

Time: (3Hours)

Total Marks: 80

- Note**
1. Question 1 is compulsory
  2. Attempt any 4 out of six questions
  3. Assume any suitable data wherever required

- Q.1** Attempt any **four**
- a. Write a note on Landfill gas management and landfill closure **05**
  - b. Define RDF and manufacturing process of RDF. **05**
  - c. Write a note on Color coding of Biomedical waste. **05**
  - d. What is the ultimate and proximate analysis of solid waste? **05**
  - e. Write a note on Bioreactor landfill. **05**
- Q.2**
- a. Estimate the volume of methane produce by aerobic digestion of one tone of Waste having chemical composition of, **10**  

$$C_{50} H_{105} O_{45} N C_a H_b O_c N_d + \{(4a-b-2c+3d)/4\} H_2O \{(4a+b-2c-3d)/8\} CH_4 + \{(4a-b+2c+3d)/8\} CO_2 + dNH_3$$
  - b. Write a detail note on pyrolysis technology and its by-products. **10**
- Q.3**
- a. Explain the Hauled container system with a neat sketch. Why is route optimization necessary? **10**
  - b. Explain significance of factors C/N, Aeration, Moisture content, pH on the rate of composting. Explain any one type of composting in detail. **10**
- Q.4**
- a. Explain functional elements of solid waste management in India. What type of awareness programs and initiatives are taken by the government for solid waste management. **10**
  - b. Write a note on the following **10**
    1. E- waste management in India
    2. Utilization of construction and demolition waste
- Q.5**
- a. Estimate the number of trips taken by the truck per week to collect the waste of the society having 250 residents. Assume following data given below: **05**  
 Occupants per residents =3.5, Solid waste generation rate = 1.45 kg/ person/ day, collection vehicle capacity = 20 m<sup>3</sup> , compacted density of solid waste in collection vehicles = 325 kg/m<sup>3</sup>

**b.** Calculate the energy content of solid waste having the following composition using modified Dulong's formula. Figures in brackets are % by mass. **05**

1) Carbon (35) 2) Hydrogen (7) 3) Oxygen (52) 4) Ash (5.4) Nitrogen (0.5) 6) Sulphur (0.1)

**c.** Define hazardous Waste. Give sources of generation, different methods of disposal and describe handling and storage of hazardous waste in detail **10**

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

**a.** Energy recovery from municipal solid waste

**b.** Stages of construction of secure landfill

**c.** Legal aspects for hazardous waste and biomedical waste

**d.** Compaction station

**e.** Application of IOT in solid waste management

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Duration: 3hrs

[Max Marks:80]

- N.B. :** (1) Question No 1 is Compulsory.  
(2) Attempt any three questions out of the remaining five.  
(3) All questions carry equal marks.  
(4) Assume suitable data, if required and state it clearly.

- 1 Attempt any FOUR [20]
- a Explain how criminals plan the attack
  - b Explain various security challenges posed by mobile devices
  - c Explain need of Cyber law in India
  - d Explain E-contracts and its different types.
  - e What are Botnets? How it is exploit by attacker to cause cyber-attack?
- 2 a Explain the classification of cybercrimes with examples. [10]
- b Explain Phishing and Identity theft in detail. [10]
- 3 a Explain different buffer overflow attacks also explain how to mitigate buffer overflow attack [10]
- b Explain electronic banking in India and what are laws related to electronic banking in India [10]
- 4 a What do you understand by DOS and DDOS attack? Explain in detail. [10]
- b Write a note on Intellectual Property Aspects in cyber law. [10]
- 5 a Explain SQL injection attack. State different countermeasure to prevent the attack. [10]
- b Explain the objectives and features of IT Act 2000 [10]
- 6 a Explain the term evidence and different types of evidences [10]
- b Write key IT requirements for SOX and HIPAA. [10]

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3 Hours

80 Marks

1. Question no. 1 compulsory.
2. Answer any three questions out of remaining five
3. Attempt sub questions in order
4. Figures to the right indicate full marks.

