MANIPAL INSTITUTE OF TECHNOLOGY
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MANIPAL INSTITUTE OF TECHNOLOGY

7TH SEMESTER B.TECH (CIVIL ENGINEERING)

END SEMESTER EXAMINATION, NOV 2023

PAVEMENT MATERIALS AND DESIGN (CIE 4069)

(- - 2023)

TIME: 3 HRS. **MAX.MARKS: 50**

Note: 1. Answer all questions.
2. Any missing data may be suitably assumed.
3. Use of Formula book, Design charts and IRC codes are permitted

Sl.No	Questions	Marks	CO	BL
1A.	The results of Marshall test for five specimen is given below. With the help of these results, decide the optimum bitumen content of the mix.	4	2	5
1B.	Calculate the thickness of concrete overlay as per the US Corp of Engineers method over an existing concrete pavement 15cm thick which is in good condition. It has been found that a new slab of thickness 20cm is actually needed. If so, calculate the overlay thickness for the existing slab if it is badly cracked.	4	4	3
1C.	List out the factors affecting mechanical stabilization.	2	5	1
2A.	Determine the maximum stress due to interior, corner and edge loading on a concrete slab. Given K = 27 .2 MN/m3, h = 254 mm, a = 152 mm, and P = 44.5 kN.	4	3	3
2B.	Explain temperature stresses and their effects on rigid pavements.	3	2	1
2C.	Explain raveling and describe the possible causes of raveling with the help of a neat figure.	3	5	2
3A.	With the help of a neat figure, label all parts of a rigid pavement.	2	1	2
3B.	Briefly explain the different types of rigid pavement.	4	1	2
3C.	List out and explain the properties of the bituminous mix. Explain	4	3	2
4A.	Using neat figures describe the effect of the combination of stresses on rigid pavements.	4	3	2
4B.	Calculate the thickness of an airport flexible pavement for an equivalent single wheel load of 40kN. The subgrade CBR is 5. The tyre pressure is 1.4MN/m2.	3	4	3
4C.	Explain soil cement stabilization and discuss the factors affecting the same.	3	5	2

Bitumen content	Stability (kg)	Flow (units)	V_v (%)	VFB (%)	G_m
3	499.4	9.0	12.5	34	2.17
4	717.3	9.6	7.2	65	2.21
5	812.7	12.0	3.9	84	2.26
6	767.3	14.8	2.4	91	2.23
7	662.8	19.5	1.9	93	2.18

5A.	With the help of a neat figure, explain the Benkelman Beam Deflection Method for structural evaluation of the pavement.	**4**	**5**	**2**
5B.	Design size and spacing of dowel bars at an expansion joint of concrete pavement of thickness 25 cm. Given the radius of relative stiffness of 80 cm. design wheel load 5000 kg. Load capacity of the dowel system is 40 percent of design wheel load. Joint width is 2.0 cm and the permissible stress in shear, bending and bearing stress in dowel bars are 1000, 1400 and 100 kg/cm2 respectively.	**4**	**2**	**6**
5C.	Estimate the design traffic for vehicles of dual wheel assembly for a rigid pavement using the following information: Design wheel load = 4100kg Present traffic = 300 CVPD Design life = 20 years Consider the lane distribution factor to be 25% of the present traffic.	**2**	**3**	**5**