B.E. (Civil Engineering) Seventh Semester (C.B.S.)

Advanced Concrete Structures

P. Pages : 2 **PSM/KW/23/2326**

Time : Four Horus * 2 3 8 2 * Max. Marks : 80

Notes :
1. All questions carry marks as indicated.
2. Solve Question 1 OR Questions No. 2.
3. Solve Question 3 OR Questions No. 4.
4. Solve Question 5 OR Questions No. 6.
5. Solve Question 7 OR Questions No. 8.
6. Solve Question 9 OR Questions No. 10.
7. Solve Question 11 OR Questions No. 12.
8. Due credit will be given to neatness and adequate dimensions.
9. Assume suitable data whenever necessary.
10. Illustrate your answers whenever necessary with the help of neat sketches.
11. Use of non programmable calculator is permitted.
12. Use of I.S. 456:2000 and I.S. 3370:2009 may be consulted
13. Detailing Carry marks.

1. Design a 150000 Hr Capacity circular water tank resting on Ground having rigid jointed base take free board of 0.3m. Take δcbc as $7N/mm^2$, δet as $1.2N/mm^2$, δst as $150N/mm^2, m=13$. Design tank wall base slab, spherical dome and ring beam. **13**

OR

2. Design using IS 3370-Part IV a rectangular water tank $6m \times 4m$ with the depth of storage 3m resting on ground and whose walls are rigidity jointed at vertical and Horizontal edger. Assume M20Grade of concrete and Fe415 steel. Sketch reinforcement details. **13**

3. Design Isolated tooting for a rectangular column $300mm \times 300mm$. Carrying an axial load of 500kN and a bending Moment & 100 kN-m. The safe bearing capacity of soil is $200\,kN/m^2$. Use M20 Grade of concrete and Fe415 Grade of steel Draw the reinforcement details. **13**

OR

4. Design the longitudinal reinforcement for a braced column $400mm \times 400mm$ subjected to a factored axial load of 1200kN and factored moments of 80 kN-m and 60 kN-m w.r.t. the major and mine axis respectively at the top end. Assume that the column is bent in double curvature (in both direction) with the moments at the bottom end equal to 50% of the corresponding moments at the top Assume an unsupported length of 5.0m and an effective length ratio of 0.85 in both the directions. Use M20 concrete and Fe415 steel. Assume effective corer 60mm. Assume (k=0.8). **13**

5. Draw elastic Moment Diagram and bending moment Diagram after 25% moment redistribution for a two span continuous beam of span 7m each subjected to udl of 25kN/m on entire span. **13**

OR

6. a) Sketch the bending moment envelope after 30% maximum redistribution for a fixed ended beam carrying two point loads of 20kN each at one third points and a uniformly distributed load of 4kN/m over a span of 9m. **9**

b) Explain redistribution of moments state its advantages. **4**

7. Design a Cantilever retaining wall for a road with following data: **14**

i) Height of wall from bottom of base to stem = 5.0m
ii) Assume Backfill is levelled
iii) Unit weight of soil = $18\,kN/m^3$
iv) Angle of internal friction for fill material = 30^o
v) Allowable sale bearing capacity of soil = $175\,kN/m^2$
vi) Coefficient of friction between concrete and grand = 0.35
vii) Use M20 Concrete and Fe415 steel

OR

8. Design a counterfort retaining wall to retain 7m high embankment above ground level. The foundation is to be kept at 1m deep where the safe bearing capacity of soil may be taken as $180\,kN/m^2$. The Top of earth retained as horizontal and soil weight $18\,kN/m^3$ with an angle of internal friction as 30^o, Coefficient of friction between concrete and soil may be taken as 0.5. Use M20 concrete and Fe415 steel. **14**

9. Design a Intermediate portal frame (hinged at Base) for single bay single storey having span of 12m, column height 4.5m. The beam has rib width of 350mm. The superimposed load, stiffness of Beam Grade of steel, Grade of concrete are 20kN/m, $I_{Beam} = 2.5\,I_{Column}$ Fe415 and M20 respectively. **13**

OR

10. Design a Doglegged staircase for a residential building having staircase room size as $3.0m \times 6.0m$. Take live load as $3kN/m^2$, Floor finish $1.0\,kN/m^2$. Take Length, floor to floor Height as 3.12m. Graded steel Fe415 and concrete M20. **13**

11. Design a combined footing for two columns 'A' and 'B' spaced 4.0m c/c. Column 'A' is 350mmx350mm in size and transmits a load of 400kN. Column 'B' is 450mmx450mm in size and carries a load of 600kN. The maximum width of footing is restricted to 1.5m only. The state bearing capacity of soil is $150\,kN/m^2$. Use M20 concrete and Fe415 Graded steel. **14**

OR

12. Design a strap footing for two Columns 'A' and 'B' spaced 5m c/c. Column 'A' 300mmx300mm in size carries a load of 600kN and is on the property line column 'B' 400mmx400mm in size, carries a load of 900kN. The bearing capacity of soil is $120\,kN/m^2$. Use M20 concrete and Fe415 steel. **14**

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B.E. (Civil Engineering) Seventh Semester (C.B.S.)

Estimating and Costing

P. Pages : 4 **PSM/KW/23/2327**

Time : Four Hours * 2 3 8 3 * Max. Marks : 80

Notes :
1. All questions carry marks as indicated.
2. Solve Question 1 OR Questions No. 2.
3. Solve Question 3 OR Questions No. 4.
4. Solve Question 5 OR Questions No. 6.
5. Solve Question 7 OR Questions No. 8.
6. Solve Question 9 OR Questions No. 10.
7. Solve Question 11 OR Questions No. 12.
8. Assume suitable data whenever necessary.
9. Illustrate your answers whenever necessary with the help of neat sketches.
10. Use of non programmable calculator is permitted.

1. a) Explain with suitable examples. The various methods of calculating Approximate Estimates. **6**

b) The following table is an extract from the longitudinal section of a road earthwork survey. Calculate the quantity of earthwork from the following data. **7**

i) Formation width : 12 m

ii) Side Slopes : a) Banking – 2 : 1 b) Cutting – 1.5 : 1

Chainage	0	30	60	90	120	150	180
RL of Ground	99.70	99.80	100.30	100.50	100.80	100.90	100.60
RL of Formation	100.50 ---------- |in 300(+) ---------- →|← in 150(-)→						

OR

2. a) Prepare a preliminary estimate of a double storeyed building having carpet area of 1800m2. It may be assumed that 30% of the built up area will be considered for corridors and verandahs and 10% of the area to be occupied by walls Given: **6**

1) Plinth Area Rate : Rs. 1500 per m2
2) Water Supply and Sanitary works : 5% of building cost
3) Electrical Installation : 12.5% of building cost.
4) Contingencies : 10%

b) The ground levels at various chainages along centre line of a proposed road are **7**

Chainage	21	22	23	24	25
Distance	0	30	60	90	120
RL of Ground	180.50	183.36	185.52	187.10	186.50

The ground has uniform cross slope of 1 in 8. The length of chain is 30m. The road formation is proposed at uniform gradient passing through the G.L. at the end chainages with formation width as 8 m and side slope in cutting is 1:1. Estimate the quantity of earthwork for the proposed road section in a tabular form.

3. a) From the enclosed drawing (Fig.1) calculate the quantities of the following items of work in standard tabular form on answer sheet. Prepare centre line diagram and indicate long walls and short walls separately and c/c length of each L/W and S/W and also its numbers (any two) **8**

i) Excavation in foundation

ii) PCC (1:4:8)

iii) UCR Masonry

b) A RCC slab overall size 3300 mm x 6800 mm x 130 mm is provided with 16mm ϕ as main steel reinforcement bent up alternately and placed @ 140 mm c/c. Alternate bars are bent up at 540 mm from the outer edge of the slab. Distribution steel bars are of 6 mm ϕ @ 180 c/c. Assume cover as 20 mm throughout. Calculate the quantities of steel reinforcement in bar bending schedule. (All steel bars are of mild steel) **6**

OR

4. a) Estimate the quantities of following items of work (any two) from the given Drawing in fig. 1. **8**
i) Filling in Plinth. ii) RCC work in slab.
iii) Internal plaster to walls and ceiling.

b) Fig. 2 (Enclosed) shows the details of reinforcement of column and column footing. Assume cover as 25mm throughout in column and column footing both. Prepare an estimate with bar bending schedule and calculate the quantity of steel reinforcement. **6**

5. a) Explain in brief, various methods of carrying out Civil Engineering works in government departments. **7**

b) Enlist the various types of contract and explain any two of them. **6**

OR

6. a) Enlist an information to be included while drafting Tender Notice. **7**

b) Differentiate clearly between Earnest Money Deposits and Security Deposits. **6**

7. a) What is specification? Explain the various types of specification. **7**

b) Write a short note on 'Direct and Indirect charges'. **6**

OR

8. a) Write a detailed specification of the following **any two.** **8**
i) Earthwork in Excavation in foundation trench.
ii) Laying P.C.C. in foundation trench (Mix 1 : 4 : 8)
iii) Second class Brick Masonry in Superstructure

b) Write a short note on 'MAS Accounts'. **5**

9. a) Define Rate Analysis. Explain the major and minor factors affecting rate analysis. **6**

b) Calculate the rate per unit item of following items **any two.** **8**
i) PCC (1 : 4 : 8)
ii) Brick Masonry in Superstructure in C. M. 1 : 6 (Brick Size 19 cm x 9 cm x 9 cm)
iii) 20 mm thick Cement plaster in C. M. 1 : 4.

OR

10. a) What do you understand by Task work of a labourer? Explain the factors affecting taskwork. **6**

b) Calculate the rate per unit item of the following (any two) **8**
i) RCC work (1 : 2 : 4) in slab (Assume 1% steel Reinforcement)
ii) Brick Masonry in superstructure in C. M. 1 : 4 (Brick size 23 cm x 11 cm x 7 cm)
iii) 10 cm thick cement concrete flooring (1 : 3 : 6)

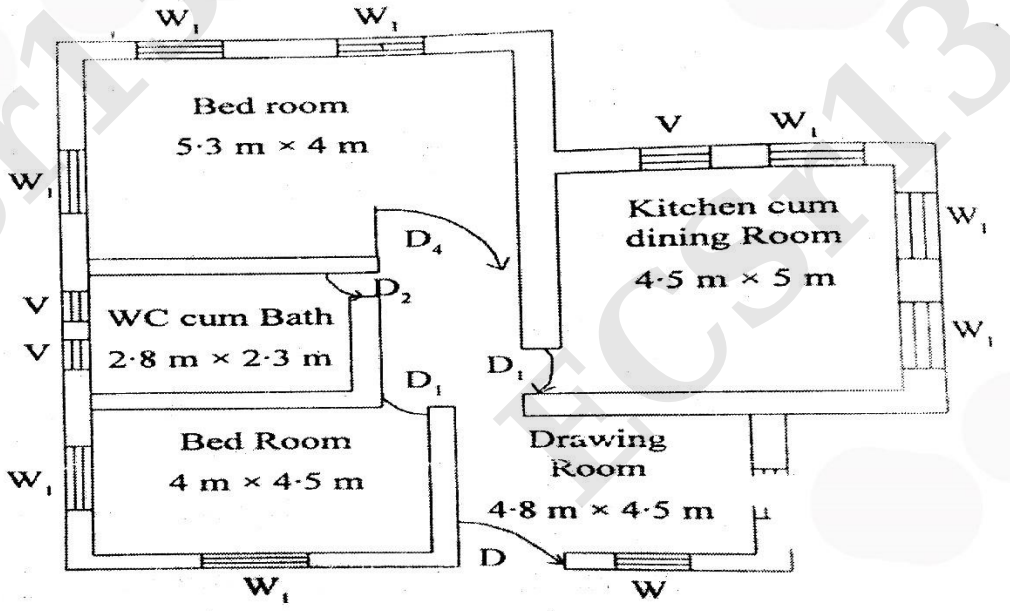
11. a) What is valuation? Explain in brief the various purposes of valuation. **6**

b) A person has purchased an old building at the cost of Rs. 90 Lakhs on the basis that the cost of land is Rs. 50 Lakhs and the cost of building structure is Rs. 40 Lakhs. Considering the future life of a building as 20 years. Calculate the amount of sinking fund at 4% interest, when scrap value is 10% of the building structure. **7**

