Reg. No.										

MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL

(A constituent institution of MAHE, Manipal)

VI SEMESTER B.TECH. (CIVIL ENGINEERING)

END SEMESTER EXAMINATIONS, APRIL/MAY 2018

SUBJECT: PAVEMENT MATERIALS AND DESIGN [CIE 4011]

REVISED CREDIT SYSTEM

(24/ 04/ 2018)

Time: 3 Hours MAX. MARKS: 50

Instructions to Candidates:

- Answer ALL the questions.
- Missing data may be suitable assumed.
- IRC codes and formulae handouts are permitted

Q.No		Marks	CO
1A.	Explain the objective and functional requirements of pavement	**5**	**1**
1B.	With a neat sketch the components of flexible pavement system.	**5**	**1**
2A.	A wheel load of 5100kg act on a three layer pavement structure consisting of 150mm of bituminous layer on 250mm of crushed stone road base. The subgrade has a CBR of 10%. The radius of contact area of wheel is 16cm. Calculate the vertical and horizontal stresses and strains on both sides of each interface.	**5**	**3**
2B.	Design the flexible pavement using the following data and compute the allowable stresses and strains. (i) Design CBR value of subgrade: 5% (ii) CBR value of 500mm thick layer of compacted soil over subgrade: 8% (iii) Initial traffic at the time of completion of construction: 1500CV per day. (iv) VDF=3.5 (v) LDF=0.5	**5**	**3**
3A.	With a neat sketch explain the types of stresses developed in rigid pavement. Explain the measures to negotiate the development of stress.	**5**	**3**
3B.	Design the dowel system using the following data: (i) Thickness of the slab:32cm (ii) Design wheel load: 10,000kg (iii) Width of joint:2cm (iv) Modulus of subgrade reaction: 30kg/cm^3	**5**	**3**
4A.	Explain the types of joints in concrete pavement. Derive the formula for area of steel and length of tie bar.	**5**	**3**
4B.	Design tie bar system using the following data: (i). Thickness of slab:30cm (ii).Coefficient of friction:1.5 (iii). Unit wt. of concrete slab:2350kg/cm^3 (iv). Dia of tie:1.6cm	**5**	**3**

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<table>
<tr><td></td><td>(v). Allowable working stress in steel: 1250kg/cm^2
(vi). Permissible bond stress of tie bars: 17.5kg/cm^2</td><td></td><td></td></tr>
<tr><td>5A.</td><td>Determine the optimum bitumen content of the mix using the following data.
<table>
<tr><th>Bitumen content</th><th>Stability (kg)</th><th>Flow (units)</th><th>V_0 (%)</th><th>VFB (%)</th><th>G_m</th></tr>
<tr><td>3</td><td>499.4</td><td>9.0</td><td>12.5</td><td>34</td><td>2.17</td></tr>
<tr><td>4</td><td>717.3</td><td>9.6</td><td>7.2</td><td>65</td><td>2.21</td></tr>
<tr><td>5</td><td>812.7</td><td>12.0</td><td>3.9</td><td>84</td><td>2.26</td></tr>
<tr><td>6</td><td>767.3</td><td>14.8</td><td>2.4</td><td>91</td><td>2.23</td></tr>
<tr><td>7</td><td>662.8</td><td>19.5</td><td>1.9</td><td>93</td><td>2.18</td></tr>
</table></td><td>5</td><td>2</td></tr>
<tr><td>5B.</td><td>Explain the mud pumping phenomenon in concrete pavement</td><td>5</td><td>4</td></tr>
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