1. Write short notes on (any 4) [20]
  - a) Capacity building
  - b) Functions of NIDM
  - c) Sea walls, embankments and bio shields
  - d) Triage
  - e) Environmental hazard
  - f) National Disaster Management Policy
  - g) Community based disaster preparedness
2. a) Discuss the framework for disaster management in India. [8]
2. b) Explain global warming and climate change. [6]
2. c) Comment on radiation hazards. Also discuss possibilities of chemical spills in Mumbai. [6]
3. a) Discuss the various types of technological disasters and highlight the specific efforts to mitigate such disasters in India. [8]
3. b) Explain the role of various international agencies for Disaster Management. [6]
3. c) Explain various means of raising finance for mitigating and managing disasters [6]
4. a) Differentiate between structural and non-structural measures of flood mitigation and discuss the importance of forecasting, warning and monitoring system in India [8]
4. b) Appraise the role of GIS and GPS in disaster management [6]
4. c) Discuss various types of natural disasters in India and highlight their impacts on life. [6]
5. a) Explain in detail the design concepts involved in as well as the construction materials used for the safe construction of facilities in case of earthquakes and cyclones. Also discuss the fire resistant facilities that need to be essentially provided in a building/industry. [8]
5. b) Elaborate the guidelines laid down by NDMA for disaster management in India. [6]
5. c) Explain in detail, vulnerability, with reference to floods and cyclones. List down the preparatory measures for minimizing vulnerabilities related to Tsunami. [6]

6. a) Discuss in brief the Disaster Management Act 2005. [6]
6. b) Explain Community based disaster preparedness [5]
6. c) Is rapid depletion of ground water a type of disaster? To which category does this belongs?  
What are the reasons for this problem? [5]
6. d) Identify and discuss the various hazards which are associated with volcanic eruptions [4]
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Duration: 3 Hours

[Max Marks: 80]

- N.B.:** (1) Question No 1 is Compulsory.  
(2) Attempt any three questions out of the remaining five.  
(3) All questions carry equal marks.  
(4) Assume suitable data, if required and state it clearly.

- 1 Attempt any FOUR [20]**
- a What is green building? Why to go for green building. **05**
  - b How we can reduce construction waste? **05**
  - c Define energy efficiency. **05**
  - d Write note on green audit. **05**
  - e How we can reduce indoor air pollutant? **05**
- 2 a Write a note on Energy metering management with respect to building. [10]**
- b Explain preservation of transportation of tree on site. [10]**
- 3 a What are the different waste management methods in green building? [10]**
- b Explain the role of HVAC system in green building. [10]**
- 4 a Discuss about Irrigation system and management. [10]**
- b Explain the concept of rainwater harvesting along with its components. [10]**
- 5 a Explain outdoor air quality management. [10]**
- b Explain about water efficient plumbing system along with its components. [10]**
- 6 a Write short note on new innovations in design process for sustainable development. [10]**
- b Discuss about the effective waste management for reducing the carbon footprint in the green building construction. [10]**
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(3 hours)

(80 marks)

N.B:

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

- Q1 Write short note on Any four 20
- a Pipe jacketing
  - b Hydraulic dredger in waves
  - c Sound proofing walls
  - d Silos and Chimneys
  - e Vacuum Dewatering with a labelled sketch
  - f Cofferdams
- Q2 a Mention the key aspects of green buildings and zero energy buildings and explain in detail the characteristics of green buildings. 10
- b Briefly describe in detail the process of erection of lattice tower used in transmission line 10
- Q3 a Explain the different methods for the launching of heavy bridge decks with labelled sketch 10
- b Explain in detail the seismic retrofitting strategies of structural members such as Beams, Columns and Slabs. 10
- Q4 a Enlist the various techniques of construction for continuous concreting operation in tall buildings of various shapes and varying sections. Explain anyone. 10
- b What is dredging? State the various purposes for which it is done. Point out the difference between agitation dredging & pneumatic dredging 10
- Q5 a What is Building integrated photovoltaic (BIPV)? State its merits, demerits & applications. 10
- b Explain in detail various methods and techniques of ground improvement for soft soil 10
- Q6 a Mention how repairs of monuments is different as compared to conventional buildings. 10
- b Write short note on smart road technologies. 05
- c Explain box jacketing in detail 05