OR

12. a) Enlist the various types of valve. Explain any two. **6**

b) A leasehold property is to produce a net annual income of Rs. 12,000 for the next 20 years. The owner expects a return of 8% on his capital and also sets apart a sinking fund to accumulate at 6% annually to replace the capital. Determine the capitalized value of the property. **7**



D → 1·2 × 2·1 W_1 → 1·2 × 1·5

D_1 → 1 × 2·1 V → 0·5 × 0·5

D_2 → 0·9 × 2·1

W → 1·5 × 1·5

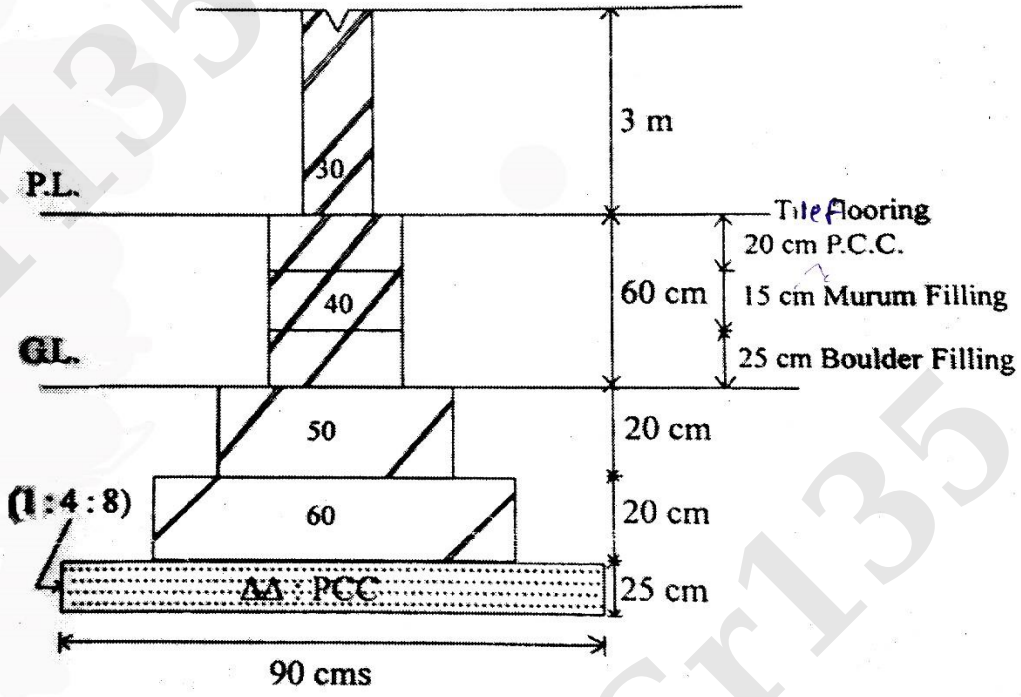


Fig.1 (Q. 3a)

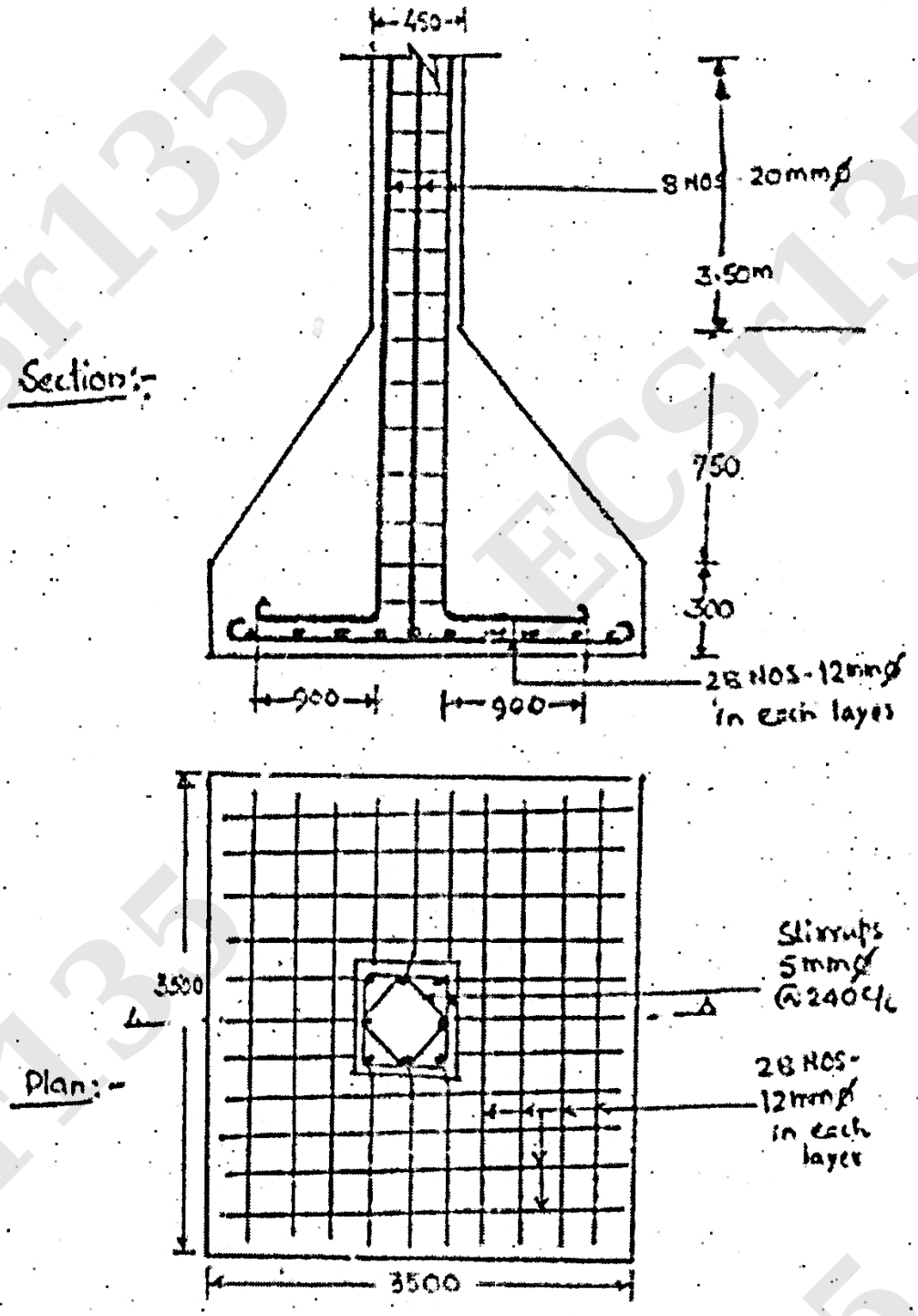


Fig. 2 (Q. 4b)

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B.E. (Civil Engineering) Seventh Semester (C.B.S.)

Elective-I : Earthquake Resistant of Structure

P. Pages : 2 **PSM/KW/23/2328**

Time : Three Hours * 2 4 9 2 * Max. Marks : 80

Notes :
1. All questions carry marks as indicated.
2. Solve Question 1 OR Questions No. 2.
3. Solve Question 3 OR Questions No. 4.
4. Solve Question 5 OR Questions No. 6.
5. Solve Question 7 OR Questions No. 8.
6. Solve Question 9 OR Questions No. 10.
7. Solve Question 11 OR Questions No. 12.
8. Assume suitable data whenever necessary.
9. Illustrate your answers whenever necessary with the help of neat sketches.
10. Use of non programmable calculator is permitted.
11. I.S. 1893 Part – I – 2002, IS 13920-1993, IS 456-2000 may be consulted.

1. a) Describe plate tectonics theory in detail. What are the major plate tectonics on the earth surface? **7**

b) Explain in brief response spectra. **6**

OR

2. a) Explain in brief elastic rebound theory of an earthquake. **6**

b) Enlist various seismic waves waves generated during an earthquake excitation. Also describe in details any three seismic waves with neat sketch. **7**

3. a) What are the Earthquake effects on structure. **7**

b) Explain with neat sketches various configurational deficiencies (Irregularities) in RC building? **7**

OR

4. a) How the architectural features affects the seismic behaviour of the building. **7**

b) Write the note on seismic damages occurred during past earthquakes. **7**

5. a) Explain the mathematical modeling of floor diaphragms in RC buildings. **7**

b) Explain in brief 2D plane frame modeling of RC building. **6**

OR

6. a) Explain Winkler model theory of soil foundation. **7**

b) Explain various seismic methods of analysis of RC structure as per relevant IS code. **6**

7. A RCC beam is having following details: **14**

i) Size of Beam: $300\,mm \times 550mm$

ii) Span of beam : 5.5m

iii) M20 grade of concrete & Fe415 grade of steel.

iv) Ultimate bending moment at top of beam (kN-m)

At left support: 190

At Mid span : 100

At Right support: 170

v) Ultimate bending moment at bottom of beam (kN-m)

At left support : 120

At Mid Span: 185

At Right support : 130

Calculate reinforcement as for ductile detailing code with neat sketch.

OR

8. A RCC frame hospital building of five Storeys is situated at Mumbai. The height between the floors is 3m and total height of building is 15m. The (along x direction) & width (along y direction) of building plant at plinth level is 20m. The dead load & live load is lumped at respective floor level as given below: **14**

Floor 1 = 4000 kN Floor 2 = 3000 kN, Floor 3 = 3000 kN

Floor 4 = 3000 kN Floor 5 = 2500 kN.

The soil below foundation is hard rock. Determine the total base shear along length & load distributed at each floor level. Draw neat sketch of frame showing the horizontal forces.

9. a) Explain in brief about seismic retrofitting. **6**

b) Explain in brief various failure modes of masonry structures and repairing techniques. **7**

OR

10. a) Write a note on Seismic Retrofitting. **6**

b) Explain in detail Comparative study of various retrofitting methods. **7**

11. a) Write a short note on Base Isolation System. **6**

b) Explain in brief various failure modes of masonry structures. **7**

OR

12. a) Write a short note on IS Code provisions for retrofitting of masonry structure. **7**

b) Explain in brief various repairing Techniques for masonry structure. **6**

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B.E. (Civil Engineering) Seventh Semester (C.B.S.)

