

Time: 3 hours

Max. Marks: 80

N. B.

1. Question No. 1 is compulsory
2. Attempt any 3 Questions from the remaining.
3. All questions carry equal marks.
4. Figures on the right indicate the maximum marks for those questions.
5. Assume suitable data if required and highlight the same.

- |             |   |           |
|-------------|---|-----------|
| <b>Q. 1</b> | <b>Attempt Any Four</b>   | <b>20</b> |
|             | a Write short a note on Earthmoving equipment   |           |
|             | b Write a note on the tunnel boring machine.  |           |
|             | c Distinguish between tunnelling of roads and metro   |           |
|             | d Explain the procedure of installation and operation of the overhead transmission tower.                                   |           |
|             | e Draw the layout of a hydropower station. Enlist the equipment required for the construction of a hydropower plant.        |           |
|             | f What is PFHS? What are the advantages of PFHS?  |           |
| <b>Q. 2</b> | a What is formwork? Write a note on the MIVAN formwork system along with its advantages & disadvantages.                    | <b>10</b> |
|             | b What are the different techniques for the demolition of buildings? Explain any one technique.                             | <b>10</b> |
| <b>Q. 3</b> | a What is tunnelling? What are the popular methods of tunnelling in soft rock? Describe any two methods with a neat sketch. | <b>10</b> |
|             | b Describe in detail with a diagram about slip and jump formwork  | <b>10</b> |
| <b>Q. 4</b> | a Explain with a neat sketch tower crane. & Write the benefits they offer for high-rise construction                        | <b>10</b> |
|             | b Write a note on the laying of pipes using the pipeline insertion system.  | <b>05</b> |
| <b>Q. 5</b> | a Which method is used for bridge or flyover construction? Explain in detail the balanced cantilever method.                | <b>10</b> |
|             | b What are the different techniques/methods used for the construction of emergency houses for disaster management?          | <b>10</b> |
| <b>Q. 6</b> | a How effectively do drones and GPS are used for monitoring the projects/working of airports and seaports?                  | <b>10</b> |
|             | b Write a detailed note on measures taken while working in a restricted space.  | <b>10</b> |

**(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

- |            |  |             |
|------------|--|-------------|
| <b>Q 1</b> | <b>Write short notes on :</b>  | <b>(20)</b> |
| a          | Tunnel boring machine  |             |
| b          | Single acting hammer   |             |
| c          | Incremental launching Method   |             |
| d          | All terrain crane.   |             |
| <b>Q 2</b> |  | <b>(20)</b> |
| a          | Compare Articulated truck and normal truck   | 06          |
| b          | Explain the process of locating underground utilities using GPR.   | 08          |
| c          | Justify : Tunneling in soft soils is difficult.  | 06          |
| <b>Q 3</b> |  | <b>(20)</b> |
| a          | Describe the various methods used for ventilating a tunnel.  | 10          |
| b          | Describe the working of Tunnel lining trolley.   | 10          |
| <b>Q 4</b> |  | <b>(20)</b> |
| a          | Tunneling using VSM or NATM ... Which is better and Why ?  | 10          |
| b          | Enlist various stone crushing equipments & describe gyratory crusher in detail.                                      | 10          |
| <b>Q 5</b> |  |             |
| a          | Draw neat schematic sketches showing : i) Rock bolting. ii) Guniting.<br>iii) Concrete placing boom iv) Power shovel | 12          |
| b          | Enlist the difficulties faced while constructing a :<br>i) Concrete dam ii) Skyscraper                               | 08          |
| <b>Q 6</b> |  | <b>(20)</b> |
| a          | Write a note on applications of Air compressor to construction field.  | 10          |
| b          | Write a note on components of an atomic power station alongwith a neat sketch.                                       | 10          |

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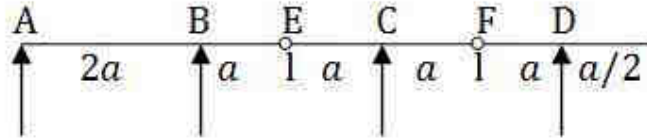
Time: 3 hour

Max. Marks: 80

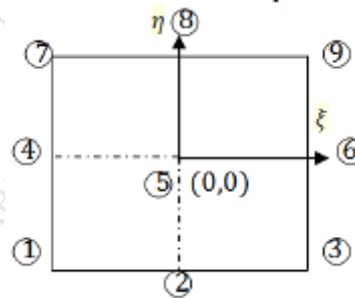
N. B.

1. Questions No. 1 is compulsory.
2. Solve any three questions from remaining questions.
3. Figures to the right indicate full marks.
4. Assume suitable data wherever necessary.

