(3 HOURS)   [Total Marks : 100]

N.B. 1) Question No 1 is compulsory.

2) Solve any four questions from remaining six questions.

3) Assume suitable data if required but justify same.

4) Use of IS 456 is not permitted.

5) Figures to the right indicate full marks.

Q. No. 1

a) From the first principales, derive stress block parameter for limit state method for single reinforced section. For grade of concrete M20 and grade of steel Fe415   (05)

b) What are the function of longitudinal reinforcement and transverse steel in column.   (05)

c) Explain and illustrate balance, under-reinforced and over-reinforced R. C. section.   (05)

d) Under what situation a beam will be subjected to torsional moment. How longitudinal and transverse reinforcement is designed to resist it.   (05)

Q. No. 2 a) Why doubly reinforced beam is required   (04)

b) A reinforced concrete beam 230mm wide is to carry load 40 kN/m. The beam is simply supported on a span of 8 m. Design a section when

I) Depth is not restricted

II) Effective depth is restricted to 500mm. Use M20 grade of concrete, Fe415 grade of steel and LSM   (16)

Q. No. 3) a) A rectangle beam 230mm x 450mm (effective depth) is reinforced with 6 bars of 16 mm diameter out of which two bars are bent at 45^0. Determine the shear resistance of bent up bars and additional shear reinforcement required if the ultimate shear force is 300 kN.. Design shear reinforcement adopt M20 and Fe415   (10)

Pt%	0.25	0.5	0.75	1.0	1.25	1.5	1.75	2.0	2.25	2.5
τ	0.36	0.48	0.56	0.62	0.67	0.72	0.75	0.79	0.81	0.83

b) A T- beam section has b_f =1200 mm D_f =120mm and d = 400 mm, b_w = 230 mm Ast= 6 bars of 16mm diameter. Determine the moment of resistance of the section . Use M20 grade of concrete , Fe415 grade of steel   (10)

QP Code : **MV-20025**

(3 Hours)   [Total Marks : 100

N.B. :   (1)   Questions No. 1 is compulsory.
       (2)   Attempt any four questions out of remaining questions.
       (3)   Assume suitable data wherever necessary.

1.   (a)   Explain the necessity of irrigation in India, briefly discuss the advantages   7
          of the same.

     (b)   Establish relation between duty, delta and base period.   5

     (c)   Show components of single peaked hydrograph. Explain unit hydrograph.   8

2.   (a)   Write short note on drip irrigation system.   5

     (b)   Explain recording and non recording raingauges, draw neat sketch of   7
          simon's raingauge.

     (c)   A field channel has culturable commanded area of 2000 hectares. The   8
          intensity of irrigation for gram is 30% and for wheat is 50%. Gram has a
          Kor period of 18 days and kor depth of 12 cm, while wheat has a Kor
          period of 15 days and a kor depth of 15 cm. Calculate the discharge of
          the field channel.

3.   (a)   A tube well of 25cm diameter penetrates fully in an artesian aquifer. The   10
          strainer length is 17m. Caclulate the yield from the well under a draw
          down of 3m. The aquifer consists of sand of effective size of 0.2mm
          having coefficient of permeability equal to 50m/day. Assume radius of
          draw down equal to 150m.

     (b)   Explain recuperation test.   5

     (c)   Write note on confined and unconfined aquifer   5

4.   (a)   Discuss various factors which govern the selection of type of dam.   10

     (b)   List methods of design of gravity dam. Explain gravity method in detail.   10

5.   (a)   Describe the various types of cross-drainage works on a canal. In what   10
          condition each type is most suitable.

     (b)   Design an irrigation channel to carry a discharge of 40 cumec. Take   10
          N = 0.0225 and critical velocity ratio as 1. The channel bed slope is 0.18
          meters per kilometer.

N.B : (1)   Question No.1 is compulsory

(2)   Attempt any four questions out of Six questions

(3)   Assume suitable data wherever necessary

Q1.   Answer any Four   20 M

1. The 3 days 20°C BOD of domestic sewage is 400 mg/l. Estimate the 5 day BOD at 20°C.

Assume value of $k_{20} = 0.1$/day (base e).

2. State the significance of BOD in waste water treatment.

3. Name the two factors used as criteria for selection of pipe diameter and slope in design of sewer

4. Define Noise and explain why it should be regarded as an environmental pollutant.

5. Enumerate the various sources of air pollution.

Q2.   1.What are traps, and why are they provided? How can the water seal in traps be broken? What methods are to be employed to maintain the seal?   10 M

2.Explain the various sewer appurtenances used in the sewerage system   10 M

Q3.   1. Explain in detail the dilution method of disposal of sewage. State the oxygen sag curve. 10M

2. Differentiate between aerobic and anaerobic treatment of sewage giving major end products. Name one treatment method in each category.   10 M

Q4.   1. Calculate the discharge of 1.25m circular sewer laid at a slope of 1 in 360, when it is running half full. Assume n in Manning's formula as 0.011.   10 M