Elective-I : Advanced Traffic Engineering

P. Pages : 3 **PSM/KW/23/2329**

Time : Three Hours * 2 4 9 3 * Max. Marks : 80

Notes :
1. All questions carry marks as indicated.
2. Solve Question 1 OR Questions No. 2.
3. Solve Question 3 OR Questions No. 4.
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5. Solve Question 7 OR Questions No. 8.
6. Solve Question 9 OR Questions No. 10.
7. Solve Question 11 OR Questions No. 12.
8. Assume suitable data whenever necessary.
9. Illustrate your answers whenever necessary with the help of neat sketches.
10. Use of non programmable calculator is permitted.

1. a) Explain the human factors governing the road user characteristics. **6**

b) A passenger car weighing 2 tonnes is required to accelerate at a rate of $3 m/sec^2$ in the first gear from a speed of 10 KPH. The gradient is +1 percent and the road have a black topped surface. The frontal projection area of the car is $2.0 m^2$. The car tyres have radius of 0.33m. The rear axle gear ratio is 3.82:1 and the first gear ratio is 2.78:1. Calculate the engine horsepower needed and the speed of the engine. Make suitable assumption. **7**

OR

2. a) Explain in details how vehicular characteristic affecting the Road design. **6**

b) Analyze the following spot speed data and estimate the- **7**
a) Medium Speed,
b) Lower & Upper Speed,
c) Design Speed

Speed Group (KMPH)	Frequency	Speed Group (KMPH)	Frequency
20-24.9	04	45-49.9	35
25-29.9	05	50-54.9	22
30-34.9	12	55-59.9	09
35-39.9	14	60-64.9	03
40-44.9	36	65-69.9	01

3. a) Write short notes on Poisson Distribution & Binomial Distribution. **6**

b) At an uncontrolled T junction past experience indicates that the probability of vehicles arriving on side road during 15 sec interval and turning right into the main road is 1/5. Find the probability that is a period of 1 min, there will be 0, 1, 2,3 or 4 vehicles arriving and turning right. **7**

OR

4. a) In analyzing the employment structure of households in an urban area, in connection with a trip generation study it has been found that there are 2500 households of 4 members in each. Find the probability that a particular household of this size has 0, 1, 2, 3 and 4 employed residents. Assume suitable data. **6**

b) On a motor way, the numbers of vehicles arriving from one direction in successive 10 sec intervals was counted and recorded in the table. Find out the mean rate of arrival and with the help of Poisson distribution and compare the observed frequency with the theoretical frequency. **7**

Vehicles arriving in 10 sec intervals	Frequency
0	11
1	28
2	30
3	18
4	8
5	4
6	1
7 & above	0

5. Design a rotary intersection for the following data of 2 Highways, situated in urban area. The highways intersect at right angles and have a carriage width of 15m. Make suitable assumptions. **14**

Approach	Left Turning (PCU)	Straight Ahead (PCU)	Right Turning (PCU)
N	415	643	350
S	549	358	424
E	408	450	402
W	450	423	493

OR

6. a) Draw the neat sketch of various types of grade separated intersection showing on it all the traffic movement. **7**

b) Write the advantages and disadvantages of rotary intersection. **7**

7. a) A fixed time 2-phase signal is to be provided at an intersection having a North-South and an East-West road where only straight ahead traffic is permitted. The design hour flows from the various arms and the saturation flows for these arms given in the following table, **7**

	North	South	East	West
Design Hour Flow (q) in PCU/Hr	800	400	750	1000
Saturation Flow (s) in PCU/Hr	2400	2000	3000	3000

Calculate the optimum cycle time and green times for the minimum overall delay. The time lost per phase due to starting delay can be assumed to be 2 second. The value of the amber period is 2 seconds .Sketch the timing diagram for each phase.

b) Enlist the different types of traffic signals also explain why it is necessary? **6**

OR

8. a) Describe the general principal of traffic sign also Draw its various types. **6**

b) At the entrance of Toll booth to a bridge can handle 210 veh/hr. The vehicle arrival is 150 veh/hr with a poissonial arrival pattern. Service time is exponentially distributed. Determine. **7**

a) The length of queue
b) Average number of vehicles in the systems
c) Probability where more than 'n' vehicles in the system
d) Percentage of time for toll path operator is fee

9. a) What are the causes of accident? Enlist the prevention taken to reduce accident. **7**

b) The accidents records for three consecutive years at an uncontrolled junction indicate the following numbers of accidents. Calculate the probability of 4 accidents occurring per year at the site. **6**

Year	No. of accidetns
2016	3
2017	6
2018	9

OR

10. a) Indicate and draw the standard symbols that are commonly employed in condition diagram. **7**

b) The accident data pertaining to the metro-politan city for the years 2014 & 2019 are as below. Also test whether there is any significant increase in the accidents rates in two years. **6**

Year	2014	2019
No. of Accidents	350	450
Vehicle Km of Travel	300	350
	Million	Million

11. a) Write the desirable parking space standards for different land use. **7**

b) Estimate the total parking demand in the commercial area having following floor area composition, **7**

a. Shops - 4000 m^2
b. Cinema Hall - 400 Seats
c. One Star Hotel - 25 Rooms
d. Restaurants - 500 Seats
e. Offices - 5000 m^2

OR

12. Write short notes on **any four.** **14**

i) Parallel Parking
ii) Vehicle operating cost
iii) Motor vehicle ACT
iv) SPG (Signal Plan Generation)
v) Truck Lay-bye

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B.E. (Civil Engineering) Seventh Semester (C.B.S.)

Elective-I : Air Pollution & Solid Waste Management

P. Pages : 2 **PSM/KW/23/2330**

Time : Three Hours * 2 4 9 4 * Max. Marks : 80

Notes :
1. All questions carry marks as indicated.
2. Solve Question 1 OR Questions No. 2.
3. Solve Question 3 OR Questions No. 4.
4. Solve Question 5 OR Questions No. 6.
5. Solve Question 7 OR Questions No. 8.
6. Solve Question 9 OR Questions No. 10.
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8. Due credit will be given to neatness and adequate dimensions.
9. Assume suitable data whenever necessary.
10. Illustrate your answers whenever necessary with the help of neat sketches.

1. a) Define air pollution describe different air pollution episodes mentioning type of pollutant and meteorological condition responsible? **6**

b) Give classification of air pollutants mentioning the source of their generation. **7**

OR

2. a) Explain the effect of air pollution on human and plants. **6**

b) Write short notes on Green House effect and explain how to control it? **7**

3. a) Explain meteorological factors affecting air pollution. **6**

b) Explain different types of plume behavior with neat sketches. **7**

OR

4. a) Explain procedure for collection of SPM by high volume dust sampler. **6**

b) Discuss the methods of ambient air sampling. **7**

5. a) What are the principles on which gaseous control equipment work's ? Explain any two. **7**

b) Write short note on Automobile exhaust (Due to diesel and petrol engine). **7**

OR

6. a) Write short note on noise pollution and it's ill effect and explain how to control it? **7**

b) What are the sources, standards for noise? Explain methods to control noise pollution. **7**

7. a) Explain functional elements of solid waste management system with flow sheet. **6**

b) What is per capita generation of solid waste? Explain measures to estimate per capita generation. **7**

OR

8. a) What are physical & chemical characteristics of solid waste? **6**

b) What are the various sources for generation of solid waste? **7**

9. a) Explain various methods of solid waste collection with sketch. **7**

b) What is transfer station? Explain it's types. **6**

OR

10. a) Describe various types of transportation vehicles used for collection and transportation of solid waste. **7**

b) Discuss method of processing solid wastes. **6**

11. a) Define composting explain different types of composting. **7**

b) Write a note on control of landfill gases. **7**

OR

12. Write short note on **any four.** **14**

i) Site selection of sanitary landfill.

ii) Types of incinerators.

iii) Three component diagram.

iv) Control of gaseous from sanitary landfill.

v) Leachate management.

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B.E. (Civil Engineering) Seventh Semester (C.B.S.)

Elective-I : Advanced Hydraulics

P. Pages : 2 **PSM/KW/23/2331**

Time : Three Hours * 2 4 9 5 * Max. Marks : 80

Notes :
1. All questions carry marks as indicated.
2. Solve Question 1 OR Questions No. 2.
3. Solve Question 3 OR Questions No. 4.
4. Solve Question 5 OR Questions No. 6.
5. Solve Question 7 OR Questions No. 8.
6. Solve Question 9 OR Questions No. 10.
7. Solve Question 11 OR Questions No. 12.
8. Assume suitable data whenever necessary.
9. Use of non programmable calculator is permitted.

1. a) State the conditions under which uniform and non-uniform flows are produced. **4**

b) A triangular gutter, whose sides include an angle of 60°, conveys water at a uniform depth of 4m. If the slope of bed is 1 in 1000, Find the rate of flow of water. Take Chezy's constant C = 55. **9**

OR

2. a) Prove that the length of the backwater curve is given by **5**

$$\ell = \frac{E_2 - E_1}{sb - se}$$

b) Find the length of the backwater curve caused by an afflux of 2.0m in a rectangular channel of width 40m and depth 2.5m. The slope of the bed is given by 1:11000 and N=0.03. **8**

3. a) Explain direct step method of computing GVF in a rectangular channel. **5**

b) Describe in brief Chow's method of integrating GVF equation and list the assumptions made there in along with the limitations. **8**

OR

4. A trapezoidal channel having base width of 6.0m and side slope 1V:2H carries a discharge 12 cumecs with bed slope of 0.0016 and Mannings constants 0.025. Determine the length of back water curve corresponding to a depth of 1.6m. Tust behind the dam to the point where the depth is 1% more than the normal depth using chows method. **13**

5. a) Explain the effect of Froude number on types of jump. **7**

b) A hydraulic jump occurs in a rectangular channel and the depth of flow before and after the jump are 0.5m and 2.0m resp. Calculate the critical depth of flow. **7**

OR

6. a) A hydraulic jump occurs in a horizontal rectangular channel at an initial Froude number of 10.0 what percentage of initial energy is lost in this jump. **5**

b) The Froude number of the subcritical flow after hydraulic jump in horizontal channel is 0.3 Estimate the Froude number of the supercritical approach flow. **5**

c) Derive an expression for loss of energy head for hydraulic jump. **4**

7. a) Derive the expression for time flow establishment. **6**

b) A 20cm dia 2000m long pipe leads from a large reservoirs to an outlet which is 20m below the water level in the reservoir. If the valve at outlet is suddenly opened, estimate the time required to reach 60% V_0 and 95% V_0, if friction factor is 0.03 and minor loss constant is 6.0. **7**

OR

8. a) Derive an expression for the rise of pressure when the flowing water in a pipe is brought to rest by closing the valve gradually. **6**

b) How water hammer pressure is controlled? Enlist the devices used for this purpose. **7**

9. A 800mm diameter pipe of 1200m length supplies water under gravity from a storage reservoir having water surface elevation 15m above the valve fitted at the other end. The maximum discharge through the pipe when the valve is fully opened is $1.2\,m^3/sec$. The valve closes in 12 seconds such that the area of opening of the valve decreases linearly. Calculate the maximum pressure rise using Allievi's interlocked equation. **13**

Assume Esteel = $200\,kN/mm^2$ & K water = $2.1kN/mm^2$.