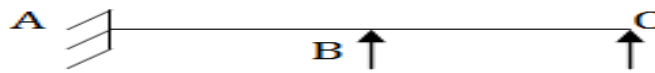
- Q1. Solve any four. 20
- a Draw the influence line diagram for reaction B of the beam shown in figure. 5



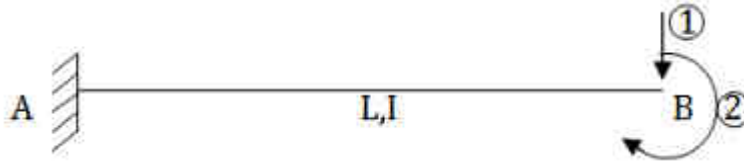
- b Determine the shape function for the Node 1,3,7 and 9 in nine noded rectangular elements in natural co-ordinate system using Langrange's function. 5



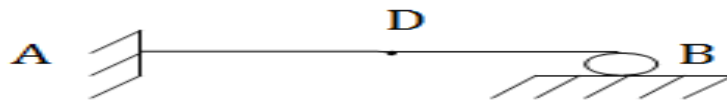
- c Draw the influence line diag. for vertical reaction at C of the beam. 5



- d Develop the flexibility matrix for the following beam element 5



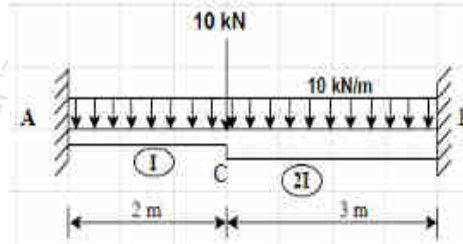
- e Draw qualitative ILD for the BMD at D. 5



Q.2 Solve any ONE.

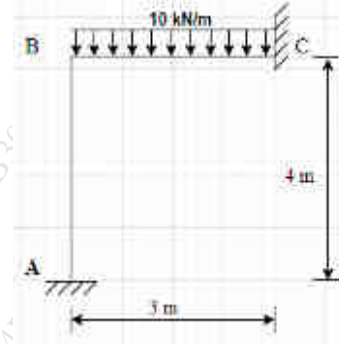
20

A Find the bending movement at Support A and support B by column Analogy Method.



20

B Find the support reaction at Support A and support B by Elastic Centre Method.



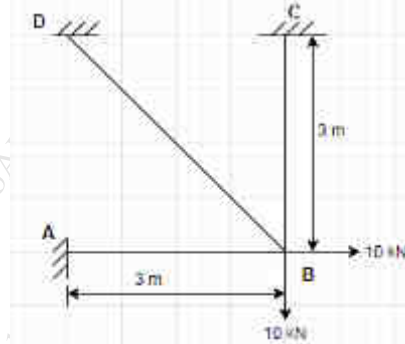
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Q.3 Solve any ONE.

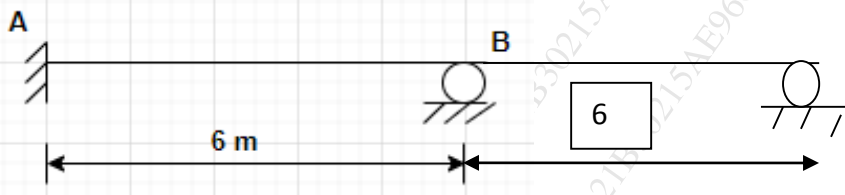
20

A Analyze the pin jointed plane frame by Stiffness Method

20



B Draw the Influence Line Diagram for reaction  $V_b$  for the given structure at the interval of 2 meter.

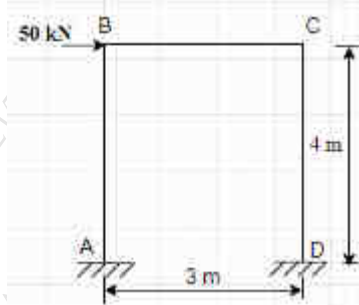


Q.4

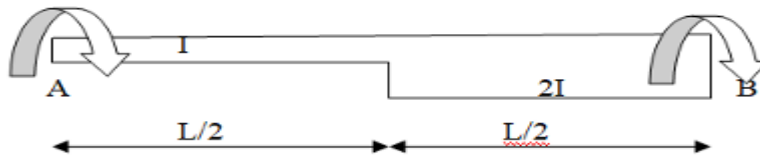
20

A Draw Bending Movement Diagram for the given structure by modified moment Distribution Method.