2. Draw a flow diagram of an activated sludge plant for the treatment of sewage. Discuss the role of return sludge.   10 M

Q5.   1.Design a septic tank for a hostel of 250 inmates with average daily sewage flow of 120 litres per head. Detention period is 30 hours. Cleaning interval is 6 months. Draw a neat sectional sketch showing all details.   12 M

2. Discuss the stages of biological action constituting sludge digestion.   8 M

Q6.   1. Define sludge bulking and explain causes of sludge bulking.   08 M

2. Determine the size of a high rate trickling filter for the following data   12 M

Sewage flow = 4 MLD   Recirculation ratio=1.3 BOD of raw sewage = 300 mg/l

B O D removal in Primary tank =25% Final effluent BOD desired = 30 mg/l

Q7.   1. Explain the causes, effects and control measures of Air pollution.   10 M

2. Explain factors affecting self purification of stream.   10 M

Con. 11481-14.

QP Code : MV-20241

(3 Hours)   **[Total Marks: 100**

N.B.   (1) Question No. **1** is **compulsory**.
       (2) Attempt any <u>four</u> questions from the remaining six questions.
       (3) **Figures** to the **right** indicate **full** marks.
       (4) Draw neat sketches wherever required.

1.   Explain the following: **(Any four)**   (4x5=20)

       A)   Cathodic protection
       B)   Shotcreting
       C)   Cover meter test
       D)   Pre packaged Zinc Sacrificial anode
       E)   Maintenance Cycle.

2. (A)   What are the causes of deterioration of concrete structures?   (10)

   (B)   Explain the procedure for conducting condition survey of an RCC structure. (10)

3. (A)   Discuss the different design and construction errors seen in concrete structures.
                                                                              (10)

   (B)   Explain the following tests.   (2x5=10)

         i) Rebound hammer test
         ii) Pull-off and pull out test.

4. (A)   Explain polymer modified concrete and its applications.   (10)

   (B)   What are the objectives of grouting? Explain various types of injection grouting.
                                                                              (10)

                                                                    [TURN OVER

QP Code : **MV-19105**

(3 Hours)   [Total Marks : 100]

N.B. : (1) Question No. 1 is compulsory.
      (2) Attempt any **four** questions out of the remaining **six** questions.
      (3) Draw sketches, wherever necessary.
      (4) Assume suitable data, if required & state it clearly.

1. Answer the following :
    (a) Enlist grouting marterials, grouting equipments & grouting methods   4
        used for grouting.
    (b) Explain the use of shaft in tunnelling.   4
    (c) What is economic life of an equipment? Explain.   4
    (d) Explain any one type of crane.   4
    (e) Explain the working of power shovel.   4

2. (a) Explain the method of tunnelling in soft rock by 'Needle beam   10
        method' in detail.

    (b) Enlist all types of drilling equipments & explain any one drilling   10
        equipment in detail.

3. (a) Determine hourly owning & operating cost of a machine from the   10
        data given below :
        (a) Purchase Cost   =   Rs. 30 Lakhs
        (b) Useful Life   =   12 years
        (c) Investment Cost   =   20% of avg. investment
        (d) Actual working   =   3000 hours / year.
        (e) Salvage value   =   Rs. 3 lakhs.
        (f) Engine (Diesel)   =   40 HP.
        (g) Operating factor   =   0.7
        (h) Maintenance & repairs cost = Same as depreciation amount.
        (i) Lubricant cost   =   25% of fuel cost.
        (j) Operator's Salary   =   Rs. 12000/- month.

    (b) Explain the points to be considered while selecting a construction   10
        equipment.

4. (a) Enlist various types of pile driving equipments. Also explain any two   10
        of them in detail.

    (b) What are various types of compacting equipments? Also explain all   10
        types in brief with their suitability.

10

5.   (a) Draw neat sketches for :-
         (i) Stone column
         (ii) Grouting application.

10

     (b) Explain :-
         (i) Pilot Tunnel.
         (ii) Lining of Tunnel.

6.   (a) A m/c is down for 4%, 6%, 8%, 10% & 12% of time respectively in   10
         first five years. Its operating cost is Rs. 1000/- hour. Machine works
         for 3000 hours in a year. The average productivity factor is 0.7.
         Workout down time cost & cumulative downtime cost.

     (b) (i) Explain 'Vaccum Concrete' in detail.   8
          (ii) Define 'Stemming'.   2

7. Write notes on following (any **five**) :-   20
     (a) Hot weather concreting.
     (b) Concrete pump.
     (c) Liner plate method.
     (d) Slip form.
     (e) Tunnel Boring Machine.
     (f) Standard & special equipment.
     (g) Sand drain technique.