OR

10. Explain hydraulic stability of surge tank and derive the Thomas criteria for stability of surge tank. **13**

11. Determine the height of surge tank and factor of safety if the diameter of surge tank 7m. Diameter of tunnel 2.2m, Rate of flow $6.6\,m^3/sec$, length of tunnel 6000m friction factor 0.02, Tail race level 50m and Head race level 200m. **14**

OR

12. Explain the following **any two.** **14**

i) Application of Allievi's method & charts.

ii) Stilling basin with horizontal apron.

iii) Bresse's method for GVF computation.

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B.E. (Civil Engineering) Seventh Semester (C.B.S.)

Elective-I : Sustainable Resource Management in Civil Engineering

P. Pages : 1 **PSM/KW/23/2332**

Time : Three Hours * 2 4 9 6 * Max. Marks : 80

Notes :
1. All questions carry marks as indicated.
2. Solve Question 1 OR Questions No. 2.
3. Solve Question 3 OR Questions No. 4.
4. Solve Question 5 OR Questions No. 6.
5. Solve Question 7 OR Questions No. 8.
6. Solve Question 9 OR Questions No. 10.
7. Solve Question 11 OR Questions No. 12.
8. Assume suitable data whenever necessary.
9. Illustrate your answers whenever necessary with the help of neat sketches.

1. Define sustainability. Discuss in detail the sustainable practices in civil engineering at local & global level. **14**

OR

2. Enumerate the natural resources required in construction industry. Discuss the current status of the same. Comment why do we need to adopt sustainable approach towards the resources. **14**

3. Enumerate various types of construction waste. Discuss the concept of Bero waste production in construction industry. **14**

OR

4. Discuss in detail the alternative building materials. **14**

5. What are the components of sustainable water management? Discuss. **13**

OR

6. Discuss the 3R of conservation of water with an example. **13**

7. What are renewable and non-renewable sources of energy? Discuss the potential of harnessing renewable energy sources in India with examples. **13**

OR

8. Write detailed note on energy conservation. Comment on ECBC. **13**

9. Discuss the effect of light, heat, humidity and noise on the occupants. **13**

OR

10. What do you understand by the term Indoor Air Quality? Discuss the management of Indoor air quality. **13**

11. Discuss in detail life cycle Assessment and costing. **13**

OR

12. Enumerate and explain the provisions of National Building Code in life cycle costing & management. **13**

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B.E. (Civil Engineering) Seventh Semester (C.B.S.)

Elective-I : Building Services

P. Pages : 2 **PSM/KW/23/2333**

Time : Three Hours * 2 4 9 7 * Max. Marks : 80

Notes :
1. All questions carry marks as indicated.
2. Solve Question 1 OR Questions No. 2.
3. Solve Question 3 OR Questions No. 4.
4. Solve Question 5 OR Questions No. 6.
5. Solve Question 7 OR Questions No. 8.
6. Solve Question 9 OR Questions No. 10.
7. Solve Question 11 OR Questions No. 12.
8. Due credit will be given to neatness and adequate dimensions.
9. Assume suitable data whenever necessary.
10. Illustrate your answers whenever necessary with the help of neat sketches.

1. Enlist the general principles of design and construction of a house drainage system. **13**

OR

2. What are the systems of plumbing? Explain **13**

3. What are the sound absorption materials commonly available in the market? What are its characteristics? **13**

OR

4. Define noise mention its effects. What are its type? **13**

5. a) Compare between fuse and MCB. **7**

b) What are the types of lightening fixtures? **7**

OR

6. Explain in detail planning and layout of electrical installation within a building complex. **14**

7. Define the term ‘ventilation’. Discuss the various factors which affect the ventilation. **13**

OR

8. Explain various systems of air conditioning why re-circulation of used air is preferred to fresh air. **13**

9. Explain about the different types of security and alarm systems. **13**

OR

10. Write an explanatory note on installation of escalators with illustrative diagram. **13**

11. a) Explain the measures that may be adopted in limiting the spread of fire in a building. **7**

b) Explain protection of openings from fire. **7**

OR

12. Explain the following on **any two**. **14**

i) Automatic sprinklers.

ii) Heat and smoke detectors.

iii) Fire alarm system

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B.E. (Civil Engineering) Seventh Semester (C.B.S.)

Elective-I : Advanced Construction Materials

P. Pages : 2 **PSM/KW/23/2334**

Time : Three Hours * 2 4 9 8 * Max. Marks : 80

Notes :
1. All questions carry marks as indicated.
2. Solve Question 1 OR Questions No. 2.
3. Solve Question 3 OR Questions No. 4.
4. Solve Question 5 OR Questions No. 6.
5. Solve Question 7 OR Questions No. 8.
6. Solve Question 9 OR Questions No. 10.
7. Solve Question 11 OR Questions No. 12.
8. Assume suitable data whenever necessary.
9. Illustrate your answers whenever necessary with the help of neat sketches.
10. Use of non programmable calculator is permitted.

1. a) Classify various special purpose cements. Explain high alumina cement. **6**

b) Explain the various types of finishes and treatments. **7**

OR

2. a) Write a note on high strength concrete. **6**

b) Explain the effect of using light weight aggregates in concrete. **7**

3. a) What are the advantages and disadvantages of steel in construction? **6**

b) Difference between TMT & HYSD steel bar. **7**

OR

4. a) What are different protective coating used for steel? What is their function? **6**

b) Write a short note on tenders. **7**

5. a) How polymers are produced? Explain. **6**

b) Write a note on fibre reinforced concrete. **7**

OR

6. a) What is ceramic material? Draw a flow chart for the production of ceramic tiles from recycled glass. **6**

b) Write a note on thermal insulation materials. **7**

7.		Write a short note on **any three**.	**14**
	a)	Geo-membranes	
	b)	Agro-waste materials.	
	c)	Water proofing compounds.	
	d)	Set Retarders.	

OR

8.	a)	Difference between Tar & Bitumen.	**7**
	b)	Classify construction chemicals. Give one examples of each.	**7**
9.	a)	What materials are used in building formwork. Explain advantages & disadvantages of each.	**6**
	b)	What is plywood? Why is odd number of laminates used in plywood? Where are these commonly used?	**7**

OR

10.	a)	Write design consideration of building formwork.	**6**
	b)	Write characteristics of good timber.	**7**
11.	a)	What is benefits of using smart materials? Explain with examples.	**7**
	b)	What is Bio cement? Write in brief about photo mechanical materials.	**7**

OR

12.	a)	What is dielectric elastomer? Write in brief about self healing.	**7**
	b)	Describe the use of shape memory alloys & polymers.	**7**

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B.E. (Civil Engineering) Seventh Semester (C.B.S.)

Construction Management and Law

P. Pages : 3 **PSM/KW/23/2335**

Time : Three Hours * 2 3 8 4 * Max. Marks : 80

Notes :
1. All questions carry marks as indicated.
2. Solve Question 1 OR Questions No. 2.
3. Solve Question 3 OR Questions No. 4.
4. Solve Question 5 OR Questions No. 6.
5. Solve Question 7 OR Questions No. 8.
6. Solve Question 9 OR Questions No. 10.
7. Solve Question 11 OR Questions No. 12.
8. Assume suitable data whenever necessary.
9. Illustrate your answers whenever necessary with the help of neat sketches.
10. Use of non programmable calculator is permitted.

1. a) Enlist various types of projects. Discuss various modes of financing the project. **7**

b) What do you understand by the term site planning? Draw a typical site layout of construction site of a project and show all of its component. **6**

OR

2. a) What is DPR? Discuss how the feasibility of any project is assessed. **7**

b) Write detailed note on time-cost optimization. **6**

3. a) Discuss the objective of construction management. **5**

b) Establish the critical path and determine the total float for each activity of the project network shown below. Also determine the free float & independent float. **9**

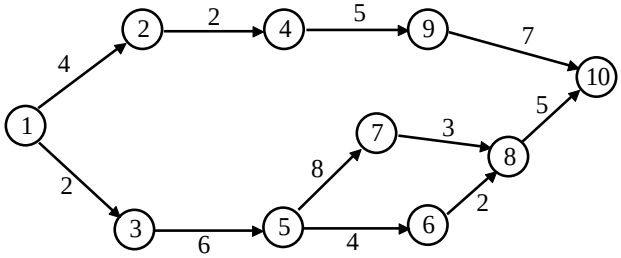

Fig. for Q. 3 (b)

OR

4. a) Explain the term Resource smoothing with an example. **5**

b) From the data, draw a network diagram and calculate variance, standard deviation & project time. Use. PERT technique. **9**

Activity	1-2	1-3	2-4	3-4	4-5	3-5
t_o	2	3	5	2	1	6
t_m	5	12	14	5	4	15
t_p	14	21	17	8	7	30

Table for Q. 4 (b)

5. a) Discuss ABC analysis. **6**

b) Determine the probable cost per hour for owning and operating a power shovel (crawler mounted) for the following conditions. **8**
Engine : Diesel – 160hp
Crankcase capacity : 30 litres
Time between oil change : 100 hrs.
Operating factor : 0.6
Useful life : 5 yrs.
Hours used per year : 2000
Total initial cost : Rs. 5,47,060/-
Estimated salvage value : Rs. 40,000/-
Assume any other data, if necessary.

OR

6. a) Write the necessity of Quality control. **6**

b) A Piere of equipment costs Rs. 24,000/- and has a useful life of 5 years and a salvage value of Rs. 4000/-. Determine the depreciation and book value at the end of each year using some of year method. **8**

7. a) Discuss various causes of accidents at construction site. **6**

b) Explain in detail the characteristics of management information system (MIS) **7**

OR

8. a) As a project manager of a large housing project, explain various safety measures you would promote. **6**

b) Discuss the concept of continuous Improvement by TQM. **7**

9. a) Discuss the objective of MRTP Act. State the role of local body authority under MRTP Act. **7**

b) Discuss the objective of Highway Act. State the role of CPWD and PWD in NH & SH construction. **6**

OR

10. a) What is mean by Gunthewari? Enumerate the process of regularizing the Gunthewari developments as per the Gunthewari Act. **7**

b) What is MWRRA? Discuss its provision under the Irrigation act. **6**

11. a) As per the environment protection Act (EPA), define the following terms **7**
i) Environment & environmental pollution
ii) Environmental pollutants.
iii) Hazardous substance.

b) Define the following terms under the Indian contract act **6**

i) Promise
ii) Obligation
iii) Plantiff
iv) Agreement
v) Consent
vi) Contract

OR

12. a) As per the forest conservation Act, explain the following: **7**

i) Protected forest
ii) Reserved forest
iii) Village forest.

b) What is national Green Tribunal? Discuss its role under the Air (Prevention & control of pollution) Act. **6**

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B.E. (Civil Engineering) Seventh Semester (C.B.S.)

Transportation Engineering-II

P. Pages : 2 **PSM/KW/23/2336**

Time : Three Hours * 2 3 8 8 * Max. Marks : 80

Notes :
1. All questions carry marks as indicated.
2. Solve Question 1 OR Questions No. 2.
3. Solve Question 3 OR Questions No. 4.
4. Solve Question 5 OR Questions No. 6.
5. Solve Question 7 OR Questions No. 8.
6. Solve Question 9 OR Questions No. 10.
7. Solve Question 11 OR Questions No. 12.
8. Assume suitable data whenever necessary.
9. Illustrate your answers whenever necessary with the help of neat sketches.
10. Use of non programmable calculator is permitted.