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Time: 4 hours

[Total Marks-80]

- N.B. :**
- (1) Question No.1 is compulsory
  - (2) Attempt any **THREE** questions from the remaining 5 Questions
  - (3) Figures to the right indicate full marks
  - (4) Assume suitable data if necessary

**Q1** Figure No 1 shows the plan and sectional details of a Framed Structure. **20**  
 Work out the quantities of the following items of work from **Figure No -1**

- a) Total volume of Concrete in all footings and Plinth Beam
- b) Internal and External Plastering Quantity in CM 1:4
- c) Volume of 1<sup>st</sup> Class Brick Work in Super Structure.
- d) Flooring and Skirting Quantity

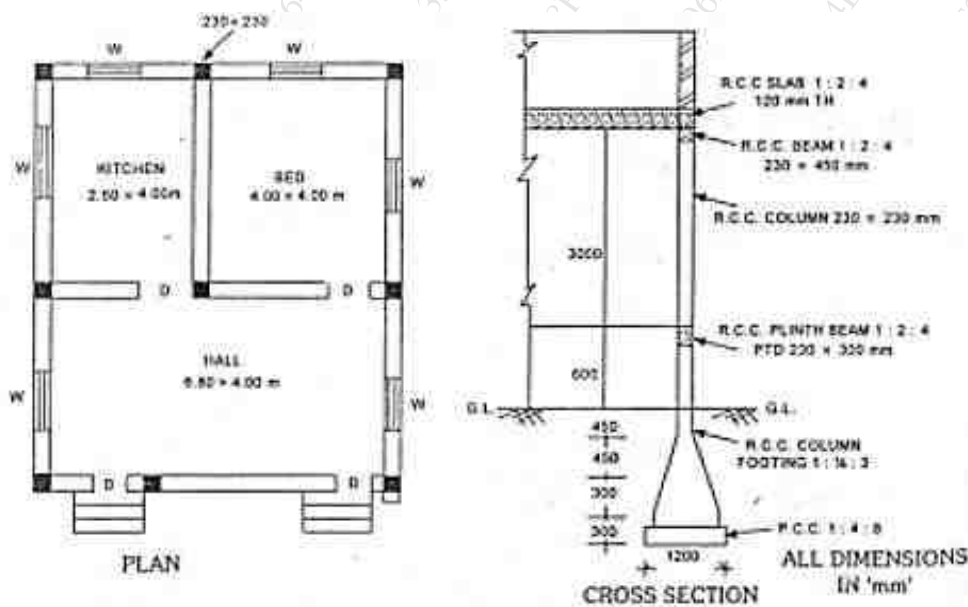


Figure 1

- Q2**
- (a) Prepare an Abstract of cost for all items in Question Number 1 **8**
  - (b) Prepare a schedule of the following bars for the Beam as per section shown in figure 2. **12**
    - i) 2 nos 12 mm dia Anchor bars
    - ii) 2 nos 20 mm dia Bent up bars and 2 nos Bottom bars
    - iii) 6 nos 10 mm dia Stirrups

