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Question Paper Code: U5606

M.E. DEGREE EXAMINATION, NOV 2025

Professional Elective

Civil Engineering

21PSE506 – ADVANCED CONCRETE TECHNOLOGY

(Regulations 2021)

Duration: Three hours

Maximum: 100 Marks

Answer ALL Questions

PART - A (5 x 20 = 100 Marks)

1. (a) For the construction of a jetty in a marine environment, apply IS 456:2000 exposure classifications to propose a durable concrete mix using artificial aggregates. Highlight how you would adjust the water– cement ratio and aggregate selection. CO2-App (20)

Or

(b) A contractor reports difficulty in pumping fresh concrete for high-rise construction. Apply your knowledge of chemical admixtures to recommend a suitable admixture type and explain how it enhances pump ability without affecting strength. CO2-App (20)

2. (a) A laboratory test on hardened concrete indicates low compressive strength compared to the design mix. Apply your understanding of water–cement ratio, curing, and aggregate grading to identify causes and suggest corrective actions. CO2-App (20)

Or

(b) A site engineer finds excessive deflection in a concrete slab soon after de-shuttering. Apply your understanding of early-age loading, curing, and reinforcement detailing to suggest possible causes and remedial measures. CO2-App (20)

3. (a) A site uses angular 20 mm aggregate and finds the mix is sticky and requires more water to achieve required slump. Using IS mix design logic, apply corrective measures (including admixture selection and quantity calculations) to restore workability without increasing the w/c ratio. Show computations for reduced effective water and adjusted cement content. CO3-App (20)

Or

- (b) A ready-mix plant has a stock of high-fineness fly ash and wants to reduce OPC use in M30 by 30% using supplementary cementitious material (GGBS). Using IS method principles, design the modified mix (w/c, cementitious quantity, aggregates) and calculate per-m³ quantities ensuring target strength and severe exposure durability. Explain any adjustments to setting time and curing. CO3-App (20)
4. (a) Analyze the role of core tests in validating NDT results. Discuss how discrepancies between core strength and NDT predictions should be resolved, and suggest a protocol for integrating results into final strength acceptance decisions. CO4-Ana (20)
- Or
- (b) Analyze how chloride ingress in a marine concrete structure influences half-cell potential test results. Suggest how combining half-cell mapping with UPV or resistivity measurements can differentiate between localized corrosion and uniform deterioration. CO4-Ana (20)
5. (a) A tunnel lining develops micro-cracks due to shrinkage. How would you apply self-healing concrete to minimize maintenance? CO3-App (20)
- Or
- (b) In a smart city project, how would you apply translucent concrete in building façades to improve aesthetics and reduce artificial lighting demand? CO3-App (20)