(3Hours) **Max Marks=80**

Note 1. Question No.1 is compulsory
2. Attempt any three questions from remaining questions.
3. Assume any suitable data where ever required.
4. Figures to the right indicate full marks.

Q.1 Attempt any **four**

a. Explain with neat sketch 'Hauled Container System' 05

b. Estimate density of solid waste sample from the given data. 05

Components	% by weight	Typical density(kg/m3)
Food waste	30	290
Glass	5	195
plastic	15	65
Paper	30	85
Wood	13	240
Ferrous Metal	5	320
Miscellaneous	2	240

c. What is landfill? Explain any one type. 05

d. Explain the term 'colour coding' as is used in relation to the biomedical wastes, and how does it help on safe disposal of bio-medical wastes? 05

e. What is called as optimization of collection route? 05

Q.2 a. Estimate the theoretical volume of methane gas that could be expected from anaerobic digestion of one tonne of waste having the composition of $C_{55}H_{110}O_{35}N_1$. 10

$$C_aH_bO_cN_d + \left(\frac{4a-b-2c-3d}{4}\right) H_2O \rightarrow \left(\frac{4a-b-2c-3d}{8}\right) CH_4 + \left(\frac{4a-b+2c+3d}{8}\right) CO_2 + dNH_3$$

b. Explain physical, chemical and Biological transformation of solid waste. 10

Q.3 a. Explain the working of municipal incinerator with neat sketch. Explain the air pollution control measures adopted in conjunction with incinerator. 10

b. What is Leachate? How it is formed? How its movement is controlled? 10

Q.4 a. What are the different characteristics of hazardous waste? How such a waste stored, transported and disposed. 10

b. Estimate the energy content of solid waste (on dry basis and ash free dry basis) with the following composition is given in a table below. 10

Components	% by Mass	Energy KJ/Kg
Food wastes	35	4650
Paper	15	16750
Cardboard	5	16300
Plastics	10	32600
Garden Trimmings	20	6500
Wood	12	18600
Tin Cans	3	700

Q.5 a. Determine the amount of air required to oxidize one tonne of waste with the chemical composition $C_{50}H_{100}O_{40}N_2$. 10

$$C_aH_bO_cN_d + \left(\frac{4a+b-2c-3d}{4}\right)O_2 \rightarrow aCO_2 + \frac{b-3d}{2}H_2O + dNH_3$$

b. Describe the various methods of construction and demolition waste management, including recycling, reuse, and disposal, and explain the advantages and challenges associated with each approach. 10

Q.6 Write short note on **any four** 20

a. IOT in SWM
b. Vermi composting
c. E-waste management
d. Legal issues related to solid waste disposal
e. Transfer station

****

(3 HOURS)

[Total Marks:80]

N.B:

1. **Question No:1 is compulsory**
2. Attempt **any three** questions from the remaining **five questions**.
3. Figures to the right indicates full marks

Q 1		**(20)**
a	Briefly explain the procedure of erecting sand drains.	
b	Discuss balanced cantilever method of Bridge construction.	
c	Explain the Ways/means to transport, handle light weight structures.	
d	State the procedure of dewatering while laying foundation of a bridge pier.	
Q 2		**(20)**
a	Discuss various methods to prevent ingress of water in structures continuously submerged in water.	10
b	Mention the various advanced construction technologies used with respect to the under construction Colaba-Seepz Underground metro in Mumbai.	10
Q 3		**(20)**
a	Write down the method and sequence followed in the construction of : i) Concrete Dome. ii) Lattice tower used in transmission line.	12
b	State the advantages & disadvantages of prefab construction.	08
Q 4		**(20)**
a	State various methods of strengthening columns and explain jacketing in detail.	12
b	Discuss the special care taken while constructing buildings along the coastline.	08
Q 5		
a	Explain: i) Solar Paints. ii) Need of dredging.	10
b	Explain the stepwise procedure of underwater construction of diaphragm walls.	10
Q 6	Write short notes on:	**(20)**
a	Process of post tensioning of slab.	
b	Energy dissipation techniques to enhance earthquake resistance.	
c	Vaccum dewatering of concrete flooring.	
d	Applications of geotextiles in ground improvement.	

Duration: 3 hours **Max. Marks: 80**

N.B.: 1) Question No.1 is compulsory.
2) Attempt any THREE questions out of remaining FIVE questions.
3) Figures to the right indicates full marks.
4) Assume suitable data if necessary.