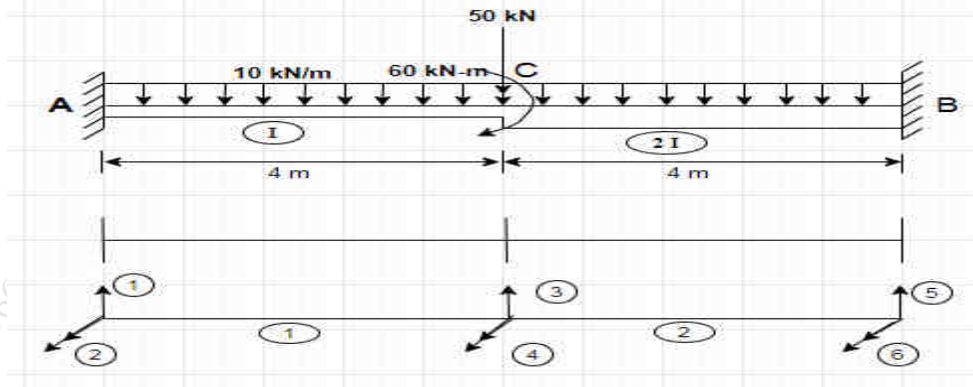
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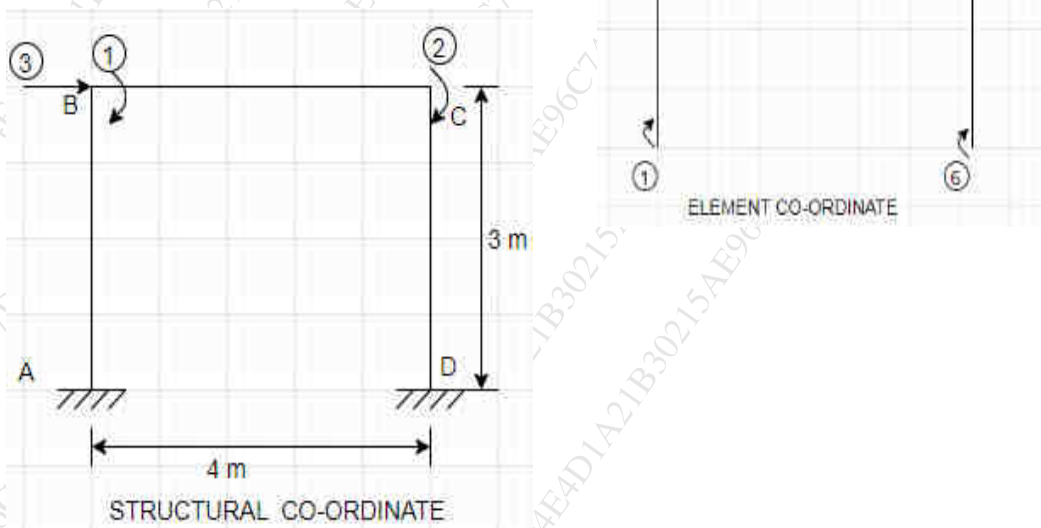
- B Developed the stiffness matrix in the given direction by using Column Analogy Method 10
- Column Analogy Method



- Q5. Find only reaction by using Stiffness Method ( Member Approach ) 20
- A 10



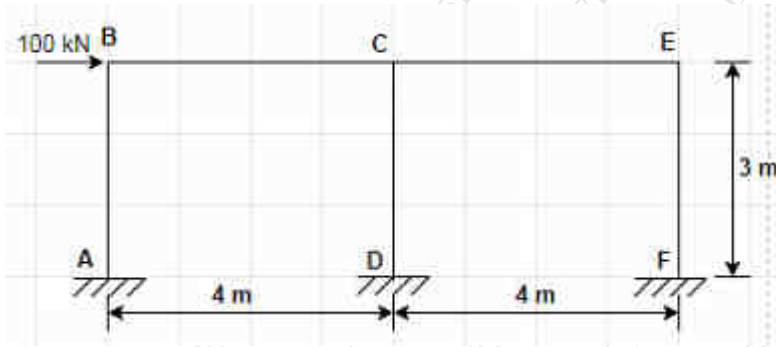
- B Developed K-element Matrix for above co-ordinate System. 10
- Developed the Displacement Matrix
- Developed the Structural Matrix



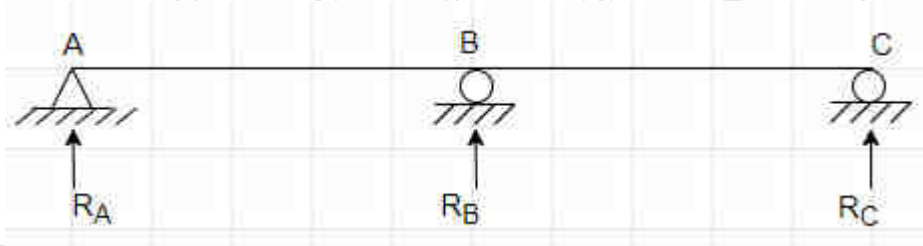
Q.6

A Draw BMD by Portal Frame Method.

20  
10



B



10

Draw Influence Line Diagram For reaction  $R_A$  Length AB is equal to 4 m and Length BC is equal to 6 m at interval of 2 meters.

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(3 Hours)

Total Marks : 80

INSTRUCTIONS

- (1) Question No. 1 is compulsory.
- (2) Attempt any (3) from remaining (5) questions.
- (3) Assume suitable data if required.
- (4) Figures to the right indicate full marks.

**Q1** Attempt any four (4) questions.

- a) Explain different types of Blockchain. Give example of each. [5]
- b) What is Smart Contract? Explain different types of Smart Contracts. [5]
- c) Explain the concept of Ethereum Virtual Machine with suitable diagram? [5]
- d) With suitable diagram explain how transaction flow occurs in Hyperledger fabric? [5]
- e) What are different types of test-networks used in Ethereum? [5]

- Q2** a) Explain the phases of development in ETH 2.0 with suitable diagram. [10]  
b) What are different steps involved in the implementation of Blockchain? [10]

- Q3** a) Explain Bitcoin UTXO with suitable example. [10]  
b) Explain the RAFT consensus mechanism with suitable diagram. [10]

- Q4** a) Explain Ethereum Accounts in detail. [10]  
b) How does Blockchain Supports Crowd Funding? [10]

- Q5** a) What is Hyperledger Fabric? What are different components of Hyperledger Fabric? [10]  
b) What is Quorum Blockchain? Explain the structure of Quorum Node with suitable diagram. [10]

