study? **3**

5A. Enumerate the difference between the rigid pavements and flexible pavements with respect to properties. **5**

5B. Determine the ESWL for a dual wheel assembly carrying 2050kg on each wheel for a pavement thickness of 8cm and 15cm with a centre line spacing between the tyres is 30cm and the clear distance between the tyres is 12cm. **5**