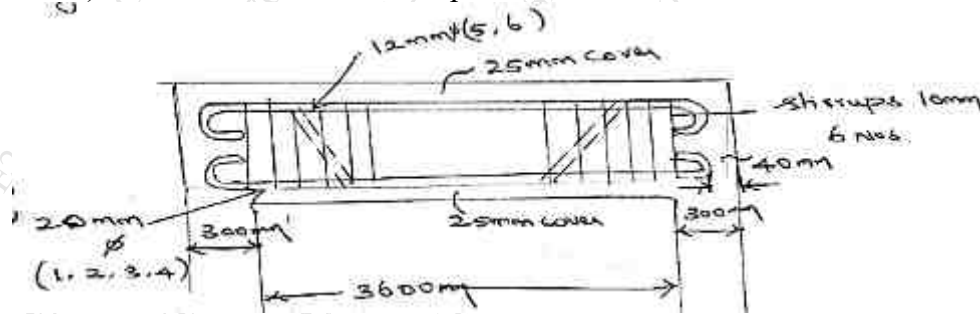


Figure 2



- Q3** (a) Define Specification. State the different purposes served by specification. Write brief specification of First class brick work in Superstructure with CM 1:4. **8**
- (b) Estimate the quantity of earthwork for a portion of a road to be constructed by **Mean Depth Method** from the following data. **12**

Formation width = 12 m.

Side slope in banking = 2:1, and in cutting 1.5:1.

Downward gradient 1 in 200

RL of Formation level at zero chainage is 51.4 m.

Chainage and corresponding ground levels are given below.

Chainage	1	30	60	90	120	150	180
RL of GL	50.8	50.6	50.7	51.2	51.4	51.3	51

- Q4** (a) A (G+2) building has a carpet area of 800 sqm. The area occupied by corridor, staircase etc is 25% and the area occupied by walls, column is 10%. Consider water supply @7.5%, Electrification @8.5% and contingency @4% cost of construction. Prepare an Approximate Estimate considering the cost of construction is Rs 10000 per m<sup>2</sup> **10**
- (b) i) Draft a tender notice for the construction of 4 lane bituminous road of 25 km long in Palghar Region. Estimated cost is 25 crores and time of completion is 7 months. **5**
- ii) Explain Earnest Money Deposit and Security Deposit **5**

- Q5** (a) Analysis and workout the Rates for the following items of construction **12**
- i) UCR Masonry in CM 1:6 in foundation and plinth.
- ii) 12 mm thick plastering to internal wall surface with two coats in CM 1:4
- (b) A newly constructed building cost Rs 1 crore on a plot of valuation of 80 lakhs. 10 flats of 100 m<sup>2</sup> each are constructed. Determine the monthly rent per flat from the following data. **8**
- i) Net return on land and Building @ 7%
- ii) Life of building is 50 years
- iii) Interest rate on Sinking Fund is 6%
- iv) Salvage value @ 10% of building cost
- v) Repairs and Maintenance @ 3% of building cost
- vi) Municipal taxes and other outgoings 20% of Gross rent.

- Q6** Attempt any **FOUR** of the following: **20**
- a) Explain the terms Administrative approval and Technical sanction for any PWD work
- b) Explain item rate contract with respect to the following points  
Nature of agreement, Mode of payment to contractor, Suitability and Disadvantages
- c) Briefly explain the importance and state various purposes of approximate estimate
- d) Easement Rights
- e) Freehold Property and Leasehold Property
- f) Valid, Void and Voidable Contracts

Duration: 3 Hours

Total Marks: 80

**N. B: 1. Q1 is compulsory.** Attempt any **three** out of the 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** Differentiate between loss of stresses in steel in pre-tension and post-tension prestressed concrete beams. **05**
- B** Explain the Freyssinet anchorage system. Also write its advantages and disadvantages. **05**
- C** Explain the use of internal resisting couple concept in analysis of prestressed concrete sections. **05**
- D** Why high high-strength steel and high-grade concrete is used in prestressed concrete construction? **05**