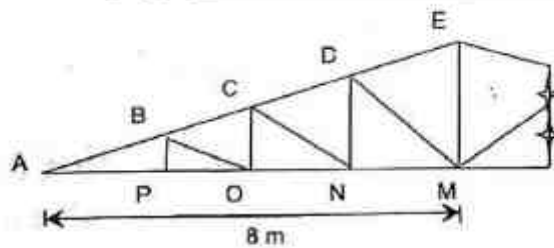
- Q6** Write a short note on : [20]  
a) MetaMask  
b) Mist Wallet  
c) Ripple Blockchain.  
d) Byzantine Fault Tolerant

Time: 4 hours

Total Marks: 80

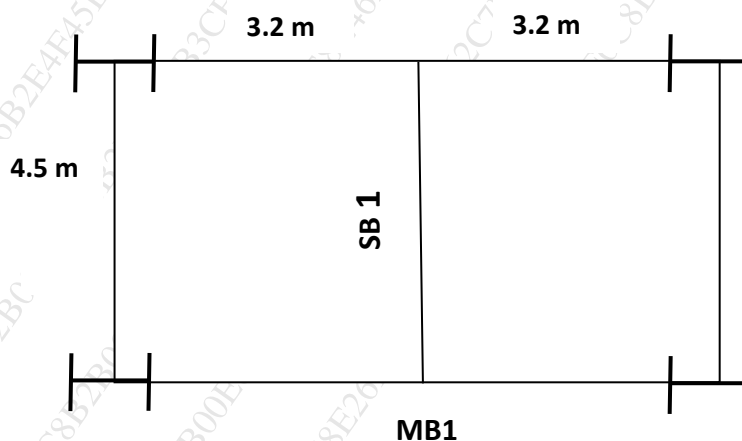
- N.B**
1. **Question No.1** is compulsory, attempt **any three** out of remaining questions.
  2. Draw neat and proportionate sketches wherever applicable.
  3. Use of IS 800:2007 and steel table is permitted.
  4. Assume suitable data if necessary and justify the same.

- Q 1 a)** A truss is provided over an industrial building in the vicinity of Mumbai as shown in **Figure -1 (a)** Calculate Panel Point load for DL,LL and WL to design member AB,BC,AP and PO for the following data : **32**
- Inclination of roof with horizontal =  $15^\circ$   
 Span of Truss-16 m, Spacing of truss : 4 m  
 Self weight of purlin -200 N/m  
 Weight of AC sheets-170 N/m<sup>2</sup>,  
 $K_1=1.0, K_2=0.98, K_3=1.0$  and  $(C_{pe}-C_{pi})= -0.8$



**Figure -1 (a)**  
**OR**

- Q 1 b)** The flooring system of an industrial shed is planned as shown in **Figure -1 (b)** Design beam SB1, MB1 and beam to beam connection between them with top flange of beam at same level. Use following data : **32**
- Thickness of slab -150 mm, Thickness of wall -200 mm,  
 Height of wall is 1.3 m over outer beams, Unit weight of concrete and brick wall is  $25 \text{ kN/m}^3$  and  $20 \text{ kN/m}^3$



**Figure -1 (b)**



- Q 2 a)** Design a laced column 6.2 m long to carry factored axial load of 1000 kN. **10**  
 The column is restrained in position but not in direction at both the ends. Use 2 channel section placed as back to back. Draw neat sketch showing details of connection. Use 16 mm diameter bolts .
- Q 2 b)** Design a slab base for a column ISHB 300 @ 618 N/m subjected to an **06**  
 factored axial compressive load of 900 kN where the load is transferred to the base plate by direct bearing of column flanges. The base rests on concrete pedestal of grade M20.
- Q 3 a)** A column ISHB 350 @ 710N/m; carries a factored axial load of 1600kN. **10**  
 Calculate ONLY the size and thickness of the gusseted base, assuming M20 concrete grade.
- Q 3 b)** Determine the design axial load on the column section ISMB 400, given that **06**  
 the height of the column is 3.5 m and that it is pin-ended. Assume  $f_y = 250 \text{ N/mm}^2$ ,  $f_u = 410 \text{ N/mm}^2$ ;  $E = 2 \times 10^5 \text{ N/mm}^2$
- Q 4 a)** Design a fillet weld to connect a 10 mm thick bracket to the flange of a **08**  
 column [Refer Figure 4(a)]

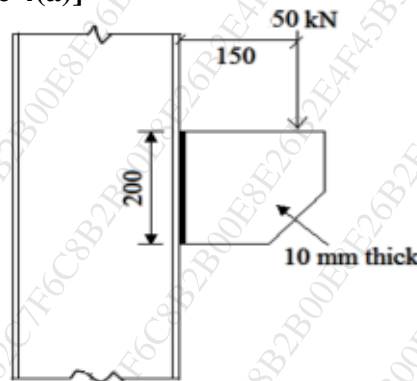


Figure 4(a)

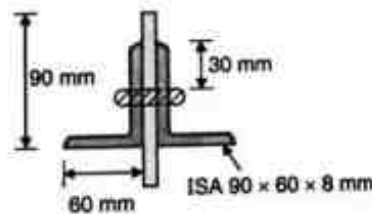
- Q 4 b)** Design a laterally unsupported beam of effective span 4 m and subjected to **08**  
 maximum bending moment of 550 kN-m and maximum shear force of 200 kN .Use steel of grade Fe 410.
- Q 5)** A simply supported welded plate girder of span 12 m is subjected to DL of 20 **16**  
 kN/m and LL of 20 kN/m excluding self weight, it is also subjected to two point load of 600 kN at 4 m from both the supports. The girder is simply supported at the ends and fully restrained at both the ends against lateral buckling throughout the span .  
 Design the cross-section, provide a check for shear buckling, and design bending strength,  
 Assume Load factor as 1.5 and  $f_y=250 \text{ Mpa}$ .

