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- Answer all the following questions
  - Illustrate your answers with sketches when necessary.
  - The exam. consists of one page
- No. of Questions 3
  - Total Mark: 30 Marks
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**Question No. 1 (10 marks)**

Design concrete mix to achieve Target mean strength =  $45 \text{ N/mm}^2$  at 28 days. Use Ordinary Portlan cement CEM I, 42.5, Uncrushed aggregate with maximum aggregate size 20 mm, fine aggregate with 60% passing 600  $\mu\text{m}$  sieve. The required slump 30-60 mm. The relative density of combined aggregate is equal to 2.65.

**Question No. 2 (10 marks)**

Determine the Target Mean strength for concrete with characteistic strength of  $30 \text{ N/mm}^2$ , in the following cases;

- 1) Concrete mix with no previous strength data, and 5% defective.
- 2) Concrete mix with more than 40 test results and standard deviation of  $30 \text{ kg/cm}^2$ , 10% defective.
- 3) Concrete mix with more than 40 test results and standard deviation of  $60 \text{ kg/cm}^2$ , 1% defective.

Determine the Target Mean strength for concrete with characteistic strength of  $18 \text{ N/mm}^2$ , in the following cases;

- 1) Concrete mix with no previous strength data, and 5% defective.
- 2) Concrete mix with more than 40 test results and standard deviation of  $25 \text{ kg/cm}^2$ , 1% defective

**Question No. 3 (10 marks)**

Design **5% air entrained** concrete mix to achieve Target mean strength =  $35 \text{ N/mm}^2$  at 28 days. Use Ordinary Portlan cement CEM I, 42.5, crushed aggregate with maximum aggregate size 10 mm, fine aggregate with 40% passing 600  $\mu\text{m}$  sieve. The required slump 30-60 mm. The relative density of combined aggregate is equal to 2.65.