Q1	**Attempt any FOUR of the following**	**20**
a	What are Mobile Vulnerabilities?	
b	What are different Security Risks for Organizations?	
c	Difference between virus and worm.	
d	How cybercrimes differ from most terrestrial crimes?	
e	Explain the objectives of IT Act 2000.	
Q.2		
a	What is WIPO? List treaties prepared by WIPO.	**10**
b	Explain about the impact of Cybercrimes in Social Engineering.	**10**
Q.3		
a	Explain steps for SQL Injection attack. How to prevent SQL Injection attacks?	**10**
b	Explain E-contracts and its different types.	**10**
Q.4		
a	What is Cybercrime? Who are Cybercriminals? Explain	**10**
b	What is e-commerce? Discuss types of e-commerce.	**10**
Q.5		
a	What are basic security precautions to be taken to safeguard Laptops and Wireless devices? Explain.	**10**
b	What are illegal activities observed in Cyber Cafe? What are safety and security measures while using the computer in Cyber Cafe?	**10**
Q.6	**Write short notes on any FOUR**	**20**
a	Digital evidence	
b	HIPAA	
c	Buffer overflow attack	
d	Planning of cyberattacks by criminal.	
e	Vishing attack	
f	Trojan horse and backdoor	

(Time: 4 Hours) **(Total Marks: 80)**

Instructions:
(1) Question No 1 is **compulsory**.
(2) Attempt any **three full** questions out of the **remaining five.**
(3) Each **full** question carries **20** marks.
(4) Use of all **relevant IS codes** permitted
(5) Assume suitable data, if required and state it clearly

.

Q1. Attempt **any four** **20**

(a) Draw and explain ductile detailing in beam.

(b) Differenciate between a rigid base and flexible base in water tanks based on their structurual behaviour.

(c) Write down step by step procedure for design of combined footings.

(d) Explain any three general guidelines for planning the staircase.

(e) Differenciate between static and dynamic loads.Explain different types of dynamic loads.

Q2

(a) A hall in building of clear dimension 14.10m x 9.7m is to be provided a floor consisting of a continuous slab with 300mm wide beam spaced at 3.6mc/c and supported on 300mm wall at ends. The floor is to support a L.L of 3kN/m^2, Partition Load of 1.0kN/m^2 and Floor Finish of 1.0kN/m^2 Design the continuous slab taking M20grade of concrete and Fe 415 Steel. **10**

(b)Design cantilever retaining wall and show all stability checks which is supporting a backfill of height 4.8 m earth above ground level. Take SBC and density of 250kN/m^2 and 18kN/m^3 respectively Use M20 and Fe415 steel, $\mu = 0.6$, $\acute{O} = 30$deg. **10**

Q3

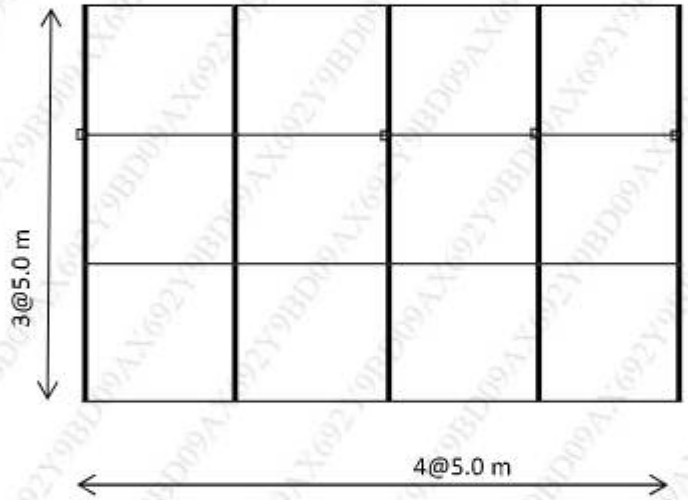
Design a dog- legged staircase for a building in which the vertical distance between floors is 3.6m. The stair hall measures 3.5m x 5m. The L.L may be taken as 2.0 kN/m^2. Use M20 concrete and Fe415 steel bars.Draw plan and elevation showing reinforcementdetails. **20**