**Q2**

- A** An unsymmetrical I-section (top flange 400 x 150 mm, web 150 x 400 mm, and bottom flange 250 x 250 mm) is used to support an imposed load of 10 kN/m over a span of 15 m. The applied pre-stressing force is 825 kN which is located at 65 mm from the soffit of the section at midspan. The parabolic cable is concentric at the supports. Calculate extreme fiber stresses in concrete at quarter span section at service stage. Take the loss ratio as 0.82. **12**
- B** A rectangular beam 250 mm wide & 500 mm deep is prestressed by a parabolic cable carrying an effective force of 250 kN. The cable has an eccentricity of 100 mm above the centroid at supports and 150 mm below the centroid at midspan. 10 m long simply supported beam supports 23 kN/m ultimate load (inclusive of self-weight). Calculate the principal tensile stresses at the neutral axis at the support section and compare with permissible limit if M50 concrete is used. **08**

**Q3**

- A** A 3 m long, concrete beam is 90 mm wide and 180 mm deep. It is prestressed by two wires of 7 mm diameter stressed to 920 N/mm<sup>2</sup>. The wires are curved in parabolic profile with an eccentricity of 36.8 mm at mid span and concentric at supports. The beam supports a concentrated load of 10 kN at center of span. The modulus of elasticity of concrete is 31 kN/mm<sup>2</sup>. Compute the deflection of the beam at the center of the span under;
- i. Prestress + Self-weight
  - ii. Prestress + Self-weight + Live load, assuming 15% loss in prestress due to various causes.
- Compare the deflections with the respective permissible limits. **12**
- B** What do you mean by kern points? Also develop the equations to prove that moment of resistance of the section is more for greater distance between kern points. **08**

**Q4**

- A** A post-tensioned beam has rectangular C/s is 250 mm wide. The beam is to be designed for an imposed load of 12 kN/m on a span of 12 m. The stress in the concrete must not exceed 17 MPa in compression and 1.4 MPa in tension at any time. The beam is safe in limit state of serviceability maximum compression in flexure and cracking. Take  $\eta = 0.85$  **12**
- i. Calculate the minimum possible depth of the beam.
  - ii. For the section provided, determine the minimum prestressing force and the corresponding eccentricity.

- B** A simply supported beam of span “L” is prestressed by a cable having maximum eccentricity “e” at mid span and concentric at supports. Prestressing force in the cable is “P”. Develop the equations for the equivalent upward load due to prestressing force for the following cases. **08**
- i. Cable is linear
  - ii. Cable is parabolic

**Q5**

- A** A 10 m long prestressed concrete beam is 300 mm wide and 450 mm deep. This beam is provided with a cable of area 500 mm<sup>2</sup>, located at a constant eccentricity of 50 mm and carrying an initial stress of 1200 N/mm<sup>2</sup>. Calculate the percentage loss of stress in wires, if **12**
- i. The beam is prestressed.
  - ii. The beam is post-tensioned.

Refer Following data

- $E_s = 2 \times 10^5$  MPa
- $E_c = 37 \times 10^3$  MPa
- Creep Coefficient = 1.6
- Total Shrinkage strain =  $300 \times 10^{-6}$  (pretension beam),  $200 \times 10^{-6}$  (posttensioned beam)
- Relaxation loss of stress in steel = 5 % of the initial stress
- Wave effect of cable = 0.0018/m
- Anchorage slip = 2 mm,
- Jacking from one end only

- B** A pre-tensioned beam having a rectangular section of 150 mm width and 300 mm effective depth, has an effective cover of 50 mm. If  $f_{ck} = 40$  MPa,  $f_y = 1600$  MPa and  $A_{ps} = 450$  mm<sup>2</sup>, estimate the ultimate flexural strength of the section. **08**

**Q6**

- A** A 6 m long simply supported beam has rectangular section 200 mm wide and 300 mm deep (overall). It is prestressed by a parabolic cable which is concentric at supports and has a maximum eccentricity of 150 mm at mid-span. Take, PF = 300 kN,  $f_{ck} = 50$  MPa and effective cover to the tension reinforcement = 50 mm. The beam supports 55 kN/m ultimate load (inclusive of self-weight). Design shear reinforcement using Fe 250 steel. **12**

- B** What is safe cable zone? Develop equations for minimum section modulus and limiting eccentricities for safety of beam in limit state of serviceability cracking and maximum compression in flexure. **08**

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[ Total Marks : 80 ]

( 3 Hours )

Notes :

1. Question No 1 is compulsory
2. Attempt any THREE questions out of five questions
3. ASSUME any additional data if necessary and state it clearly
4. Draw FIGURES wherever necessary .Figures to the right indicate full marks
5. WRITE proper question / sub question numbers on the left margin allotted in answer sheet.