(4 Hours)

Max Marks=80

- Note**
1. Question 1 is compulsory
  2. Attempt any 3 out of five questions
  3. Assume any suitable data where ever required

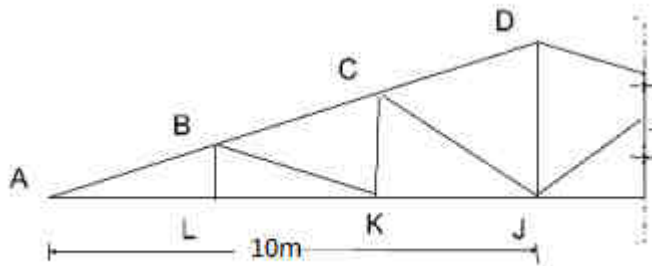
- Q.1** Attempt any **four**
- a. Name and explain the design criteria and explain them, also draw the sketches of different built up sections used in steel structures **05**
  - b. Write step by step procedure followed in the design of slab base. **05**
  - c. Explain the advantages of steel structures and name the types steel sections used in steel structures **05**
  - d. Enlist the Types of steel section used in Steel Structures give the advantages of steel structures **05**
  - e. Explain why the built up section is required to design with neat sketch **05**
- Q.2**
- a. A built up column 8 m long to carry factored axial load of 900 kN. The column is restrained in position but not in direction at both the ends. Find out the spacing required to keep the channel sections back to back and design dimensions of lacing flat to connect the column member. Assume steel grade of Fe 410 and bolts of grade 4.6 **10**
  - b. A strut consist of a double angle section ISA 70 X 70 X 8 mm and 3.2 long. The member is connected to the gusset plate by 03 numbers of 20 mm diameter bolts. Calculate the design compressive strength of the member when the angles are placed on the opposite of 10 mm thick gusset plate **10**
- Q.3**
- a. Determine the tensile capacity of the sections shown in figure, angles are placed on the opposite sides of gusset plate, the bolts are 6 Nos. and 16 mm diameter used (Tack Bolted) **10**



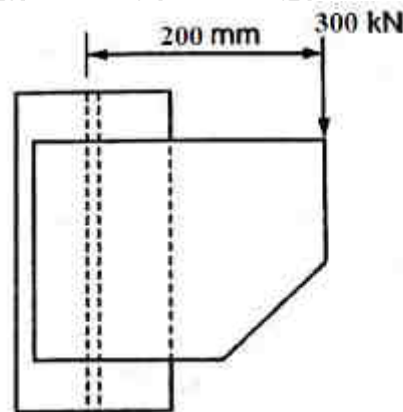
- b. Compute the size of web and size of flange for plate girder of simply supported bridge deck beam with clear span 18 m, Subjected to D.L. of 18 kN/m (excluding self-weight), L.L. 12 kN/m and two concentrated loads 150 kN each at 4 m from each end. Assume that the top compression flange of Plate Girder is restrained laterally and prevented from rotating. Use Fe-415 grade of steel. Design as an unstiffened plate girder with thick web. **10**
- Q.4**
- a. Calculate the design bending strength of ISLB 300@ 0.369 kN/m considering the beam to be laterally supported. **10**
  - b. A column ISHB 350 at 661.2 N/m carries compressive factored load is 1400 kN. Design suitable bolted gusset base. The base rests on M15 grade concrete pedestal. Use 24 mm diameter bolts of grade 4.6 for making the connection. **10**

The SBC of soil is  $180 \text{ kN/m}^2$ . Sketch plan, elevation and side view of the gusseted base which is designed.

- Q.5 a.** Design a welded seat connection when ISMB 500 @  $853 \text{ N/m}$  transmit an end reaction of  $200 \text{ kN}$  (factored) to the flange of ISHB 300 @  $577 \text{ N/m}$ . **10**
- b.** Design a laterally supported beam of effective span  $6 \text{ m}$  for the following data **10**  
 , Grade of steel – Fe 410, Factored maximum BM=  $150 \text{ kNm}$ , Factored maximum shear force =  $150 \text{ kN}$  , Also check the beam for deflection.
- Q.6 a.** Find the panel point load for given truss for DL, LL, and WL, The structure **10**  
 is situated in mumbai industrial area with rise of  $(1/3)$  span, spacing between truss is  $4 \text{ m}$ , span of truss  $20 \text{ m}$ , self weight of purlin -  $200 \text{ N/m}$ , weight of GI sheets -  $160 \text{ N/m}^2$   
 The values of  $K_1=1.0$ ,  $K_2 = 0.97$ ,  $K_3 = 1.0$  and  $(C_{pe}-C_{pi}) = -0.7$



- b.** A column of ISHB 150 @  $300 \text{ N/m}$  carries factored end reaction of  $300 \text{ kN}$  on a beam. Design a welded bracket connection with an eccentricity of  $200 \text{ mm}$ , the thickness of bracket plate is  $12 \text{ mm}$ , provide welding on 3 sides of bracket plate. **10**



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(3 Hours)

(Maximum Marks: 80)