Q4

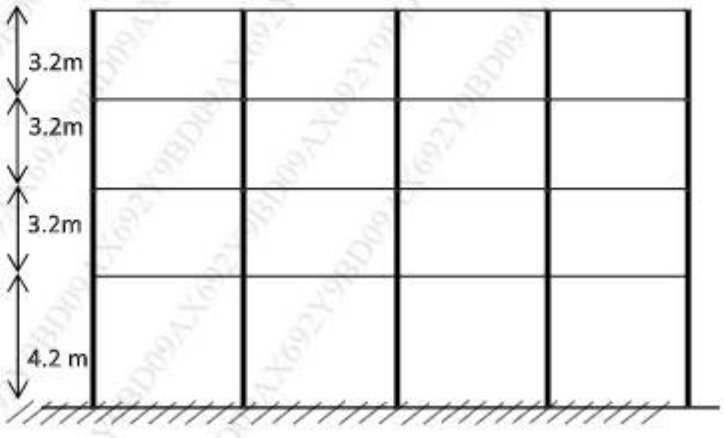
Design a circular water tank resting on ground by approximate method for a capacity of 3 lakh liters. The water tank has flexible base. Use M25 grade of concrete and Fe500 steel. Draw reinforcement detail. **20**

Q5.

a) The building shown in figure is located in Bhopal. The soil conditions are hard and the entire building is supported on a raft foundation. The R. C. frames are infilled with brick-masonry. The lumped weight due to dead loads is 10 kN/m^2 on floors The floors are to cater for a live load of 3 kN/m^{2}on floors. Determine design seismic load on the structure as per IS:1893(Part1)2016. **14**



PLAN

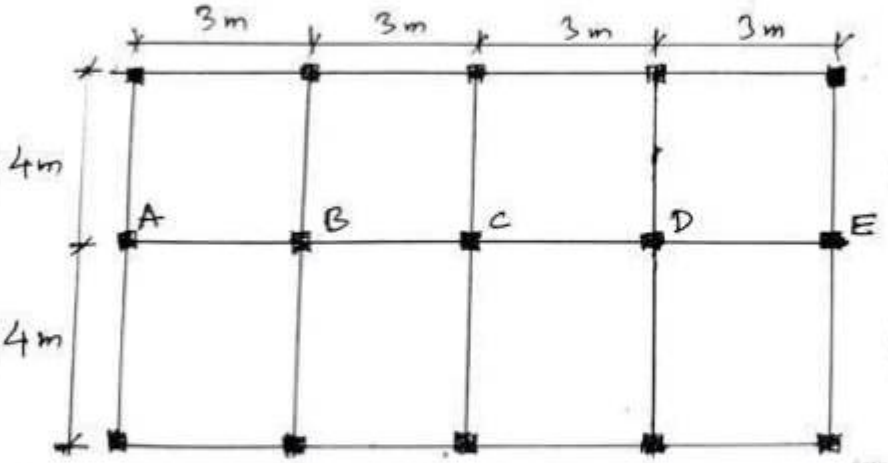


ELEVATION

b) In a post-tensioned beam cable is subjected to a stress of 1000 N/mm^2.If the slip is found to be 3mm.find the percentage loss due to this cause. The beam is 15m long.Take Es=200 kN/mm^2. **06**

Q6. The framing plan of a building is shown below.The design live load is 3 kN/m^2 and floor finish is 1 kN/m^2.All beams carry wall of 150mm thick. Slab thickness is 200mm and floor to floor height is 3.2 m. All columns are of 450mmx450mm.Grade of concrete is M20 and steel is Fe415.

Design beam ABCDE and draw reinforcement details. (Design of slab is not required) **20**



(3 HOURS)

[Total Marks:80]

N.B:

1. **Question No:1 is compulsory**
2. Attempt **any three** questions from the remaining **five questions**.
3. Figures to the right indicates full marks

Q 1		**(20)**
a	Explain PDCA cycle of disaster management.	
b	Define the terms disaster, hazard, vulnerability and risk.	
c	Explain how global warming affects the water cycle and its various components.	
d	Explain disaster management for floods in urban areas.	
Q 2		**(20)**
a	What are droughts ? State the mitigation measures taken in drought prone areas.	10
b	Explain natural and man made disasters. Which disasters can be mitigated and how?	10
Q 3		**(20)**
a	Write a short note on DM Act 2005.	10
b	Describe in brief about the role of NGO's in disaster management.	05
c	Explain the concept of Capacity building along with suitable example.	05
Q 4		**(20)**
a	Discuss the applications of remote sensing and GIS in Disaster management process.	10
b	What are the scope and responsibilities of NIDM and NDMA ?	10
Q 5		
a	What are the various methods of financial management during a disaster ? Explain the government's fund-raising system for disaster response and recovery.	10
b	Discuss the role of growing population, industrialization, urbanization, and changing lifestyles in contributing to environmental degradation.What measures can be taken to mitigate their impact?	10
Q 6		**(20)**
a	Write a note on Volcanic eruptions.	08
b	Explain with examples structural and non-structural mitigation measures	06
c	What are the dos and don'ts in the event of a Covid like pandemic?	06

Duration: 3 Hours **Maximum Marks: 80**

Instructions:
1. Question No. 1 is compulsory.
2. Attempt any three questions from Q.2 to Q.6.
4. Figures to the right indicate full marks.