1. Attempt any 4 [20]
  - a) What are Types and Elements of Maps
  - b) Map Projections
  - c) Types of Spatial Data
  - d) overlaying analysis
  - e) Write a short note on History Geographic Information Systems
  - f) TIN Model
2. a) Explain Projection Coordinate System: Geographic, rectangular & Polar [10]  
b) What are the different types of DBMS [10]
3. a) Non spatial data and its Types [10]  
b) Short Note on Data Base Management Systems [10]
4. a) Short Note on Vector & Raster Analysis Methods [10]  
b) What are the different components of GIS [10]
5. a) Short note on : a) Objective of GIS [10]  
b) Coordinate Systems [10]  
b) Short Note : Meta data [10]
6. Write Short Note on (any 4) [20]
  - a) Spatial Analysis (Dem Analysis)
  - b) Error in GIS
  - c) GIS Output Design and Presentation
  - d) Functions of DBMS
  - e) Web GIS
  - f) Network Analysis

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Time: (3 Hours)

[Total Marks: 80]

**N.B.:** (1) Question **No.1** is **Compulsory**.

(2) Attempt **any three** questions from the **remaining** questions.

(3) Assume **suitable** data wherever required but **justify** the same.

(4) **Figures** to the **right** indicate **full marks**.

(5) Answer to each new question must start on a **fresh page**.

1. (a) What type of data analytics is used in healthcare? [5]  
(b) Which imaging technologies do not use radiation? Explain those technologies in brief. [5]  
(c) What you mean by the term Natural Language Processing for clinical/medical text data. [5]  
(d) Define Advanced Data Analytics for Healthcare with six real-world applications. [5]
2. (a) Define Phenotyping Algorithms with key aspects. [10]  
(b) What is visualization? Explain different types of visualization techniques, tools with advantages and disadvantages. [10]
3. (a) Illustrate Predictive Modelling in Healthcare with at least two examples. [10]  
(b) Describe the following: - [10]
  1. BAN
  2. Dense/Mesh area network for smart living environment
  3. Senor Technology
  4. Image Registration
  5. Feature Extraction
4. (a) What are the components of EHR? What are the barriers for adopting EHR? [10]  
(b) Explain types of Fraud detection in healthcare with the help of example. [10]
5. (a) What are the challenges one may face while processing Covid clinical reports? [10]  
(b) Define Data science with applications of healthcare data analytics. [10]
6. (a) How will we analyze Mental health status of someone using their tweets on twitter? [10]  
(b) Define Biomedical Imaging Modalities with their Applications. [10]

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**Duration : 3 Hours**

**Total Marks: 80**

- Note: i) Question No. 1 is **Compulsory**  
ii) Attempt **any 3** out of remaining **5 questions**.  
iii) Answer each question in order.  
iv) Assume suitable data if required.

