Reg. No.



MANIPAL INSTITUTE OF TECHNOLOGY

(A constituent unit of MAHE, Manipal)

VII SEMESTER B.TECH. (CIVIL) END SEMESTER EXAMINATIONS, APRIL/MAY 2019 SUBJECT: PAVEMENT MATERIALS AND DESIGN [CIE 4011]

Date of Exam:

Max. Marks: 50

Instructions to Candidates:

- ✤ Answer ALL the questions.
- Missing data may be suitably assumed.
- ✤ Use of tables of IRC 37 and IS 10262 is permitted

Q. No		Marks	со				
1A.	Describe the importance of materials in road construction.						
1 B .	Enumerate the requirements of pavement structure.	3	1,2				
1C.	Describe the composition of road structure	5	1,2				
2A.	Find ESWL at depths of 5cm, 20cm and 40cm for a dual wheel carrying 2044 kg each. The centre to centre tyre spacing is 20cm and distance between the walls of the two tyres is 10cm.						
28.	A new four lane divided highway is to be constructed on a subgrade of CBR 1.8%. The ADT of truck traffic based on the last count was 8000. The directional split of traffic is 55:45. Vehicle damage factor based on axle load survey was 4.0. Design a suitable pavement section for a design life of 15 years. The last traffic count was taken 1 year back and the project would be completed in 2 years from now. Growth rate of traffic = 7%.	5	4				
2C.	Explain with neat sketches the modulus of subgrade reaction with respect to rigid pavements.	3	3				
3A.	Discuss the following types of bitumen: a) Penetration grade bitumen b) Bituminous emulsion	4	2,4				
3B.	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 and 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=cm ² respectively.	4	3,4				

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Q. No											Marks	СО
3C.	Describe Bradbury's analysis of load transfer in a dowel bar										2	3
4A.	Calculate the blend proportions of aggregates A and B shown in table below by using mathematical method of blending of aggregates.									5	2	
	Aggregate Percent passing the sieve											
	Percent	12.5	9.5 mm	4.75	2.36	1.18	0.60	0.30	0.15	0.075		
	Aggregate A	100	95.0	17.5	2.2	1.1	0.8	0.6	0.5	0.4		
	Aggregate B	100	100.0	95.2	82.5	65.3	47.0	25.2	19.3	7.9		
	Specification	100	80-100	45-80	30-50	20-45	10-35	5-25	4-14	3-6		
4B	 Explain briefly the following types of flexible pavement failures by mentioning causes and remedial or maintenance measures. Bleeding Depression 									res by	5	5
5A	What is soil – bituminous stabilization and explain the factors affecting properties of soil bitumen stabilization.										5	5
5B.	 Design a cement concrete mix for an M20 grade concrete by Bureau of Indian Standards method with the following data: a) Design stipulations Characteristic compressive strength required in the field at 28 days = 20 MPa Maximum size of aggregate = 20 mm (angular) Degree of workability = 0.90 (compacting factor) Degree of quality control = Good Type of exposure = Mild 									5	3	
	 b) Test data for materials Specific gravity of cement = 3.15 Compressive strength of cement at 7 days - Satisfies the requirement of IS 269 -2989 Specific gravity of coarse & fine aggregates = 2.60 Water absorption of coarse aggregate = 0.50 % Free (surface) moisture: Coarse aggregate - Nil and Fine aggregate - 2% 								e			