1. a) Discuss the deal requirement of permanent way. **7**

b) What are the various types of stresses induced in the railway track? Explain in brief each of them. **6**

OR

2. a) Discuss in detail about conning of wheel. **6**

b) Why the uniformity of gauges is desirable in any country? Mention the demerits of non uniformity of gauges. **7**

3. a) Discuss various types of Ballast. **6**

b) Discuss different types of rail joints with the help of neat sketches and give their merits and limitations. **7**

OR

4. a) What are the possible causes of creep? Explain various preventive and remedial measures that can be taken. **6**

b) What are the desirable qualities pr requirements of good sleepers? Explain the necessity of sleepers in railway track. **7**

5. a) What is meant by Railway crossing? What are the essential requirements of a good crossing? **7**

b) Explain the working principle of the turnouts also enlist the function of point and crossing in railway track layout. **7**

OR

6.	a)	Describe the various mechanical device used for interlocking. Explain the principle of interlocking.	**7**
	b)	Explain the modern techniques used in the maintenance of railway track system.	**7**
7.	a)	Discuss the various factor which are considered while selecting a suitable site for an airport.	**6**
	b)	Why taxi way is provided at airport. Explain? Write short notes on exist taxiway.	**7**

OR

8.	a)	Enlist the runway geometric design standards. Explain in brief.	**6**
	b)	An Airport is proposed at an elevation of 400m above MSL. Where the mean of maximum & mean of avg. Daily temp of hottest month are 44.8ºC & 26.2ºC respectively the max. Elevation difference. Along the proposed profile run way is 6.3 the Basic runway length is 1260 m. Determine the actual length of runway to be provided.	**7**
9.	a)	Define Terminal Area. Enlist & explain the facilities provided in this area.	**7**
	b)	Discuss with neat sketch Runway lighting & Runway marking.	**6**

OR

10.	a)	Define Air traffic control. What are the control aids provide through ATC.	**7**
	b)	Write short notes on instrumental landing systems, Microwave loading system.	**6**
11.	a)	Enlist the types of survey which used in tunnel surveying. Explain one of them in details.	**7**
	b)	Define ventilation in tunnel. Why it is provided explain.	**7**

OR

12.	a)	Write short notes on.	**14**
	i)	Drainage in tunnel.	
	ii)	Lightning in tunnel.	
	iii)	Economics in tunneling.	
	iv)	Tunnel lining.	

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B.Tech. (Civil Engineering) Seventh Semester (C.B.C.S.)

Design of Steel Structure

P. Pages : 2 **PSM/KW/23/2829**

Time : Four Hours * 2 2 6 0 * Max. Marks : 70

Notes :
1. All questions carry marks as indicated.
2. Solve Question 1 OR Questions No. 2.
3. Solve Question 3 OR Questions No. 4.
4. Solve Question 5 OR Questions No. 6.
5. Solve Question 7 OR Questions No. 8.
6. Solve Question 9 OR Questions No. 10.
7. Assume suitable data whenever necessary.
8. Illustrate your answers whenever necessary with the help of neat sketches.
9. Use of non programmable calculator is permitted.
10. Use of Structural steel table and IS-800:2007 is permitted.

1. a) Find out shape factor and plastic moment of resistance for the section shown in fig. 3 about X - X axis. Assume 'D' & 'd' as the outer and inner diameter for the ring resp. **7**

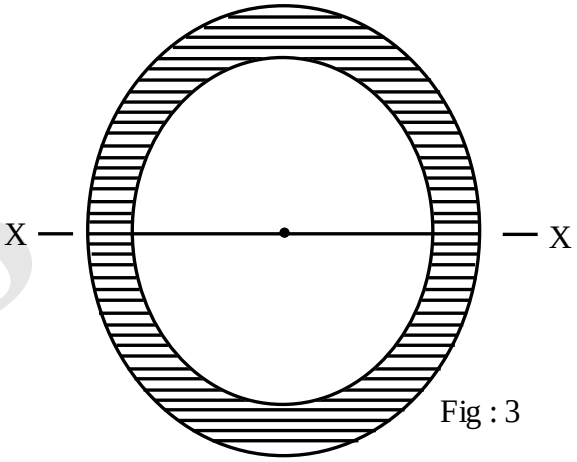

Fig : 3

b) Find out true collapse load for the beam shown in fig: 4. Assume a > b. **7**

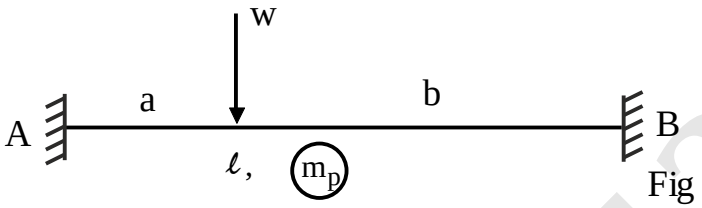

Fig : 4

OR

2. a) Two plates 10 mm and 18 mm thick are to be jointed by a double cover butt joint. Assume cover plates of 8 mm thick. Design the joint to transmit a factored load of 500 kN. Assume Fe410 plate and grade of bolt 4.6. **7**

b) Calculate the size of weld required to connect a bracket to the flange of the column ISHB 200 as shown in fig. 1. **7**

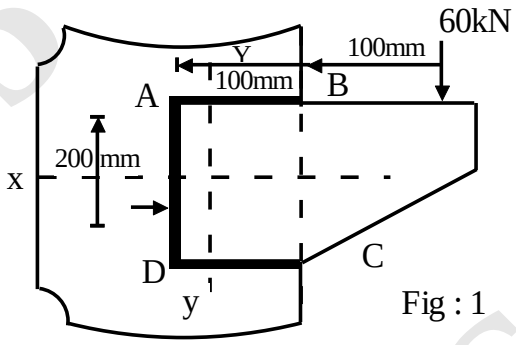

Fig : 1

3. Design a single angle tie member to carry a safe load of 150 kN. Length of member 2.5m. Provide bolted connection. **14**

OR

4. a) Determine the design axial load on the column section ISMB 350, given that the height of the column is 3m and that it is pin ended. Also assume the following $f_y = 250\,\text{MPa}$, **7**

$F_u = 410\ \text{MPa}$ and $E = 2\times10^5\,\text{MPa}$.

b) A rolled steel section ISMB 300 @ 58.8 kg /m is used as a column. The column is fixed in position but not in direction at both ends. Determine the design compressive strength of the section if the length of the column is 5m. **7**

5. Design a laterally restrained simply supported steel beam of effective span of 6.3 m subjected to working udl of 20 kN/m along with two concentrate load of 40 kN each placed at 1/3 span point. **14**

OR

6. A laterally supported girder of effective span 9.0 m is loaded by a service load of 50 kN/m throught its length. Design the girder if. Its depth is restricted to 375 mm. **14**

7. A beam-column of effective length of 6m carries a service axial load of 450 kN and equal end moment of 50 kN-m each about the major axis. Design the member using single rolled section. Assume that the sway of the member is prevented and the column bends either in single and double curvature. **14**

OR

8. Design a built up column consisting of two channel place back to back to carry a factor load of 1600 kN. The unsupported length of column is 10.5 m with column effectively held in position and restrained against rotation at both ends. Also design suitable lacing system. **14**

9. A column ISHB 350 @ 67.4 N/m subjected to a compressive factored load of 1800 kN. Design suitable bolted gusseted base. The base rests on M20 grade concrete pedestal use 24 mm diameter bolts of grade 4.6 for making the connection between gusset plate and column flanges. **14**

OR

10. Design a slab base for a column ISHB-350@ 67.5 kg/m carrying a factored load of 1000 kN. Also design the welded connection between slab base and column.
Use concrete grade M20 and steel of Fe410. **14**

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B.Tech. Civil Engineering) Seventh Semester (C.B.C.S.)

Elective-IV : Advanced RCC Design

P. Pages : 2 **PSM/KW/23/2830**

Time : Four Hours * 2 2 6 1 * Max. Marks : 70

Notes :
1. All questions carry marks as indicated.
2. Solve Question 1 OR Questions No. 2.
3. Solve Question 3 OR Questions No. 4.
4. Solve Question 5 OR Questions No. 6.
5. Solve Question 7 OR Questions No. 8.
6. Due credit will be given to neatness and adequate dimensions.
7. Assume suitable data whenever necessary.
8. Illustrate your answers whenever necessary with the help of neat sketches.
9. Use of non programmable calculator is permitted.
10. Use IS 456, IS 3370 - 2021, IS: 1893 – 2014 (Part - I) (Revised) and IRC - 06 - 2017 may be permitted.

1. An overhead water tank circular in shape has internal diameter of 6m and height of wall is 4m. The base slab of tank is supported over its periphery by a circular ring beam. The rise of top dome can be assumed as 800 mm. Design top dome, top ring beam & vertical wall of circular water tank. Assume M25 grade of concrete and Fe415 grade of steel. Draw the reinforcement details. **18**

OR

2. a) Explain how the earthquake forces are calculated in the design of RCC overhead water tank. **9**

b) Explain in detail, how analysis of staging is carried out for overhead circular water tank subjected to horizontal forces and supported on 6 Nos. of columns. **9**

3. Design RCC bridge deck slab for highway using following data. **17**

i) Clear roadway width = 7.2m (Two lane)

ii) Clear span = 6m

iii) Kerb = 750 mm

iv) Wearing coat = 75 mm

v) Width of bearing = 500 mm

vi) Loading: IRC class A vehicle

vii) Assume K = 2.84

viii) Use M20 grade & Fe 415 steel

Draw neat sketch reinforcement.

OR

4. Design RCC bridge deck slab for following data: **17**

i) Carriage way = 6.5 m wide (Two lane)

ii) Clear Span = 5.2 m

iii) Width of kerb = 650 mm

iv) Wearing coat = 80 mm

v) Width of bearing = 450 mm

vi) value of K = 2.85

vii) Loading IRC class AA tracked vehicle

viii) Use M20 grade concrete & Fe415 steel

ix) Impact factor for 5m span is 25% and linearly decreasing to 10% for 9m span.

5. A portal frame with hinged base is required to suit following data. **18**

i) Spacing of portal frames = 4m c/c

ii) Height of columns = 4m

iii) Distance between column centres = 10m.

iv) Live load on roof = $1.5\,kN/m^2$

v) The RC slab is continuous over the portal frame

vi) SBC of soil at site = $200\,kN/m^2$

Adopt M20 grade concrete and Fe415 steel design slab and portal frame. Sketch R/F details. Make suitable assumption as required.

