Ref No EX/PG/CE/T/128B/2024

M..E CIVIL ENGINEERING 1st YEAR 2nd SEMESTER EXAMINATION 2024

SUBJECT: Advanced Concrete Science and Technology (SE)

Time : 3 hours Full marks : 100

Part – I (60 Marks)

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) What are the main characteristics of ITZ in concrete? How can you improve the microstructure of ITZ?

b) What is high strength concrete? State the limit of high strength concrete as per BIS code. What is the difference of failure surfaces of high strength concrete and normal strength concrete ?

c) The mix design of concrete of grade M35 is as follows: Cement = 440 Kg/m^3 Coarse Aggregate =1045 Kg/m^3 fine aggregate = 810 Kg/m^3, water – cement ratio = 0.35. Temperature of both coarse and fine aggregates are 50 ^{0} C, temperature of cement is 34^0 C and that of mixing water is 28^0 C. Assume the aggregates are dry. The specific heat of cement and aggregate is 0.22cal/gm/^{0} C. What will be the temperature of freshly mix concrete? If the temperature of mixing water is lowered to 10^0 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/m^3 ,water cement (w/c) ratio =0.36. Check whether the concrete mix and the nominal cover is appropriate against carbonation induced corrosion.

Assume, Ym1 =1.07 (for less than 75 yrs of design life) ,ym2 =1.05 (for medium quality control) Weather coefficient, W = 1.0, Yf =1 (internal structure), Tp = 10 years , CO_{2CK} , concentration (ppm) at Kolkata = 400 x=0.45 for OPC.

Cd = C/ym2 ; Klck = 9.5* (w/c) -2.75 (for OPC) ; Kld = Klck *Ym1 ;

Ti (yrs) = Cd/(W* Kld *γf*(CO_{2ck}/500) *x)

6+6+8

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M.E. CIVIL ENGINEERING FIRST YEAR SECOND SEM. EXAM. -2024

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	**Answer all questions**	**Marks 6+9+10+9=34**
1.	Write down the properties of Self-compacting concrete? What are the materials used for Self-compacting concrete. Describe any one test for measuring the filling ability of Self-compacting concrete. What are the advantages of Self-compacting concrete.	3+3+10 +4=20
2.	Why fly ash used in concrete. Write down the benefits of use of fly ash in cement concrete	3+4=7
3.	Write down the reasons for lacking of durability of concrete exposed in marine environment.	6
4.	Describe the effects of high temperature on hydrated cement paste in concrete.	7