- Q.1 Solve any **four** out of **six** **5 Marks each**
- A. Enlist important laws related to the construction industry, discuss any one in brief.  
B. Discuss Indian Contract Act 1872 with its objectives.  
C. Explain scrutinization in process of tenders.  
D. Discuss about an interim award in arbitration.  
E. Explain GST Tax act 2017, Enlist its types.  
F. Discuss objectives of Environment Protection Act.
- Q2. A. Explain BOCW act 1996. What are the objectives of the act. **8**  
B. Discuss duties of Engineer, Owner and Contractor in safety at construction sites. **6**  
C. Explain Peris agreement 2020. What are climate targets of India as per the act? **6**
- Q3. A. Prepare a tender notice to invite a tender for ha school building costing 2 Cr. Opening date of tender 14 January 2024. Assume suitable data required. **8**  
B. Enlist types of contracts. Discuss two types of contracts most used in construction. **6**  
C. What are the duties and power of an arbitrator. **6**
- Q4. A. What is Arbitration and conciliation Act? Explain arbitration process. **8**  
B. Explain procedure of Environment impact assessment report. **6**  
C. Discuss step wise E-Tendering process of Public Work Department **6**
- Q5. A. Write down ethical responsibilities of Civil Engineer, Contractor and other parties in construction. **6**  
B. Enlist essential documents required in BOT contract? **6**  
C. Discuss various aspect of Dispute Resolution Board. **8**
- Q6. A. Explain three envelop system in tendering, provide list of documents in each envelop **6**  
B. Enlist various safety rules at construction sites. **6**  
C. What are essentials of a valid contract? Explain breach in contracts **8**

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**Duration: 3hrs**

**[Max Marks: 80]**

NB:

- (1) Question No.1 is Compulsory
- (2) Attempt any three questions out of remaining five.
- (3) All questions carry equal marks
- (4) Assume suitable data, if required and state it clearly.

1. Attempt **any FOUR** **[20]**
    - a. Discuss CIA Triad in Information Security.
    - b. Explain concept of High Availability.
    - c. Illustrate various XSS attacks
    - d. Explain Information Security issues in Cloud computing
    - e. Explain various threats to Access Control.
  2.
    - a. Describe Risk assessment techniques outlined in ISO31010 framework. **[10]**
    - b. Define Intrusion Detection System. Explain in detail IDS techniques. **[10]**
  3.
    - a. Explain Availability, Mean Time Between Failure (MTBF), Mean Time to Repair (MTTR), and Calculate the Availability for a product has MTBF of 200hrs and MTTR of 10 hrs. **[10]**
    - b. Explain in detail COBIT Framework. **[10]**
  4.
    - a. Describe various Disaster Recovery Techniques. **[10]**
    - b. Explain any two different Access Control Models from the following. **[10]**
      - a. Discretionary,
      - b. Mandatory,
      - c. Role based
      - d. Rule-based.
  5.
    - a. Compare the quantitative and qualitative risk assessment approaches. **[10]**
    - b. Explain various types of Audits in Windows Environment. **[10]**
  6.
    - a. What are the key characteristics of OCTAVE approach? **[10]**
    - b. What are the objectives of IT ACT? Explain in detail IT ACT 2000 and IT ACT 2008. **[10]**
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Duration: 4hrs

[Max Marks: 80]