OR

6. A multistory building having two bay has continuous beam with AB = 4.3m, BC = 2.5m. The beams are placed equally at an intervals of 4m. The thickness of the floor slab is 150 mm, Live load $3\,kN/m^2$, floor finish = $0.5\,kN/m^2$, size of beam = $230\times400\,mm$, size of column = $230\times500\,mm$, height of floor = 3.5m, I beam = 2I column. Analyse the intermediate frame and design the beam, column and foundation. Assume column having fixed based. Use M20 grade concrete and Fe415 steel, Draw R/F details. **18**

7. Design an interior pannel of cylindrical shell roof covering clear plan area $12\times34\,m$ using beam theory. The semi central angle is 40º. Make suitable assumptions for the size of edge beam, thickness of shell and reinforcement in edge beam. Use M20 grade of concrete and Fe415 steel. Sketch the R/F details. **17**

OR

8. A cylindrical silo having a ratio of height (cylindrical portion) to the diameter of 4 is required to store 2000 kN of wheat having density of $8kN/m^3$. The coefficient of friction between grain and concrete is 0.444 and the ratio of horizontal to vertical pressure is 0.4. Design the R/F in the walls and conical bottom of silo. Adopt M20 grade and Fe415 concrete. **17**

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B.Tech. (Civil Engineering) Seventh Semester (C.B.C.S.)

Elective-IV : Advanced Soil Engineering

P. Pages : 2 **PSM/KW/23/2831**

Time : Three Hours * 2 2 6 2 * Max. Marks : 70

Notes :
1. All questions carry marks as indicated.
2. Solve Question 1 OR Questions No. 2.
3. Solve Question 3 OR Questions No. 4.
4. Solve Question 5 OR Questions No. 6.
5. Solve Question 7 OR Questions No. 8.
6. Solve Question 9 OR Questions No. 10.
7. Due credit will be given to neatness and adequate dimensions.
8. Assume suitable data whenever necessary.
9. Diagrams and chemical equations should be given whenever necessary.
10. Illustrate your answers whenever necessary with the help of neat sketches.
11. Use of non programmable calculator is permitted.

1. a) Explain Compressibility Characteristics. **6**

b) A stratum of normally consolidated clay 7m thick is located at a depth 12m below ground level. The natural moisture content of the clay is 40.5 percent and its liquid limit is 48 percent. The specific gravity of the solid particles is 2.76. The water table is located at a depth 5m below ground surface. The soil is sand above the clay stratum. The submerged unit weight of the sand is $11\,kN/m^3$ and the same weighs $18\,kN/m^3$ above the water table. The average increase in pressure at the center of the clay stratum is $120\,kN/m^2$ due to the weight of a building that will be constructed on the sand above the clay stratum. Estimate the expected settlement of the structure. **8**

OR

2. a) Explain consolidation theory using spring analogy. **8**

b) Explain the Terzaghi's theory of one-dimensional consolidation. **6**

3. a) Explain the effective stress law in soil mechanics? **6**

b) Classify the shear tests based on drainage conditions. Explain how the pore pressure variation and volume change take place during tests. **8**

OR

4. a) Explain the effective stress concept. **8**

b) Explain the stress dilatancy theory. **6**

5. a) Explain Rehbann's graphical method for cohesion-less soil. **7**

b) Retaining wall 10 m high with smooth vertical back retains a $c-\phi$ soil with c = 30 kN/m^2 and $\phi = 18^o$. Unit weight of soil is $20\,kN/m^3$. Calculate **7**

i) Active earth pressure assuming no tension cracks developed.
ii) Active earth pressure assuming full tension crack developed and is filled with water.

OR

6. a) Explain the stability checks for gravity cantilever retaining walls. **7**

b) Explain the design steps of counter fort retaining walls with its formulation. **7**

7. a) What are the factors affecting liquefaction. **7**

b) Explain the liquefaction susceptibility. **7**

OR

8. a) What are the two main categories of soil liquefaction? Explain these categories of soil liquefaction. **8**

b) Explain the liquefaction mechanism. **6**

9. a) What are the requirements of machine foundation. **7**

b) What are the effect of machine foundation on adjoining structures. **7**

OR

10. a) Explain the methods of isolation in machine foundations. **8**

b) What are the isolating materials. Explain their properties. **6**

****

B.Tech. (Civil Engineering) Seventh Semester (C.B.C.S.)

Elective-IV : Sustainable Resource Management

P. Pages : 2 **PSM/KW/23/2832**

Time : Three Hours * 2 2 6 3 * Max. Marks : 70

Notes :
1. All questions carry marks as indicated.
2. Solve Question 1 OR Questions No. 2.
3. Solve Question 3 OR Questions No. 4.
4. Solve Question 5 OR Questions No. 6.
5. Solve Question 7 OR Questions No. 8.
6. Solve Question 9 OR Questions No. 10.
7. Due credit will be given to neatness and adequate dimensions.
8. Illustrate your answers whenever necessary with the help of neat sketches.

1. a) Explain in details various types of natural resources. **7**

b) Distinctively, write the global initiatives and its effect in achieving sustainability. **7**

OR

2. a) Explain current global and local scenario of sustainability. **7**

b) How we achieve sustainability in construction industry. **7**

3. a) Discuss various land used pattern in India and objectives of land resources. **7**

b) Interpret water resources and its classification. **7**

OR

4. a) Explain briefly with neat sketches, hydrological cycle and its components. **7**

b) Explain in brief Supply and Renewal of Water Resources. **7**

5. a) Differentiate between conventional and Non-conventional energy sources. **7**

b) What are the 5 energy resources? Explain any one in detail. **7**

OR

6. a) Explain Thermal Energy Conversion (OTEC) Technology. **7**

b) How do the energy sources rely on resources available on Earth? **7**

7. a) What is a Mineral, Mode of Occurrence of Minerals and explain various Classification of Minerals. **7**

b) What are the ecological functions of forests? Explain Deforestation. **7**

OR

8.	a)	Write in details about developing and developed world strategies for forestry.	**7**
	b)	What is Dam? Explain their effects on forest and tribal people.	**7**
9.	a)	What is deforestation and degradation and What are the major cause of environmental degradation resource depletion?	**7**
	b)	How does overexploitation of natural resources affect biodiversity?	**7**

OR

10. Write short notes on: **14**

i) Air pollution

ii) Water pollution

iii) Soil erosion

iv) Land degradation

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B.Tech. (Civil Engineering) Seventh Semester (C.B.C.S.)

Elective-IV : Building Construction Practices

P. Pages : 2 **PSM/KW/23/2833**

Time : Three Hours * 2 2 6 4 * Max. Marks : 70

Notes :
1. All questions carry marks as indicated.
2. Solve Question 1 OR Questions No. 2.
3. Solve Question 3 OR Questions No. 4.
4. Solve Question 5 OR Questions No. 6.
5. Solve Question 7 OR Questions No. 8.
6. Solve Question 9 OR Questions No. 10.
7. Assume suitable data whenever necessary.
8. Illustrate your answers whenever necessary with the help of neat sketches.
9. Use of non programmable calculator is permitted.

1. a) Explain classification of Buildings. **7**

b) Explain types of Structures. **7**

OR

2. a) Explain Substructure Building Components and their function. **7**

b) Explain Superstructure Building Components and their function. **7**

3. a) What do you mean by centering and shuttering? **7**

b) Explain in Details Fabrication and erection of steel trusses. **7**

OR

4. a) Explain need of Site Clearance in details. **7**

b) Write short notes on **any three.** **7**

i) Damp proof courses ii) Construction joints

iii) Movement and expansion joints iv) Pre cast pavements

5. a) What do you mean by Techniques of Box jacking? **7**

b) Define the following- **7**

i) Piling techniques

ii) Well and caisson

iii) Sinking cofferdam.

OR

6.	a)	i)	What is cable anchoring and grouting?	**3**
		ii)	What do you mean by shoring for deep cutting.	**4**
	b)		Explain in details plant equipment for underground open excavation.	**7**
7.	a)		Explain in details Super Structure Construction.	**7**
	b)	i)	Explain techniques for heavy decks.	**4**
		ii)	What is in-situ pre-stressing in high rise structures.	**3**

OR

8.	a)		Explain in details Material handling.	**7**
	b)		Define- i) Braced domes and ii) Space decks	**7**
9.	a)		What are the Causes and Remedial measures Foundation Settlement?	**7**
	b)	i)	Explain causes and Types of Cracks.	**4**
		ii)	Explain Grouting and Guniting.	**3**

OR

10.	a)		Define **any two.**	**7**
		i)	Method of Demolition.	
		ii)	Plinth Protection necessity and material used	
		iii)	Damp Proof Course.	
	b)		Explain Necessity and importance of Water Proofing of roofs.	**7**

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B.Tech. (Civil Engineering) Seventh Semester (C.B.C.S.)

Elective-IV : Design of Hydraulic Structure

P. Pages : 2 **PSM/KW/23/2834**

Time : Three Hours * 2 2 6 5 * Max. Marks : 70

Notes :
1. All questions carry marks as indicated.
2. Solve Question 1 OR Questions No. 2.
3. Solve Question 3 OR Questions No. 4.
4. Solve Question 5 OR Questions No. 6.
5. Solve Question 7 OR Questions No. 8.
6. Solve Question 9 OR Questions No. 10.
7. Solve Question 11 OR Questions No. 12.
8. Assume suitable data whenever necessary.
9. Illustrate your answers whenever necessary with the help of neat sketches.
10. Use of non programmable calculator is permitted.

1. a) Write short notes: **7**
i) Sedimentation of a reservoir.
ii) Reservoir storage zones and water levels

b) Explain how would you determine the area-elevation and capacity-elevation curves for reservoir and their utility? **7**

OR

2. a) What are the methods of seepage control in an earthen dam? Explain with the help of neat sketches. **7**

b) Flow net was prepared for a 50m high earth dam having 2.5m free board, No. of potential drops = 20 and no. of flow channels = 5. If the dam is provided with 45m horizontal fitler at downstream side, determine the discharge per m length of the dam. Coefficient of permeability of the dam is 2.5×10^{3} cm/sec. **7**

3. a) Differentiate between elementary and practical profile of a Gravity dam. **7**

b) A masonry dam (specific gravity = 2.25) with vertical face has top width 4m, bottom width 20m and height 24m. FRL is 3m below top. Determine the factor of safety against overturning and normal stresses developed at the toe and heel of the dam. **7**

OR

4. a) Explain: **7**
i) Stability analysis of gravity dam.
ii) Drainage Gallery & its effect on uplift pressure.

b) A masonry dam (specific gravity = 2.25) with vertical face has top width 4m, bottom width 20m and height 24m. FRL is 3m below top. Determine the factor of safety against overturning and stresses developed at the toe and heel of the dam. **7**

5. a) Explain the design criteria for Ogee Spillway? **7**

b) Explain estimation of spillway design flood. **7**

OR

6. a) Explain radial type of Gates for spillway. **7**

b) Distinguish between a Chute Spillway and a side channel spillway. Under what circumstances are they used? **7**

7. a) Explain Bligh's Creep theory for design of weirs on permeable foundations. **7**

b) Explain design of subsurface weirs. **7**

OR

8. a) Explain Khosla's Theory of independent variables for weirs on permeable foundations. **7**

b) Design of waterways and crest levels for Barrages. **7**

9. Write in detail- **14**

i) Head regulators ii) Canal syphons

iii) Cross regulators iv) Super passage and level crossing

OR

10. Write in detail- **14**

i) Aqueduct and Super passage ii) Canal escapes

iii) Design of file drains iv) Canal falls

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B.Tech. (Civil Engineering) Seventh Semester (C.B.C.S.)