- NB.** 1. **Question number One** is compulsory  
2. Attempt **any three out of remaining five** questions  
3. Assume suitable data  
4. Figures to the right indicate the maximum marks

- Q1 Attempt any FOUR: (20)**
- a) Define and classify Cybercrime
  - b) Comment on Windows OS Artifacts
  - c) Explain Principles of Digital Forensic.
  - d) Which are the Goals of Incident Response
  - e) How to Acquire Image over a Network
- Q2 a) Explain Digital Forensics and its lifecycle. (10)**  
**b) Explain in detail Incidence Response Methodology (10)**
- Q3 a) Describe Steps to prevent cybercrime and explain Hackers, Crackers and Phreakers (10)**  
**b) Explain Forensic Investigation Report Writing in terms of Standards, Content, Style, Formatting and Organization. (10)**
- Q4 a) Describe Digital Investigation Staircase Model (10)**  
**b) How to Acquire an Image with dd Tools and with Forensic Formats (10)**
- Q5 a) Describe in details OS File Systems. (10)**  
**b) Explain Network-Based Evidence acquisition and its analyzing. (10)**
- Q6 a) Explain Need and types of Computer Forensic Tools in detail. (10)**  
**b) In Mobile Forensics explain Challenges, Evidence Extraction Process, Types of Investigation, and Procedure for Handling an Android Device. (10)**

**Time-3.0 hours**

**Marks- 80**

- Note: 1) Question No.1 is compulsory  
2) Attempt any three questions out of remaining five questions  
3) Assume the suitable data if necessary and state the same.

**Q1 Attempt any four questions out of the following**

**(5x4=20)**

- Explain the oxygen sag curve.
- What are the factors affecting location of intake structure.?
- Define air pollution and what is the effect of air pollution on human health.
- Explain why sewers are design to run partially full.
- What are the good quality of traps.

**Q2 A) Draw the layout of water treatment plant and explain the function of each unit. (10)**

**B) Design the septic tank for hostel building of 500 students. The rate of water supply is 150 liters per capita per day and assume 80% water is converted to waste water. Assume the detention period 24 hours and cleaning period 2 years. (10)**

**Q3A) Following is the data for single stage trickling filter (10)**

- sewage flow = 5MLD
- BOD of raw sewage = 300mg/l
- Recirculation ratio = 2.0
- Depth of filter media = 2.0M
- BOD removal in primary tank = 25%
- Effluent BOD= 30 mg/l

Determine the size of trickling filter and its efficiency.

**B) Draw the neat sketch of rapid sand filter with all its principle component and under drainage system and explain the function of each component. (10)**

**Q4 A) Explain the process of break point chlorination (5)**

**B) Explain the functional element of municipal solid waste management. (5)**

**C) what is temporary and permanent hardness? Explain the zeolite process. (10)**

- Q5 A) explain why rain water harvesting is necessary (5)
- B) what is noise pollution and what are the effects of noise pollution. (5)
- C) Define the following terms used in activated sludge process (10)
- i) BOD loading or organic loading rate
  - ii) F/M ratio
  - iii) Aeration period
  - iv) sludge age
  - v) sludge volume Index
- Q6 A) Draw the neat sketch of drop manhole and explain its function. (5)
- B) Differentiate between aerobic process and anaerobic process (5)
- C) The maximum daily demand of water purification plant has been estimated as 6MLD. Design the dimension of suitable sedimentation tank. Assuming detention period of 3 hours and velocity of flow 25cm/minute. (5)
- D) A 5 day BOD of raw sewage sample is 300mg/l. what will be the BOD of the sample at a temperature of 25<sup>0</sup>C after 7 days. Take KD = 0.1 (5)

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Time: 03 Hour

Marks: 80

- NOTE:**
- (1) Question No 1 is compulsory.
  - (2) Attempt any THREE questions from the remaining questions.
  - (3) Assumptions made should be clearly stated.
  - (4) Figures to the right indicate full marks

**Q1.** Attempt any FOUR questions

20

- a) Explain Sand drains
- b) Explain Jet grouting
- c) How to Use blasting for Deep Compaction of Soil?
- d) What are the different methods available for soil stabilization?
- e) Explain collapsible soil

**Q2a.** Explain in detail with neat sketches the Vibro-flotation technique of densification of deeper layers of granular soils and its quality control

10

**Q2b.** What are the permanent ground improvement techniques? Explain in detail

10

**Q3a.** Write a note on procedure to be followed for application of load in field load test of stone columns as recommended in IS 15284 (Part 1).

10

**Q3b.** What is the recent trend in GIT explain in details?

10

**Q4a. (i)** Explain bituminous stabilization

05

**(ii)** Explain soil cement stabilization

05

**Q4b.** A sub soil consists of soft soil i.e. silty clay up to 7m depth. In-situ undrained cohesion i.e.  $C_u$  is 18 kPa and additional data is given below. Weight density of soil above the water table is  $17.65 \text{ kN/m}^3$ . Effective density below water table is  $7.85 \text{ kN/m}^3$  on the above of the stone column of water tank is to be supported on earthen pad foundation. GWT is situated at 1 below the ground level. Diameter of tank is 79 m. Load intensity from tank and earthen pad is 147 kPa. Diameter of stone column is 0.9 m, angle of internal friction = 50. Take  $N_c = 6$ , FoS against bearing is 2.5. Design the stone column foundation system.