Q.1 Attempt any two of the following (Compulsory) (20 Marks):
a) Define GIS. Explain its components and applications.
b) Differentiate between Raster and Vector data models. Describe with suitable examples and diagrams.
c) Explain various types of GIS data analysis techniques such as buffer, overlay, and surface analysis.

Q.2 Attempt any two of the following: (20 Marks):
a) Explain the various types of maps and map elements.
b) Describe various sources of vector data and steps involved in georeferencing and topology creation.
c) What is a Digital Elevation Model (DEM)? Describe types, uses, and quality parameters of DEM.

Q.3 Attempt any two of the following: (20 Marks):
a) Discuss the advantages and types of DBMS used in GIS applications.
b) Explain surface and proximity analysis in GIS with examples.
c) Describe the importance and process of image classification in raster data processing.

Q.4 Attempt any two of the following: (20 Marks):
a) Write a detailed note on GIS software types – commercial and open-source.
b) Explain vector to raster and raster to vector data conversion processes.
c) What are the key elements of a good map layout? Describe GIS output and presentation formats.

Q.5 Attempt any two of the following: (20 Marks)
a) Discuss metadata and spatial data quality in the context of GIS.
b) Describe the role of transformation and coordinate systems in mapping.
c) Explain preprocessing steps required for spatial data in GIS projects.

Q.6 Attempt any four of the following: (20 Marks)
Write short notes on:
i) Toposheets
ii) Spatial vs Atribute Data
iii) Web GIS
iv) Triangulated Network Analysis
v) GIS application in Infrastructure Engineering

Duration: 3 Hours **Maximum Marks: 80**

N. B: 1. Q1 is compulsory. Attempt any **three** out of remaining **five** questions.
2. Assume suitable data if required and mention it clearly.
3. Support answers and solutions with suitable sketches.
4. **IS 1343:2012 is permitted** in examination.

Q1

A Explain the following. **05**
- **1-** Transfer stage
- **2-** Service stage
- **3-** Prestressed concrete
- **4-** Pretension section
- **5-** Posttension section

B 8 m long, simply supported concrete beam of C/s 250 mm x 500 mm supports 10 kN/m load inclusive of self-weight. It is prestressed by a parabolic cable which is concentric at supports and has maximum eccentricity 150 mm at mid span. Cable carries an effective force of 250 kN. Locate pressure line. **05**

C Locate top and bottom kern points in the following I-section. Also determine its efficiency. Flanges: 750 mm wide and 250 mm deep, Web: 200 wide and 750 mm deep **05**

D What are advantages of a load balancing cable? Sketch a load balancing cable for the following cases, when beam is subject to uniformly distribute load. **05**
- **1-** Simply supported beam
- **2-** Cantilever beam
- **3-** Fixed ends beam

Q2 **20**

A prestressed concrete slab panel of rectangular C/s 750 mm x 250 mm is simply supported over a span of 6 m. The initial prestressing force of 675 kN is applied at a constant eccentricity of 50 mm below the neutral axis of the section. The superimposed load is 8 kN/m^2. Determine stresses at mid span section and support section at transfer and service stage. Take $\eta = 0.75$

Q3

A 12 m long, post-tensioned, simply supported concrete beam is 300 mm wide and 800 mm deep. The prestressing force at the ends is 1400 kN. Cable profile is parabolic with zero eccentricity at ends and maximum 240 mm at center of span. Calculate percentage loss of stress in steel. Take $K = 0.0046$ per m, $\mu = 0.18$, creep coefficient of concrete $\phi = 1.6$, shrinkage strain in concrete $\varepsilon_{cs} = 0.0003$, total anchorage slip 4 mm, normal relaxation, M50 concrete, $f_y = 1600$ MPa, $f_i = 1200$ MPa, and $E_s = 2 \times 10^5$ MPa **10**

B A prestressed I-section has the following specifications: **10**
Area of I-section = 55 x 10^3 mm^2, second moment of area = 189 x 10^7 mm^4, statistical moment of area about centroid = 468 x 10^4 mm^3, thickness of web = 100 mm
It is prestressed horizontally by a cable containing 24 wires of 6 mm ϕ and prestressed vertically too by similar wires at 150 mm c/c. All wires carry a tensile stress of 1000 N/mm^2. Calculate principal tensile stress at the centroid of section, when an ultimate shearing force of 210 kN acts.