Elective-IV : Advanced Traffic Engineering & Management

P. Pages : 3 **PSM/KW/23/2835**

Time : Three Hours * 2 2 6 * Max. Marks : 70

Notes :
1. All questions carry marks as indicated.
2. Solve Question 1 OR Questions No. 2.
3. Solve Question 3 OR Questions No. 4.
4. Solve Question 5 OR Questions No. 6.
5. Solve Question 7 OR Questions No. 8.
6. Solve Question 9 OR Questions No. 10.
7. Due credit will be given to neatness and adequate dimensions.
8. Assume suitable data whenever necessary.
9. Use of non programmable calculator is permitted.
10. Probability distribution chart and Chi-square chart to be provided.

1. a) Explain in details vehicular characteristics. **7**

b) Analyze the following spot speed data & find **7**
i) Lower & upper speed limit
ii) Medium speed
iii) Design speed

Speed group (kmph)	Frequency
10-20	03
20-30	16
30-40	80
40-50	72
50-60	71
60-70	30
70-80	10
80-90	02

OR

2. a) The following data represent volume in PCU of average of six run in moving observer study. Analyze data for **8**
i)) Directional flow
ii) Directional running speed
iii) Directional Journey speed length of section = 1.42km.

Run direction	Travel Time (sec)	Vehicle met from opp side	No of vehicle	No of vehicle	Stopped speed time (sec)
			Overtaking	Overtaken	
E	172	94	7	5	9.6
W	151	120	8	10	11.2

b) Write short note on Design hourly volume. **6**

3. a) Explain the various factors affecting capacity of highway. **7**

b) Write short note on "level of service". **7**

OR

4. a) Define intersection what are the basic principles to be followed in the design of intersection? **7**

b) Draw neat sketch of various types of grade separated intersections showing all traffic movements. **7**

5. a) Explain the causes of accidents. **7**

b) Explain the methods of representing accident rate. **7**

OR

6. a) What is traffic safety? Explain in details. **7**

b) The accident data pertaining to the metropolitan city for year 2000 to 2005 are as below. Test whether there is any significant increase in accident rates **7**

Year	2000	2005
No. of accident	300	400
Vehicle km of travel	250	300
	Million	Million

7. Design a rotary intersection for following data of 2 Highway situated in urban area. The highway intersect a right angle and have carriage width of 15m. Make suitable assumptions. **14**

Approach	Left turning PCU	Straight ahead PCU	Right turning PCU
N	510	430	508
S	513	519	459
E	541	512	409
W	611	432	419

OR

8. a) Why rotary intersections is provided Explain details with one example. **7**

b) Enlist the different parking facilities provided in urban area. Explain one of them with neat sketch. **7**

9. a) Write short note on Poisson distribution & Normal distribution. **7**

b) On a motor way the number of vehicles arriving from one direction in successive 10 sec internal was counted and recorded in table. **7**

Vehicles arriving in 10 sec	Frequency
0	12
1	25
2	32
3	20
4	9
5	4
6	2
7 or more	0

Find out the rate of arrival and with the help of Poissons distribution compare observed frequency with theoretical frequency.

OR

10. a) The spot speed at particular location are normally distributed with mean rate at 50 kmph and std. deviation of 9 kmph what is probability that **7**

i) Speed exceed 55 kmph
ii) Speed lies between 30 kmph to 60 kmph
iii) What is 75^{th} percentile speed.

b) There following information was obtained from transportations survey of town. **7**

Traffic zone Number	Populations in zone (thousand)	Total trips generated in Hundreds
1	25	11
2	27	12
3	30	16
4	32	15
5	22	13
6	31	12
7	20	9
8	24	14

Develop linear regression model for estimating trips generating from zone if population for particular zone increase to 50,000 predict the expected trip generation from zone.

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B.Tech. (Civil Engineering) Seventh Semester (C.B.C.S.)

Elective-V : Advanced Steel Design

P. Pages : 2 **PSM/KW/23/2836**

Time : Three Hours * 2 2 6 7 * Max. Marks : 70

Notes :
1. All questions carry marks as indicated.
2. Solve Question 1 OR Questions No. 2.
3. Solve Question 3 OR Questions No. 4.
4. Solve Question 5 OR Questions No. 6.
5. Solve Question 7 OR Questions No. 8.
6. Solve Question 9 OR Questions No. 10.
7. Assume suitable data whenever necessary.
8. Illustrate your answers whenever necessary with the help of neat sketches.
9. Use of non programmable calculator is permitted.
10. Use of IS456:2000, IS875 (Part-III), IS800:2007 is permitted.

1. The effective span of a through type plate girder two lane highway bridge is 30m. The reinforced concrete slab is 250mm thick inclusive of the wearing coat. The foot-paths are provided on both sides of the carriageway. The cross girders are provided at 3 m c/c. The stringers are spaced at 2.45 m c/c. The spacing between main girders is 9.8m. Design the maximum section of plate girder, if the bridge is to carry IRC class A loading. **14**

OR

2. Design a foot bridge for the following particulars. **14**
Type of girder = N-Type truss, Span of girder = 18 m, c/c Spacing of cross girder = 2.25 m c/c, Clear walking width between main girder = 5m,
Live load = 4 kN/m2, Flooring = Timber planks on cross girder Design timber plank, cross girder, rakers, central top chord & bottom chord member.

3. Design a simply supported crane girder to carry an electric overtread travelling crane, for the following data: **14**
Crane capacity =300kN
Weight of crane including crab = 200kN
Weight of crab -100kN
Span of gantry girder = 5m
End clearance = 1.2m
Wheel base = 3.2m
c/c of gantry girder rails = 15m
Electrically operated single crane is to be considered. Yield stress of steel = 250 N/mm2.

OR

4. Design a roof truss for an industrial building given the following data : **14**
Overall length = 50m Overall width = 15.5m Width c/c of roof columns = 16.0m
Height of columns = 10.0m Roofing material = Asbestos cement sheets
Side covering = Asbestos cement sheets.

5.	A self-supporting steel chimney is 80 m high and its diameter at the top is 3 meters. Design breech (flue) opening. Adopt the wind force as per IS : 875-III. The location of the place is such that the intensity of wind pressure up to 30m height is 1.3 kN/m2.	**14**

OR

6.	Explain the types of steel chimney. Also write various forces acting of steel chimney.	**14**
7.	Design an elevated rectangular pressed steel tank having capacity of 1,20,000 liters. The tank is open at top and height of staging is 12m.	**14**

OR

8.	Design staging for circular steel water tank for capacity of 1,00,000 liters of water. The height of staging up to bottom of tank is 20m.	**14**
9.	Design rectangular steel bunker of 14m length & 8m width supported on eight columns (four along each long side) to store coal of bulk density 8.5 kN/m3 & angle of internal friction 40^{o}, height of vertical portion is 4m, height of hopper portion is 4m.	**14**

OR

10.	Design rectangular steel bunker of 20m length & 10m width supported on eight columns (four along each long side) to store coal of bulk density 5.5 kN/m3 & angle of internal friction 30 degree, height of vertical portion is 4m, height of hopper portion is 5m.	**14**

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B.Tech. (Civil Engineering) Seventh Semester (C.B.C.S.)

Elective-V : Advanced Foundation Engineering

P. Pages : 2 **PSM/KW/23/2837**

Time : Three Hours * 2 2 6 8 * Max. Marks : 70

Notes :
1. All questions carry marks as indicated.
2. Solve Question 1 OR Questions No. 2.
3. Solve Question 3 OR Questions No. 4.
4. Solve Question 5 OR Questions No. 6.
5. Solve Question 7 OR Questions No. 8.
6. Solve Question 9 OR Questions No. 10.
7. Due credit will be given to neatness and adequate dimensions.
8. Assume suitable data whenever necessary.
9. Diagrams and chemical equations should be given whenever necessary.
10. Illustrate your answers whenever necessary with the help of neat sketches.
111. Use of non programmable calculator is permitted.

1. a) What are different types of shallow foundations? Explain with the help of neat Sketches? **6**

b) Determine the ultimate bearing capacity of a strip footing, 1.20m wide, and having the depth of foundation of 1.0 m. Use Terzaghi's theory and assume general shear failure. **8**
Take $\varphi = 35^{o}, \gamma = 18\,kN/m^3$, and $C' = 15\,kN/m^2$.
Take (Nc = 57.8, $N\gamma = 42.4, Nq = 41.4$).

OR

2. a) A rectangular footing (3m X 2m) exerts a pressure of $100\,kN/m^2$ on a cohesive soil $\left(Es = 5x10^4 \text{ and } \mu = 0.50\right)$. Determine the immediate settlement at the centre, assuming **8**
i) Footing is flexible.
ii) Footing is rigid.

b) Discuss effect of water table on the bearing capacity of the soil with neat sketch? **6**

3. a) List out various classifications of pile foundations. Discuss different methods for installation of piles. **6**

b) A 30cm diameter concrete pile is driven into a homogeneous consolidated clay deposit $\left(cu = 40\,kN/m^2, \alpha = 0.7\right)$. If the embedded length is 10m, estimate the safe load (F.S.= 2.5). **8**

OR

4. a) How would you estimate the load carrying capacity of a pile by using dynamic formulae? **8**

b) Explain various measures for rectification of Tilts and Shifts with neat sketch. **6**

5. a) Explain Design steps of raft foundation. **7**

b) Explain Terzaghi's Bearing Capacity analysis of Raft foundation. **7**

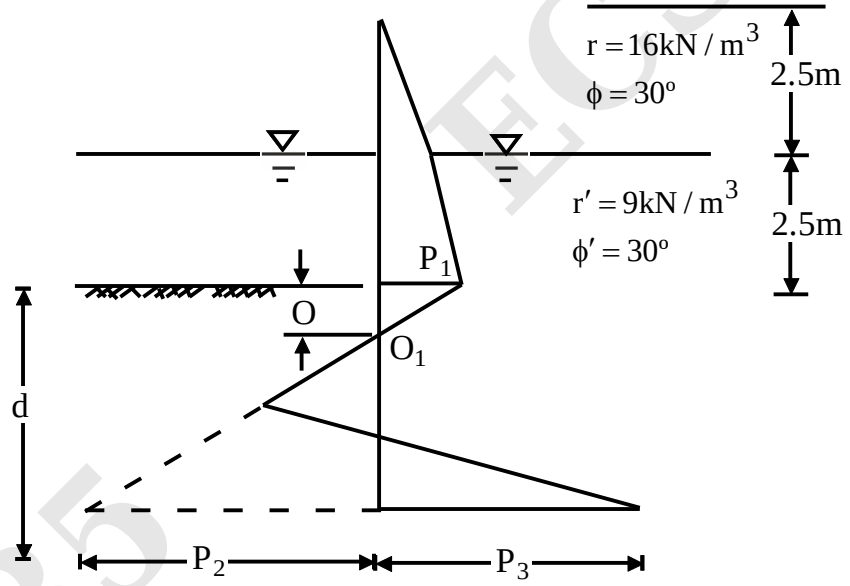
OR

6. a) Explain the steps included in analysis of flexible as per IS 2950. **7**

b) Explain the settlements occurs in raft foundation. **7**

7. a) What are different types of sheet pile walls? Explain with neat sketch. **7**

b) Determine the depth of penetration of the cantilever sheet pile as shown in figure water level on both sides is the same. **7**



OR

8. a) Explain the pressure distribution and stability of free cantilever sheet pile with neat sketch. **8**

b) Explain the settlements occurs in cofferdams. **6**

9. a) What are the methods are adopted while constructing foundation on expansive soils. Explain any two methods. **7**

b) Explain the Identification of swelling soils. **7**

OR

10. a) Explain CNS technology of foundation for expansive soils with neat sketch. **6**

b) A single under reamed pile is installed in soft clay. The center of under ream is located at a depth of 15m from ground surface. The diameter of pile shaft and bulb are respectively 1.0 m and 2.5 m. determine allowable load with FOS = 2.5
Take $Cu = 65 + 7D$ and $\alpha = 1.0$ **8**

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B.Tech. (Civil Engineering) Seventh Semester (C.B.C.S.)