10

**Q5a.** What are the desirable characteristics of grouts explain each

10

**Q5b.** Write a short note on Mononobe and Okabe method

10

**Q6a.** Explain in detail the function of geotextile used as a separator.

10

**Q6b. (i)** Distinguish between consolidation and compaction

05

**(ii)** Explain Chemical Grouting

05

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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]
- Explain Categorical data and quantitative data.
  - Find S.D of the average temperature recorded over a five-day period last winter  
18,22,19,25,12
  - Define Binomial distribution and Poisson distribution.
  - Explain Type1 and Type 2 error in detail.
  - Define the following key terms for simple linear regression.  
 i) Response ii) Record iii) Independent variable iv) Regression co-efficient v) Residuals
- 2 a The runs scored in a cricket match by 11 players are as [10]  
 follows:7,16,121,51,101,81,1,16,9,11,16.  
 Find mean, mode, median for the given data.
- b An agent sells life insurance policies to five equally aged healthy people. [10]  
 According to recent data, the probability of a person living in these conditions for 30 years or more is  $\frac{2}{3}$ . Caluclate the probability that after 30 years if
- All five people are still living.
  - At least three people are still living.
  - Exactly two people are still living (Hint: Binomial Distribution)
- 3 a X is a normally distributed variable with mean  $\mu=30$  S. D  $\sigma=4$ . Find i)  $P(X<40)$  [10]  
 ii)  $P(X>21)$  iii)  $P(30<X<35)$
- b Brief the steps in multinomial distribution goodness of fit. Elaborate the steps [10]  
 with an example.
- 4 a Brief the steps in test of independence. Elaborate the steps with an example [10]
- b Find the simple linear regression that fits the given data and co efficient of [10]  
 determination.

Bill	34	108	64	88	99	54
Tip	5	17	11	8	14	5



5 a In the context of multiple linear regression. Explain what is over fitting and multi collinearity. [10]

b Predict equation for y. [10]

y	x1	x2
-3.7	3	8
3.5	4	5
2.5	5	7
11.5	6	3
5.7	2	1

6 a Explain TIME SERIES PATTERNS [10]

- i) Horizontal Pattern
- ii) Trend Pattern
- iii) Seasonal Pattern
- iv) Trend and Seasonal Pattern
- v) Cyclical Pattern

b Consider the following time series data. [10]

<b>Week</b>	1	2	3	4	5	6
<b>Value</b>	18	13	16	11	17	14

Using the naive method (most recent value) as the forecast for the next week, compute the following measures of forecast accuracy.

- i) Mean absolute error.
- ii) Mean squared error.
- iii) Mean absolute percentage error.
- iv) Determine the forecast for week 7?

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(3 Hours)

[ Total Marks: 80

- Note:**
- i. Q. No. 1 is **compulsory**
  - ii. Attempt **any 3** out of remaining 5
  - iii. Support all **theory and numerical** with neat sketch

1. Solve any four (20 M)

- A. Explain level of service.
- B. Explain TSM methods.
- C. What are factors affecting trip generation and distribution?
- D. Compare NPV, IRR and B/C
- E. Enlist various traffic studies? Explain O & D study.
- F. Discuss on Coordinated signal system.

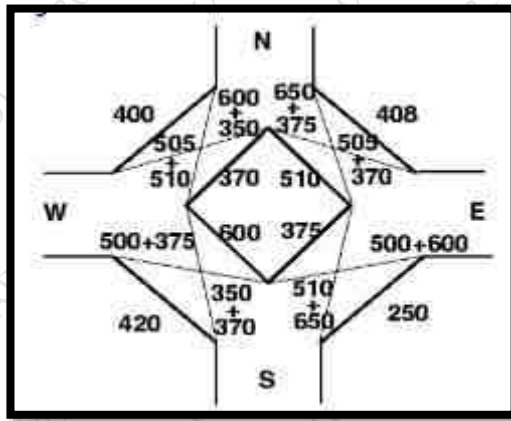
2. A. Assuming linear relationship if mean free speed is observed to be 60 kmph near zero density and jam density is 45 veh/km. Assume average length of vehicle to be 4 m. Write speed density and flow density relation. Draw Q-K-V curves with their values and compute speed and density for flow of 400 veh/hr. (08 M)

B. Solve the following matrix for the future trip distribution using Average growth factor method. (06 M)

O/D	1	2	3	P <sub>j</sub>
1	150	192	136	850
2	144	128	164	700
3	101	184	174	600
A <sub>j</sub>	800	750	600	

C. Discuss on ITS and its applications. (06 M)

3. A. Design a rotary intersection for 2 highways meeting at right angle. Also draw neat sketch of all the elements of rotary. Assume suitable data as per requirement. (08 M)



B. Design street light assuming all data for 4 lane divided road. (06 M)

C. Discuss any 1 method to carry out speed study on the road. (06 M)

4. A. What is gravity Model? Write stepwise procedure to use gravity model. (08 M)  
 B. Find which project to be selected from the following using IRR (06 M)

Project	A	B
Investment	100cr	100cr
Annual return 1	30	45
Annual return 2	35	40
Annual return 3	40	35
Annual return 4	45	30

- C. Derive equation for Q-K-V (06 M)
5. A. Find NPV & B/C if investment is 100cr. (08 M)

years	Net returns	i
1	22	10
2	35	8
3	38	8.5
4	41	8.5
5	45	9

- B. Explain with an example In-Out survey for parking. (06 M)  
 C. Discuss on four stage modelling. (06 M)

6. A. Explain application of statistics in Traffic Engineering. Analyzing employment structure of household in an urban area in connection with trip generation, it has been found that there are 2500 household of 4 members in each. Find probability that particular households has 0,1,2,3&4 employed. (08 M)

- B. Find the trip generation if population is 80000 for following table: (06 M)

Population (thousand)	Trip Generation
37	1000
40	1200
52	1600
58	1900
64	2200
80	?

