



DEGREE EXAMINATIONS: NOV/DEC 2023

(Regulation 2018)

Third Semester

STRUCTURAL ENGINEERING

P18SEE0004: Smart Materials for Construction

(Use of IS 9103, IS 11384, ACI 544.4R-18 are permitted)

COURSE OUTCOMES

CO1: Choose a suitable concrete admixture.

CO2: Design steel-concrete composite elements.

CO3: Design fiber reinforced concrete mix as per ACI standards.

CO4: Suggest composition of geopolymer and ferrocement.

Time: Three Hours

Maximum Marks: 100

Answer all the Questions:-

PART A (10 x 1 = 10 Marks)

1. Examine the following two statements and choose the correct option from the answers CO4 [K₂]
given below.

Assertion (A): Geopolymer can be produced with the basic raw materials containing silica and alumina rich mineral composition.

Reason (R): It is common practice to use of alkali activators containing sodium hydroxide and sodium silicate or a potassium hydroxide and potassium silicate.

- | | |
|---|---|
| a) Both A and R are true, and R is the correct explanation of A | b) Both A and R are true, and R is NOT the correct explanation of A |
| c) A is true but R is false | d) A is false bur R is true |

2. In braced frame buildings X-bracing systems works well for CO2 [K₂]

- | | |
|--------------------------|---------------------------|
| a) 0 to 10 story height | b) 60 to 80 story height |
| b) 20 to 60 story height | d) 80 to 100 story height |

3. For welded channel/angle/tee connector made of mild steel with minimum ultimate strength of CO2 [K₁]

- | | |
|-------------------|-------------------|
| a) 110 to 240 MPa | b) 420 to 500 MPa |
| c) 60 to 95 MPa | d) 730 to 900 MPa |

4. Matching the items of two lists and select the correct answer.

CO1 [K₂]

List I	List II
A. It is used to increase the rate of early strength developed in concrete	i. Retarders
B. Are used prior patching with mortar on concrete.	ii. Accelerators
C. Are used to overcome the accelerating effect of high temperature on setting property of hot weather concrete.	iii. Bonding admixtures
D. It is used for waterproofing the concrete.	iv. Cement

- | | A | B | C | D |
|----|-----|-----|-----|----|
| a) | iii | iv | i | ii |
| b) | iii | i | ii | iv |
| c) | iv | iii | i | ii |
| d) | i | iv | iii | ii |

5. When fibers are used as a dispersed phase for the reinforcement of matrices, the resultant composites are known as _____

CO3 [K₁]

- | | |
|---------------------------|------------------------------------|
| a) Glass-fiber reinforced | b) Carbon-fiber reinforced |
| c) Wood-fiber reinforced | d) Unidirectional fiber reinforced |

6. According to ASTM standard High range water reducing and retarding admixtures are classified as

CO1 [K₁]

- | | |
|-----------|-----------|
| a) Type A | b) Type C |
| c) Type E | d) Type G |

7. Minerals are the mix added to concrete for

CO1 [K₂]

1. Reduce permeability
2. Increase strength
3. Cost reduction

Choose the correct option

- | | |
|-------------------------|--------------------|
| a) 1, 2 & 3 are correct | b) 1 & 2 are wrong |
| c) 1 & 3 are wrong | d) 2 & 3 are wrong |

8. Which one is not the polymeric resin?

CO4 [K₁]

- | | | | |
|-----|---|-----|-------------------|
| 26. | Explain the materials and mix proportioning of ferrocement. | CO4 | [K ₂] |
| 27. | With respect Fiber Reinforced concrete explain following terms.
a) Aspect ratio b) Percentage volume of fiber | CO3 | [K ₂] |
| 28. | What are different types of fibers used in the production of Fiber Reinforced concrete? | CO3 | [K ₂] |
| 29. | Explain Accelerators and Metakaolin | CO1 | [K ₂] |
| 30. | List the applications of ferrocement in construction industry | CO4 | [K ₂] |

Answer any TWO Questions

PART D (2 x 10 = 20 Marks)

- | | | | | |
|-----|--|----|-----|-------------------|
| 31. | Explain with neat sketches the various types of steel concrete composite members. | 10 | CO2 | [K ₂] |
| 32. | Write the design steps for composite columns with axial load and uni-axial bending | 10 | CO2 | [K ₂] |
| 33. | Explain the construction of ferrocement water tank with neat diagram. | 10 | CO4 | [K ₂] |