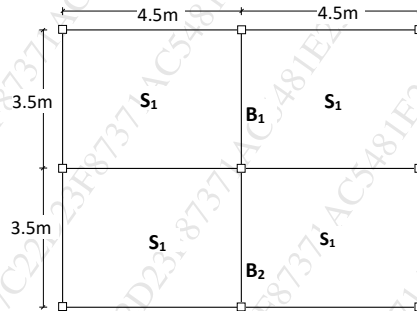
**Instructions:**

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

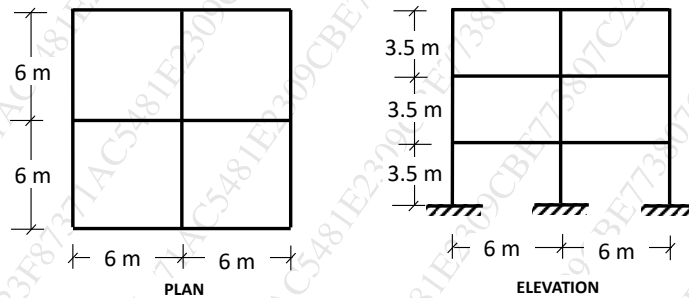
- Q.1** Attempt any **FOUR**
- a Differentiate between one way slab and two-way slab. 05 M
  - b Explain the differences in the structural behavior of cantilever and counterfort type retaining walls. 05 M
  - c Calculate the maximum hoop tension for a circular water tank with flexible joint at the base. The tank is of 12m diameter and 4.2m height with a free board of 200mm. Take unit weight of water as  $9.81\text{kN/m}^3$ . Also calculate the area of steel reinforcement required to resist the maximum hoop tension if the permissible tensile stress in steel is  $150\text{N/mm}^2$  Apply WSM. 05 M
  - d What do you mean by degree of freedom? Write the equation of motion for a single degree of freedom system and explain the terms used. 05 M
  - e A concrete beam is post-tensioned by a cable carrying an initial stress of  $1200\text{ N/mm}^2$ . The slip at the jacking end was observed to be 3 mm. The length of the beam is 20 m.  $E_s = 210\text{ kN/mm}^2$ . Friction coefficient for wave effect is 0.0015 per meter. Estimate the percentage loss of stress due to friction and anchorage slip. 05 M
  - f Why ductile detailing is important for earthquake resistant design of structures? 05M
- Q.2** Design a suitable dog legged stair for a stair room having clear dimensions 2.6m x 4.8m. Floor to floor height is 3.2m. The live load is  $3\text{kN/m}^2$  and floor finish load is  $1\text{kN/m}^2$ . Stairs are supported at plinth level, midlanding and floor level by 230mm wide beams. Show arrangement of flights with dimensions. Design both the flights and carry out necessary checks. Draw neat sketches showing reinforcement details in each flight. Adopt M25 grade concrete and Fe500 grade steel for the design. Apply LSM. 20M
- Q.3** A reinforced concrete cantilever retaining wall is supporting a levelled backfill of 3.8m above GL. Density of backfill is  $16.5\text{kN/m}^3$  and its angle of repose is  $28^\circ$ . The foundation is 1m below GL. SBC of soil  $180\text{kN/m}^2$  and coefficient of friction between concrete and soil is 0.45. Show all stability checks. Design the stem and heel slab of the retaining wall. Draw reinforcement details. Also show curtailment of reinforcement in stem. Adopt grade of concrete M25 and grade of steel Fe 415. 20 M
- Q.4** An open rectangular water tank having size 5m x 4m x 3m rests on firm ground. Design the side walls and base slab. Use approximate method. Adopt M25 concrete and Fe 415 steel. Draw neat sketches showing reinforcement details. Adopt WSM. 20 M



- Q.5** The typical framing plan for an office building is as shown in the figure below (centre to centre dimensions between columns are given). The slabs (S1) are 120 mm thick. Live load is  $3\text{ kN/m}^2$  and floor finish load is  $1.0\text{ kN/m}^2$ . All beams are supporting brickwork of 230mm thick. Floor to floor height is 3.2m. Design the **continuous beams B1-B2** and draw reinforcement details. Grade of concrete M25 and grade of steel Fe 500. Apply LSM. (Design of slab S1 not required) 20 M



- Q.6 a** A three storied Government office building at Surat is designed as a special moment-resisting frame. The soil condition is medium stiff. The RC frames are infilled with masonry walls. The lumped weight due to dead load is  $12\text{ kN/m}^2$ . The floors need to cater to an imposed load of  $4\text{ kN/m}^2$ . Determine the total design base shear on the structure using seismic coefficient method as per IS 1893(Part 1): 2016. Also show the distribution of base shear at different floor levels. 10 M



- b** A pretensioned concrete beam, 150 mm wide by 300 mm deep, is prestressed by straight wires carrying an initial force of 150 kN, at an eccentricity of 50 mm. Area of steel wires is  $160\text{ mm}^2$ .  $E_s = 200\text{ kN/mm}^2$ ,  $E_c = 35\text{ kN/mm}^2$ . Estimate the percentage loss of stress in steel due to elastic deformation of concrete. 05 M
- c** Calculate natural frequency and natural time period for the system shown in figure. 05 M

