Ref. No.: Ex/CE/PE/B/T/415D/2024(S)

B.E. CIVIL ENGINEERING FOURTH YEAR FIRST SEMESTER SUPPLEMENTARY EXAM 2024
ADVANCED PAVEMENT ENGINEERING

Time: 3 Hours **Full Marks: 100**

[50 Marks for each part]

Part I

Use Separate Answer scripts for each Part

Answer ALL Questions

Answer brief & to the point. Assume standard value for any parameter, if required

1. Explain the terms involved in the following equations (a) or (b) and (c) or (d). Explain further the application difference between the equations (a) & (b) and (c) & (d) 8+4
   a. $N_R = 4.1656 \times 10^{-08} [1/\varepsilon_v]^{4.5337}$
   or
   b. $N_R = 1.4100 \times 10^{-08} [1/\varepsilon_v]^{4.5337}$
   c. $N_f = 1.6064*C*10^{-04} [1/\varepsilon_t]^{3.89} * [1/M_{Rm}]^{0.854}$
   or
   d. $N_f = 0.5161*C*10^{-04} [1/\varepsilon_t]^{3.89} * [1/M_{Rm}]^{0.854}$ where $C = 10^{\left\{4.84\left(\frac{V_{be}}{V_a+V_{be}}-0.69\right)\right\}}$

2. The cross section profile of a National Highway pavement shows 30mm thick Bituminous wearing course overlaying 90mm Dense Bituminous Macadam Pavement, 250mm thick Granular Base and 200mm thick Sub-base over the existing subgrade. The resilient modulus of BM wearing course, DBM surface course, granular layers and effective subgrade are 700MPa, 2000MPa, 200MPa and 66MPa respectively. Per cent volume of air void and Per cent volume of effective bitumen in the mix used in the bottom bituminous layer are 3% and 11.5% respectively. The stress strain analysis of layers evolved following result - Horizontal tensile strain at 120mm and 570mm are 0.1458×10^{-03} and 0.9590×10^{-04} respectively AND vertical compressive strain at 120mm and 570mm are 0.1245×10^{-03} and 0.2443×10^{-03} respectively. Calculate the critical rutting and fatigue life as per IRC:37-2018. 14

Group: II

3. Explain the role of subgrade CBR and sub-surface drainage on the stability of flexible pavements 4+4
4. Draw neatly the typical multi-layer cross sections of flexible and rigid pavements and write a critical review on the role of base course layer regarding stability in each case 4+2+2
5. Briefly Explain the following pavement distresses 2×4
   a. Alligator cracking
   b. Reflection Cracks
   c. Pumping
   d. Bleeding

[Turn over

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B.E. CIVIL ENGINEERING EXAMINATION 2024

[4th Year; 1st Semester Supplementary Exam 2024]

Advanced Pavement Engineering

Part II

Total Time: Three Hours | Full Marks 100 (Part I: 50 + Part II: 50)

Use a separate Answer-Script for each part

Part II (50 Marks)

Answer All

1.	"All Ground Improvement Method can be termed as 'Ground Modification'. However, not all the Ground Modification Techniques can assure Ground Improvement." ---- Justify the conclusion above with possible example.	(10)	CO2
2.	What is the significance of 'Standard/Heavy Proctor Test' conducted in laboratory with respect to field application?	(8)	CO2
3.	When the tack, prime, and seal coat are given and how they work in a pavement construction?	(8)	CO3
4.	Define the method 'Pre-Loading with Vertical Drain" with schematic diagram. How is it helpful for any Civil-Construction?	(8)	CO2
5.	What is 'Kneading'? How is it related to construction of Highway Pavement	(8)	CO3
6.	Using 'Benching' is better than making a continuous steep slope. Explain with sketch	(8)	CO2

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