Q4

A A post-tensioned bridge girder is a box section of overall dimensions 1200 mm wide and 1800 mm deep. Estimate ultimate flexure strength of the section and safe uniformly distributed load on 20 m long girder, if $f_p = 1600$ MPa, $f_{ck} = 60$ MPa, $A_{ps} = 3825$ mm^2. Thickness of walls and slabs of the box girder is 250 mm. CGS is at 100 mm from soffit of the bottom slab. **10**

B A symmetric I-section with flange width and depth 500 mm and 150 mm respectively, has thickness of web 100 mm and over all depth as 800 mm, is prestressed by a 1980 kN force. Span is 8 m and cable is coinciding with the junction of web and flange throughout the span. **10**
Determine deflection at transfer stage. Is it with in permissible limit?
Calculate imposed uniformly distributed load at cracking stage and calculate respective deflection.
Take $E_c = 38$ kN/mm^2 and $E_s = 200$ kN/mm^2, $\eta = 0.8$

Q5 **20**

A prestressed concrete girder of 40 m span has an unsymmetric I-section. It is subject to 20 kN/m impose load. Verify safety of the section corresponding to limit state of serviceability cracking and maximum compression in flexure. Calculate the magnitude of prestressing force, if eccentricity is restricted to 1000 mm. Locate safe cable zone.
Properties of the section are as under;
$A = 1016500$ mm^2, $I = 6050 \times 10^8$ mm^4, $y_t = 860$ mm, $y_b = 1140$ mm:
Take $f_{ct} = f_{cw} = 16$ MPa, $f_{tt} = -1.4$ MPa, $f_{tw} = 0$, $\eta = 0.8$

Q6

A 8 m long, post-tensioned, simply supported concrete beam of rectangular section 350 mm x 700 mm deep is prestressed by a straight cable. Comment on the requirement of shear reinforcement if the beam supports 100 kN/m (all inclusive - factored). Take $f_{ck} = 40$ MPa, $f_{pe} = 1200$ MPa, $A_{pst} = 500$ mm^2 **05**

B Determine permissible flexural compressive stress and permissible tensile stress in concrete corresponding to limit state of serviceability cracking and maximum compression in flexure, at transfer and service stage in a pretension section. Consider Type-1 element, M50 concrete with $f_{ci} = 40$ MPa. **05**

C A beam of 300 mm x 900 mm is provided on 10 m span. It is prestressed with a linear cable which is concentric at supports and has maximum eccentricity of 300 mm at center Beam carries a concentrated load of 100 kN at center. If PF = 500 kN, determine stresses at mid span and quarter sections using internal resisting couple method. **10**

****

[4 Hours] **[80 Marks]**

Note:

i) **Q.1 is compulsory**
ii) Attempt **any three** out of remaining **Five** Questions.
iii) Figures to right indicates full marks.
iv) Assume Suitable data if required.

Q.1 Workout following quantities from given plan and section. (**Fig.01**). **20**

a) Excavation for work for all footings.
b) Brickwork in superstructure with cement mortar 1:5.
c) RCC work for all columns including steel & excluding formwork & shuttering.
d) Internal Plastering in cement mortar 1:4

Q.2 A) Explain the meaning of specification. Draft general specifications for 1st class brickwork in cement mortar (1:5) including scaffolding. **10**

B) Explain in brief rate analysis? Prepare rate analysis for internal plastering 12 mm thickness in cement mortar in cement mortar 1:4 **10**

Q.3 A) Prepare approximate estimate for RCC residential building with following data: Plot area = 80M x 50M, FSI = 0.6. Building is constructed G+5 storey with pile foundation. Assume cost of construction as Rs.7500 / m^2 Assume foundation cost 20% of cost of superstructure. Assume allowance for services such as water supply sanitation electrical installation as 20% of building cost. Allowance for consultant's fee = 5% of overall cost. Allowance for contingencies and work charged establishment = 5% and 3%. **10**

B) Explain acceptance and rejection of tender. **04**

C) Draft Notice inviting tender for construction of School Building in Mumbai region for estimated cost of Rs. 500 lacs time limit for work is two years. Contract will be having item rate type and tender fee Rs. 2000/- along with document **06**

