

M..E CIVIL ENGINEERING 1st YEAR 2nd SEMESTER EXAMINATION 2025

SUBJECT: Advanced Concrete Science and Technology (SE)

Time : 3 hours

Full marks : 100

Part – I (60 Marks)

Ref No EX/PG/CE/T/128B/2025

Use separate Answer-script for each part

Draw neat sketches wherever necessary.

I.S codes and Handbooks are not allowed in the examination hall

- 1 a) Nowadays, it seems more relevant to change the acceptance criteria of concrete on 56 days instead of conventional 28 days strength for blended cement – Explain
- b) What is the difference between alkali silicate reaction and alkali carbonate reaction in concrete? How can we prevent this?
- c) The mix design of concrete of grade M35 is as follows: Cement = 430 Kg/m³ Coarse Aggregate =1040 Kg/m³ fine aggregate = 800 Kg/m³ water – cement ratio = 0.35. Temperature of both coarse and fine aggregates are 40 °C, temperature of cement is 34° C and that of mixing water is 27° C. Assume the aggregates are dry. The specific heat of cement and aggregate is 0.22cal/gm/° C. What will be the temperature of freshly mix concrete? If the temperature of mixing water is lowered to 8° C, what will be temperature of freshly mix concrete?

6+6+8

2(a) Write short notes on (with reference to microstructure analysis)

- i) SEM
- ii) XRD

- b) What is Alkali Activated Concrete? Name the ingredients normally used in Alkali Activated Concrete? What are the differences between Alkali Activated concrete and normal concrete? State the limitations of the use of Alkali Activated Concrete.
- c) What are the advantages and disadvantages of the use of CFRP in repair of concrete structure? What is CFRP strips and sheets? Discuss their uses in a deteriorated reinforced concrete beams (with diagram) due to corrosion of rebar at bottom and the vertical stirrups?

6+6+8

[Turn over

3a) Describe the Rapid Chloride Permeability Test of concrete and its limitations.

Or

Describe the test method of electrical resistivity of concrete surface using 4 point Wenner Probe .

b) What are the different limit states in terms of durability of concrete? What precautions can be taken to reduce the alkali Aggregate reaction in concrete?

c) A reinforced concrete structure is to be constructed for 50 years of service life at Kolkata (Exposure class C1 – Humid Warm). The nominal cover (C) to the reinforcement =30mm .A concrete mix of grade M25 has been suggested having OPC cement content of 380 Kg/m³ ,water cement (w/c) ratio =0.36. Check whether the concrete mix and the nominal cover is appropriate against carbonation induced corrosion.

Assume, $Y_{m1} = 1.07$ (for less than 75 yrs of design life) , $Y_{m2} = 1.05$ (for medium quality control) Weather coefficient, $W = 1.0$, $Y_f = 1$ (internal structure), $T_p = 10$ years , CO_{2ck} , concentration (ppm) at Kolkata = 400 $x=0.45$ for OPC.

$$C_d = C/Y_{m2} ; K_{lck} = 9.5 * (w/c) - 2.75 \text{ (for OPC) } ; K_{ld} = K_{lck} * Y_{m1} ;$$

$$T_i \text{ (yrs) } = C_d / (W * K_{ld} * Y_f * (CO_{2ck} / 500) * x)$$

6+6+8

M.E. CIVIL ENGINEERING FIRST YEAR SECOND SEM. EXAM. -2025**Subject: ADVANCED CONCRETE SCIENCE AND TECHNOLOGY (SE)****Time: 3 Hrs****Full Marks 100****PART-II (MARKS-40)**

Use a separate Answer-Script for each part

No. of questions	<u>Answer all questions</u>	Marks 18+7+7+8=40
1.	What do you mean by Self-compacting concrete. Write down the properties of Self-compacting concrete? Describe V-funnel test for measuring the filling ability of Self-compacting concrete.	2+4+12=18
2.	What do you mean by fiber reinforced concrete? Write down the advantages and use of fiber reinforced concrete.	2+5=7
3.	Write down the reasons behind the lacking of durability of concrete exposed in marine environment.	7
4.	Describe the effects of high temperature on hydrated cement paste.	8