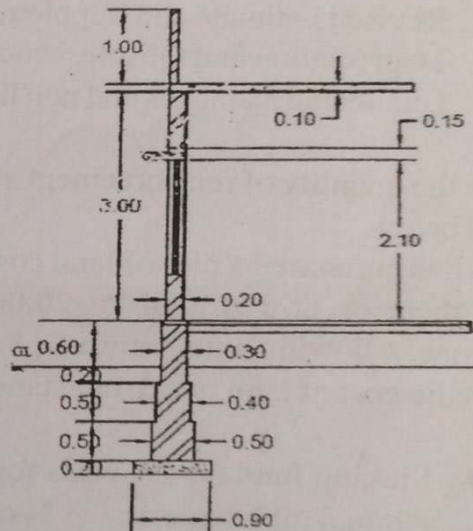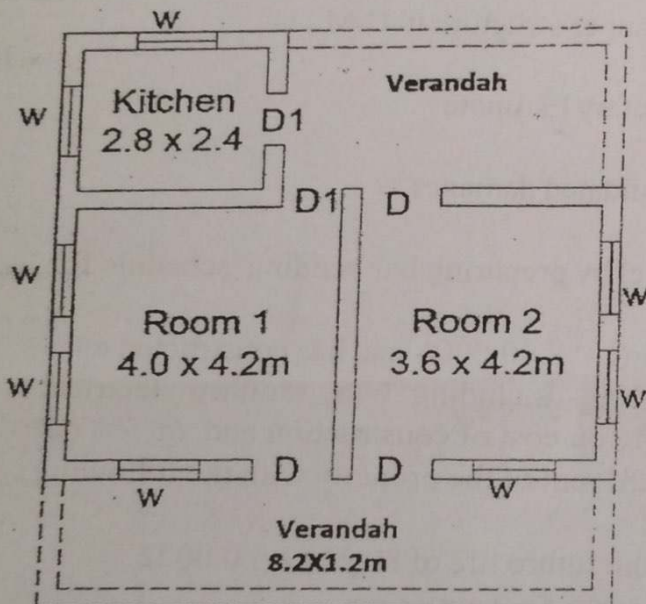
(4 Hours)   [Total Marks : 100

.B. : (1) Question No.1 is **compulsory.**
     (2) Attempt any **four** out of remaining **six** questions.
     (3) **Figures** to the **right** indicate **full marks.**

Schedule Of Doors And Windows
D   1.2 x 2.1m
D₁   0.9 x 2.1m
W   1.5 x 2.1m

ll dimensions are in metres. (a) Chajja thickness-80 mm. (b) Chajja projection-50 mm.

ork out the quantities from given plan & section :—   20
   (a) Excavation in ordinary soil.
   (b) UCR masonry in foundation in C.M. (1:4).
   (c) RCC quantities for slab, band lintel (150 mm thick) and chajja in M25 grade of
        concrete.
   (d) External plastering in C:M 1:3,15 mm thick.

Prepare an abstract for the cost of the items of work in Question 1.   8
Draft detailed specifications for :—   12
    (i)   R.CC. (1:1.5:3) in slabs, beams, lintels and staircase
    (ii) 20 mm thick external plaster in C.M (1:4).

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[TURN OVER

3. (a) Prepare an approximate estimate for the construction of (G+10) storeyed residential   **10**
building to be constructed in newly developing suburbs of Mumbai. The building
comprises of five flats per floor, each flat admeasuring 140 square metres. Assume
suitable cost of construction.

   (b) Draft a tender notice for the construction of a water treatment plant of an estimated   **10**
cost 10 crores. The duration of project is 18 months.

4. (a) Prepare rate analysis for :—   **10**
        (i) P.C.C (1:5:10) in foundation bed
        (ii) Ist class Burnt Brick Masonry in super structure in C.M 1:4.

   (b) Differentiate between :—   **10**
        (i) Revised Estimate and Supplementary Estimate
        (ii) Depreciation and Obsolescence
        (iii) Liquidated Damages and non liquidated damages.

5. (a) Calculate the quantity of reinforcement steel by preparing bar bending schedule for   **10**
fig. given below.

   (b) A person has purchased a plot of land costing ₹ 7,00,000/- and has constructed a   **10**
building there on at a cost of ₹ 20,00,000/- including W/S, sanitary electrical
installations. Allowing a net return @ 8.5% on cost of construction and @ 5% net
return on the cost of land, work out standard rent of the property with the following
data :—
        (i) Sinking fund on 4% basis for the future life of 80 years = 0.0022
        (ii) Annual maintenance - ½ % of cost of construction
        (iii) Municipal taxes and other outgoings - 28.5% of gross rent.

6. (a) Explain different types of Acts pertaining to the construction industry   **10**
   (b) Find the quantity and cost of materials for the following works.   **10**
        (i) 275 sqm. Internal plaster, 12 mm thick in C.M. (1:4)
        (ii) 120 cum. RCC (1:1.5:3) with 2% steel
        (iii) 400 m², flooring with vitrified tiles.

7. Write short notes on (any **four**) :—   **20**
        (a) Earnest money Deposit
        (b) Arbitrary Tribunal
        (c) CBRI method of approximate estimate
        (d) IS-1200
        (e) Belting Method of Valuation.