Q.4 A) The initial cost of construction equipment is Rs.75,00,000. It has useful life of 15 years. The estimated salvage value of the equipment at the end of useful life is Rs.7, 00,000. Calculate the annual depreciation and book value of the construction equipment using a) Straight line method, b) Constant percentage method. **10**

B) What are different types of contracts. Explain any two in detail. **10**

Q.5 A) Prepare road estimate for portion of road chainage 14 to 22 from the data as given below. Draw L-section and typical cross section for cutting and banking. Turfing with grass provided with side embankment at the rate of Rs. 50/m^2 .rate of earthwork in cutting is Rs. 350/ m^3 and rate of earthwork for banking is Rs. 250/ m^3 .Formation width of proposed road is 12m and side slope is 1.5:1 in cutting and 2:1 in banking. Road formation is proposed at uniform falling gradient 1:200 passing through ground level at chainage 14. Length of chain is 30 M.

Chainage	14	15	16	17	18	19	20	21	22
RL of ground(m)	108.60	109.85	109.40	108.85	108.50	107.25	106.80	107.15	107.20
RL of formation(m)	108.60								

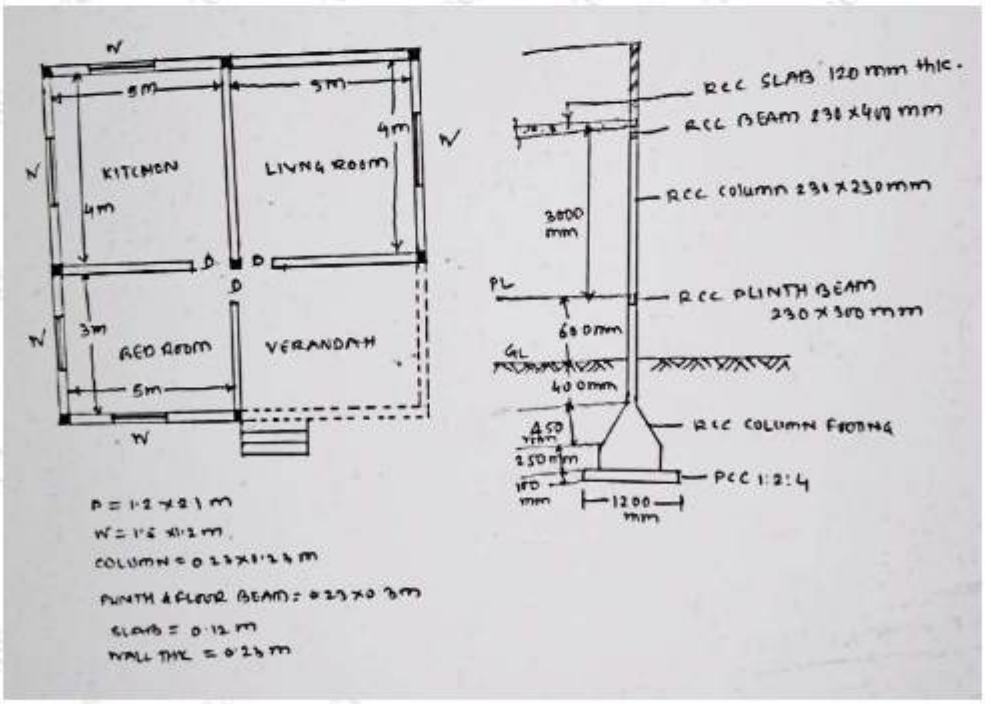
Formation width of proposed road is 12m and side slope is 1.5:1 in cutting and 2:1 in banking. Road formation is proposed at uniform falling gradient 1:200 passing through ground level at chainage 14. Length of chain is 30m. **10**

B) A room having dimension 6m x 5m. There is one T-beam of c/s 30 x 50 cm below the slab of thickness 15 cm. Find the quantity of steel for the reinforcement, bottom main bars total 8 nos having 16 mm ϕ placed in two rows, one bottom row 4 Nos straight and other top row 4 nos (2 straight and 2 bent up) Top bars 2 nos 16mm ϕ Stirrups 10 mm diameter with spacing 15 cm c/c. **10**

Q.6 Write short notes on **(any Five).** **20**

a) Easement rights.
b) Mass Haul Diagram
c) EMD and SD
d) Rules for deduction in plastering work & brickwork.
e) Technical Sanction
f) Balanced and unbalanced tender.

Fig.01



****