Ref. No. EX/PG/CT/T/121/2024

M.E. CONSTRUCTION ENGINEERING FIRST YEAR SECOND SEMESTER EXAM 2024

SUBJECT : CONDITION ASSESSMENT & HEALTH MONITORING OF STRUCTURES - I

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

Use separate Answer-script for each part.

No of Questions	Part I (50 Marks)	Marks
	Answer any four questions	
Q1a.	Explain the following i) Investigation ii) Evaluation iii) Assessment	06
Q1b.	Briefly discuss the deterioration of concrete structures by abrasion and remedial measures thereof.	6.5
Q2.	Describe the procedures of load test in case of a bridge along with the evaluation criteria.	12.5
Q3.	Describe the principle of pile integrity test.	12.5
Q4.	Write short note on sulphate attack in concrete structures.	12.5
Q5.	State the different considerations and activities involved in preliminary investigation of a structure.	12.5

[Turn over

Part – II **Marks: 25**

Answer any One Questions

USE OF ANY IS CODE IS NOT ALLOWED

1. a) How do you evaluate the **Dynamic Modulus of Elasticity of Concrete** from the **Ultrasonic Pulse Velocity (UPV)** Test Result. Discuss with example **5**

b) Discuss and derive the expression for the both the **IS Code method** and **Equi-distant method** for estimation of the **Crack depth** by **UPV test** with sketches. **10**

c) The following **UPV readings** were observed at a Bridge Girder by these methods

Point No.	Grid Length X (mm)	Sound Concrete	Cracked Concrete	
		Time T_s for X (Micro-sec)	Time T_c for X (Micro-sec)	Time T_{2c} for 2X (Micro-Sec)
A/1	90	25.6	37.3	59.2
A/2	100	27.2	41.2	63.4
B/3	75	20.3	38.8	58.1
C/4	50	14.1	28.3	39.7

Estimate the **Crack Depth** at these points by both the method and comment on it. **10**

OR

2. a) What are the **advantage** and **limitations** of **Non-destructive** test in concrete? **5**

b) Compare critically between **Schmidt Hammer** and **Ultrasonic Pulse velocity** test in the light of their objectives, principle and influencing factors on the results. **10**

b) The hammer readings at different locations of a **RCC Beam** are given below. Calculate the **average, standard deviation and most probable least value** of the **estimated strength of concrete**. Discuss on the result of the estimated strength of concrete. The correlated estimated strength may be assumed as

$$S = 0.011X^2 + 1.416X + 8.691$$ **10**

Location	L (m)	Hammer Reading (Horizontal) X									
Support	0.25	29	27	32	28	29	28	20	29	26	23
Quarter Span	1.5	30	34	34	37	30	32	36	36	31	33
Mid Span	3.0	31	25	29	32	32	34	36	35	30	35

Part – III (25 Marks)

Answer all the questions: **(5+7)+8+5= 25**

1. **A) Mention the points for which condition assessment is performed on any structure-building or bridge.**
   B) Suppose there is a wall of concrete 8mtr X 12 mtr -constructed in the year 2010 and some distresses are being visible like spalling, corrosion although the wall. Give the basis of assessment by NDT so that you can extract a nearly real data about it.

2. **Give the steps of re-strengthening / retrofitting after NDT**

3. **Make a table (IS -516) how core Cutting test results are calculate performed at site.**