- C. Discuss on methods to find PCU. (06 M)

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Duration: 3 hours

Total marks: 80

- NB:** 1) Q.1 is **COMPULSORY**  
 2) Attempt any **THREE** out of remaining questions  
 3) Assume suitable data wherever required.

**Q.1** Attempt any **FOUR** of the following (20)

- A. Define irrigation and discuss in brief disadvantages of over irrigation.
- B. What are the forms of precipitation?
- C. Define the following: aquifer, aquifuge, aquiclude, aquitard, perched aquifer
- D. Write a short note on zones of reservoir?
- E. Compare the Kennedy's and Lacey's theories.
- F. Enlist types of Canal lining.

**Q.2.** A. i. Explain with the help of a diagram the hydrologic cycle. (05)

A. ii. Define Precipitation. Explain different types of Precipitation (05)

B. The ordinates of 4-h unit hydrograph for a drainage basin are given below.

Obtain 12- hr UH by S-curve method (10)

<b>Time (hours)</b>	0	4	8	12	16	20	24	28	32	36	40	44
<b>Ordinates of 4-h UH</b>	0	20	80	130	150	130	90	52	27	15	5	0

**Q.3.** A. i Explain types of spillways based on utility. (05)

A. ii. Define Duty, delta & base period. Derive the relation between them. (05)

B. The gross command area for a distributary is 10,000hectares out of which 75% can be irrigated. The intensity of irrigation for gram (Rabi) is 60% and for rice (Kharif) is 30%. If average duty at the head of distributary is 2500 hectares per cumec for Rabi season & 1000 hectares per cumec for Kharif season, calculate the discharge required at the head of distributary. (10)

**Q.4.** A. i. Draw a neat sketch of confined aquifer & name the components. (5)

A. ii. Enumerate various causes of Water logging. (5)

**Q4.B.** During a recuperation test, the water in an open well was depressed by pumping, by 2.1m and it recuperated 1.6m in 90min. Find the diameter of well to yield 10litres/sec under a depression head of 2m. (10)

**Q5.** A. i. Differentiate between elementary & practical profile of gravity dam (05)

A. ii. Describe in brief the types of earth dams. (05)

**Q5.B.** Design the practical profile of a gravity dam from the following data:

Reduced Level of base of Dam is 1450 m

Reduced Level of F. R. L. = 1480.5 m,

Specific Gravity of masonry = 2.4.

Safe compressive stress for masonry = 1200 kN/m<sup>2</sup>.

Height of waves = 1m.

Assume any suitable data if required and state the same clearly. **(10)**

**Q.6. A.** Design an irrigation channel to carry a discharge of 100 cumecs in a soil having silt factor 1.1, using Lacey's theory. Assume side slopes of 0.5H to 1.0V **(10)**

**B.** Describe with the help of sketches various types of Cross Drainage Work. **(10)**

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Time: 3 Hours

Max. Marks: 80

- N.B.:
- (1) Question No.1 is compulsory
  - (2) Attempt any three from the remaining
  - (3) Draw neat sketches wherever essential
  - (4) Write answers in legible handwriting

- Q. 1. Attempt any four. (20)
- a) Define electrical energy and write its expression.
  - b) Describe merits and demerits of tidal power.
  - c) State difference between controlled and uncontrolled nuclear reactions.
  - d) What are the components and their functions of telecommunication tower?
  - e) Explain components of IT infrastructure.
  - f) Explain the functions of smart grid components.
- Q. 2. Attempt any two. (20)
- a) Explain the functions with neat diagrams of components; i) Trash rack, ii) Surge tank, iii) Penstock, iv) Turbine and v) Draft tube.
  - b) Describe the components and their functions of tidal power plant with neat diagram.
  - c) State the functions of components of nuclear power plant with neat sketches.
- Q. 3. Attempt any two. (20)
- a) Explain factors to be considered in design of telecommunication tower.
  - b) Differentiate between programme-controlled storage management and system-controlled storage management
  - c) Draw a neat and labelled diagram of electric power transmission and distribution.
- Q. 4. a) State and explain the types of electricity generation. (05)
- b) Draw a neat and labelled sketch of tidal power plant. (05)
  - c) Differentiate nuclear fission and nuclear fusion. (05)
  - d) Classify telecommunication towers. (05)
- Q. 5. a) Define hydrograph and unit hydrograph. (05)
- b) Describe factors affecting site selection of tidal power plant. (05)
  - c) Differentiate LAN and WAN. (05)
  - d) What are the merits of smart grid? (05)
- Q. 6. Write short notes on any four of the following. (20)
- a) Reduction of power loss
  - b) Anchor and mooring
  - c) Safety measures in nuclear power plant
  - d) Telecommunication signals.
  - e) Remote access.
  - f) Smart grid.

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