

Total Number of Questions : 23
Time : 2.00 Hours

Max. Marks : 100

PART - I

1. A rectangular concrete weir of 10 m height is used to retain water upto its top level with no over flow. Taking density of concrete as 25 kN per cum, find the minimum thickness of weir so that no tension develops at base. (4 Marks)
2. Corresponding to minimum specific energy, the depth of flow in a rectangular channel is 4 m. Find maximum discharge/width. (4 Marks)
3. State the methods of finding depreciation and find the book value of a machine (cost of purchase is Rs. 50,000) at the end of two years, using any method if the useful life is 5 years and salvage value is 10% of the cost of purchase. (4 Marks)
4. What are the conditions under which a trapezoidal footing is preferred ? How its dimensions are fixed ? (4 Marks)
5. A layer of saturated clay 4 m thick is overlain by sand 4 m deep. The water table is 3 m below ground surface. Saturated unit weight of clay and sand are 18 kN/m³ and 20 kN/m³ respectively. Unit weight of sand above water table is 17 kN/m³. What is the effective stress at 8 m below ground surface ? What will be the increase in effective stress at the same depth if the soil gets saturated by capillarity up to a height of 1 m above water table ? Take $\gamma_w = 10 \text{ kN/m}^3$. (4 Marks)
6. What is CBR ? Explain CBR method of flexible pavement design. (4 Marks)
7. Design a septic tank for a colony of 300 persons with average daily sewage flow of 80 litres per head. Detention period is 24 hours. Cleaning interval is 6 months. Assume rate of sludge deposition is 30 litres/capita/year. (4 Marks)
8. A small house construction requires the following activities in sequence-excavation for foundation - 6 days, Laying PCC as a levelling course - 4 days, RR masonry for foundation and basement - 9 days, construction of brick masonry walls - 10 days and roof slab concreting - 12 days. If the succeeding activity can start two days ahead of the completion of immediate preceding activity for the first three activities and 4 days ahead of completion of preceding activity for the other two activities, represent the activities suitably and find the minimum time of construction required. (5 Marks)

PART - II

1. How do the strength of a steel material for shafting is estimated in ASME design code for shaft ? (3 Marks)
2. How does an increase in the condenser pressure affect the coefficient of performance of a vapour compression refrigeration system ? Explain using pressure-enthalpy diagram. (3 Marks)
3. Compare focusing type solar collectors with non-focusing collectors. (3 Marks)
4. What is stress corrosion ? Explain 3 (three) methods for combating corrosion. (4 Marks)
5. Explain why entropy of the Universe is always on the increase and may eventually lead to energy crisis. (4 Marks)

P.T.O.

6. List five (5) passive vibration isolation system and their applications. (5 Marks)
7. Define Bernoulli's equation. List 3 (three) major assumptions used in the derivation of Bernoulli's equation. Write 1 (one) application of Bernoulli's equation. (5 Marks)
8. Explain the process of Thermit Welding. Write down the chemical reactions involved. Also discuss the advantages and disadvantages of Thermit Welding. (6 Marks)

PART - III

1. Distinguish between Correlation and Regression. Also specify the relation between correlation coefficient and regression coefficient. (3 Marks)
2. Explain smoothing techniques for time series data. Also explain the methods moving average smoothing techniques and exponential smoothing techniques. (4 Marks)
3. a) If A, B and C are any three independent events with respective probability of happening are $\frac{1}{4}$, $\frac{1}{2}$ and $\frac{1}{3}$ respectively. Obtain the probability of at least one of them happened.
- b) X is a binomial random variable having mean 3 and variance 2. Find the probability of X taking the values less than 1. (6 Marks)
4. a) A rural block in a district was divided into three strata. The following table gives the number of villages :

Stratum Number (i)	Number of villages (N _i)
1	20
2	10
3	30

A sample of 18 villages to be drawn. How many villages should be selected from each strata by using proportional allocation method in stratified sampling ?

- b) Discuss the applications of Students-t statistic and Chi-square statistic in testing of hypothesis. (6 Marks)
5. Discuss resource levelling in project management. Also explain the manual and MS-Project assisted resource levelling. (3 Marks)
6. Explain the concept and application of critical chain project management in organizational decision making. (6 Marks)
7. What do you mean by Project Portfolio Management (PPM) ? (6 Marks)