Elective-V : Air Pollution & Solid Waste Management

P. Pages : 2 **PSM/KW/23/2838**

Time : Three Hours * 2 2 6 9 * Max. Marks : 70

Notes :
1. All questions carry marks as indicated.
2. Solve Question 1 OR Questions No. 2.
3. Solve Question 3 OR Questions No. 4.
4. Solve Question 5 OR Questions No. 6.
5. Solve Question 7 OR Questions No. 8.
6. Solve Question 9 OR Questions No. 10.
7. Due credit will be given to neatness and adequate dimensions.
8. Assume suitable data whenever necessary.
9. Diagrams and chemical equations should be given whenever necessary.
10. Illustrate your answers whenever necessary with the help of neat sketches.
11. Use of non programmable calculator is permitted.

1. a) Define air pollution and explain any one air pollution episode in brief. **7**

b) What are the various sources of Air pollution. Explain in detail. **7**

OR

2. a) Define wind rose. Explain its importance in air pollution studies. **7**

b) Explain different types of plume behavior with neat sketches. **7**

3. a) Discuss the methods of ambient air sampling. **7**

b) A factory uses 0.3 million liters of fuel oil pr month. (Specific gravity 0.96). If has been estimated that one million liters of oil used per year, the following are the quantities of pollutant observed. **7**

i) Particulate matter = 4 tonnes/year
ii) SO2=56 tonnes/year
iii) Oxides of nitrogen = 7.0 tonnes/year
iv) CO=0.52 tonnes/year

Assuming factory works 250 days for 24 hours. Determine the safe height of chimney for the safe dispersion of pollutants. Assume suitable data if necessary.

OR

4. a) State the various types of equipment used to control particulate matter and explain any one in detail. **7**

b) Explain incineration method to control the gaseous pollutants. **7**

5. a) Explain the various sources of generation of solid waste. **7**

b) Explain the physical and chemical characteristics of solid waste. **7**

OR

6.	a)	Explain the various methods of Collection of Solid Waste.	**7**
	b)	What is transfer station? Explain Heuristic method in brief.	**7**
7.	a)	Explain 3R concept in detail along with the examples.	**7**
	b)	What are the various methods of sanitary land fill and explain each with sketch.	**7**

OR

8.	a)	Define composting. Explain different types of composting.	**7**
	b)	Write a note on "Leachate collection system" in sanitary Landfill and explain it with neat sketch.	**7**
9.	a)	Write a detail note on "Bio Gas" with neat sketch.	**7**
	b)	What are the various types of incinerators? Explain any one in brief.	**7**

OR

10. Write a note on **any three.** **14**

a) Refuse Derived Fuel (RDF).

b) Pyrolysis.

c) Gasification.

d) Carbon Footprint.

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B.Tech. (Civil Engineering) Seventh Semester (C.B.C.S.)

Elective-V : Precast and Modular construction Practices

P. Pages : 2 **PSM/KW/23/2839**

Time : Three Hours * 2 2 7 0 * Max. Marks : 70

Notes :
1. All questions carry marks as indicated.
2. Solve Question 1 OR Questions No. 2.
3. Solve Question 3 OR Questions No. 4.
4. Solve Question 5 OR Questions No. 6.
5. Solve Question 7 OR Questions No. 8.
6. Solve Question 9 OR Questions No. 10.
7. Due credit will be given to neatness and adequate dimensions.
8. Illustrate your answers whenever necessary with the help of neat sketches.
9. Use of non programmable calculator is permitted.

1. a) What are the principles of prefabrication techniques and explain in detail and also mention its advantages and disadvantages. **7**

b) What are the classification of prefabricated systems? **7**

OR

2. a) Explain the standardization in detail and factors influencing the standardization. **7**

b) Explain in detail about different materials used the in prefabrication and what are the characteristics of Materials used for construction of Prefabricated structures? **7**

3. a) What are the different structural members used in prefabricated structures? **6**

b) Write briefly about precast concrete beam and columns. Write the Design Considerations for prefabricated structures. **8**

OR

4. a) What is the necessity of providing shear walls in the precast structures? Also discuss the different types of shear walls. **7**

b) How are roofing members in prefabricates classified? **7**

5. a) Explain the behavior of large panel construction with suitable sketches. **7**

b) Explain about joints for different structural connections and also explain about expansion joint. **7**

OR

6. a) Explain the behavior of roof and floor slabs construction with suitable sketches. **7**

b) Explain the types of structural joints and also the requirements of joints? **7**

7.	a)	Explain the precasting methods and stages of work in precasting?	**7**
	b)	What is the process involved in manufacture of PFS?	**7**

OR

8.	a)	What are the methods for Manufacture of precast concrete elements and explain the factors influencing method of manufacturing.	**7**
	b)	What are the importance aspects considered during hoisting erection and transportation of precast element?	**7**
9.	a)	Define abnormal loads. Explain the causes of progressive collapse?	**7**
	b)	Explain the Codal provisions for Progressive collapse.	**7**

OR

10.	a)	Explain the procedure for calculating equivalent design loads when the structure is subjected to earthquake loading.	**7**
	b)	Write the design criteria for progressive collapse in abnormal loads.	**7**

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B.Tech. (Civil Engineering) Seventh Semester (C.B.C.S.)

Elective-V : Hydropower Engineering

P. Pages : 2 **PSM/KW/23/2840**

Time : Three Hours * 2 2 7 1 * Max. Marks : 70

Notes :
1. All questions carry marks as indicated.
2. Solve Question 1 OR Questions No. 2.
3. Solve Question 3 OR Questions No. 4.
4. Solve Question 5 OR Questions No. 6.
5. Solve Question 7 OR Questions No. 8.
6. Solve Question 9 OR Questions No. 10.
7. Due credit will be given to neatness and adequate dimensions.
8. Illustrate your answers whenever necessary with the help of neat sketches.
9. Use of non programmable calculator is permitted.

1. a) Explain the general arrangement of run of river plants. **7**

b) Discuss the different sources of energy and types of power station utilizing the energy. **7**

OR

2. a) Discuss the economics of pumped storage power plant. **7**

b) Explain various components of water power projects. **7**

3. Enlist the various types of surge tanks & discuss basic design criteria of power canons. **14**

OR

4. Write short notes on **any two.** **14**

i) Anchor blocks.

ii) Conduit valves.

iii) Bends and manifolds.

5. Discuss the functions & behavior of surge tank. **14**

OR

6. a) Explain the equation for uniform diameter of penstock. **7**

b) Explain the use of Allievi Chart. **7**

7. Explain the general principles of alignment and balancing tank. **14**

OR

8. Explain the basic flow equation & characteristics of turbine. **14**

9. a) Explain the different types of power houses. **7**

b) Explain Diversity factor on hydro turbines. **7**

OR

10. Write short notes on **any three.** **14**

i) Load factor.

ii) Capacity factor.

iii) Utilization factor.

iv) Load Duration curve.

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B.Tech. (Civil Engineering) Seventh Semester (C.B.C.S.)

Elective-V : Bridge Engineering

P. Pages : 2 **PSM/KW/23/2841**

Time : Three Hours * 2 2 7 2 * Max. Marks : 70

Notes :
1. All questions carry marks as indicated.
2. Solve Question 1 OR Questions No. 2.
3. Solve Question 3 OR Questions No. 4.
4. Solve Question 5 OR Questions No. 6.
5. Solve Question 7 OR Questions No. 8.
6. Solve Question 9 OR Questions No. 10.
7. Assume suitable data whenever necessary.

1. a) What are the main types of bridges, and what are the key differences between suspension bridges and arch bridges in terms of their design and structural elements? **7**

b) What is IRC loading, and how does it differ from other types of bridge loading standards? Discuss the significance of considering IRC loading in bridge design and construction. **7**

OR

2. a) Explain the various components of a typical bridge, including abutments, piers, and the superstructure. How do these components work together to support the bridge's function? **7**

b) Describe the primary functions of key bridge components like deck, bearings, and expansion joints. How do these components help ensure the safety and durability of a bridge? **7**

3. a) The bridge deck is designed as a continuous steel box girder. Calculate the cross-sectional dimensions and steel properties required for the deck to support the live load without exceeding the allowable stress. **7**

b) Compare and contrast the design and structural characteristics of a plate girder and a box girder. When would one be preferred over the other in bridge design? **7**

OR

4. a) Explain the fundamental concept behind a balanced cantilever bridge design. What are the key advantages of using this design in bridge construction? **7**

b) Design a balanced cantilever bridge with a central span of 200 meters. The bridge must be able to support a maximum live load of 8 kN/m^2 on the deck. The bridge will consist of two cantilever arms extending from each bank to meet at the center. **7**

5. a) Describe the basic steps involved in the design of pre-stressed concrete girders for a box girder bridge. Include considerations for pre-stressing and post-tensioning. **7**

b) What is the purpose of the end block in a box girder bridge, and how does it contribute to the overall stability of the structure? **7**

OR

6.	a)	Define primary torsion in the context of box girder bridges. Why is it important to consider primary torsion during the design phase, and how does it affect the structural integrity of the bridge?	**7**
	b)	Design the end block for a pre-stressed concrete box girder bridge with a span of 50 meters. The bridge will carry a maximum live load of $20\,kN/m^2$ on the deck. Calculate the required dimensions and reinforcement for the end block to ensure it can safely transfer the loads from the box girder to the foundation. Assume the end block is subjected to primary torsion due to the bridge's curvature.	**7**
7.	a)	Explain the functions of bridge piers and abutments in supporting a bridge. How do their roles differ in various bridge designs and locations.	**7**
	b)	Describe the various types of bridge bearings, including sliding bearings, roller bearings, and elastomeric bearings. Provide examples of situations in which each type is commonly used.	**7**

OR

8.	a)	Explain the role of bridge bearings in a bridge's structural system. How do they accommodate movements, loads, and deformations in the structure?	**10**
	b)	Design the bearing system for a pedestrian bridge with a span of 40 meters. The bridge will experience both thermal expansion and live load movement. Calculate the required dimensions and specifications for an elastomeric bearing system to support this structure safely and efficiently.	**4**
9.	a)	What is an open well, and how is it prepared during the construction of a well foundation? Explain the process of sinking well walls and the challenges associated with it.	**7**
	b)	Design a well foundation for a bridge in a river with varying soil conditions. Calculate the required well diameter and depth based on the soil properties and expected loads. Consider factors such as bearing capacity and settlement.	**7**

OR

10.	a)	Describe the key steps involved in the design and construction of a well foundation. What are the critical considerations in terms of depth, shape, and material selection?	**7**
	b)	Provide an overview of the procedures involved in sand filling and casting the well cap. How do these steps complete the construction of a well foundation?	**7**

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B.Tech. (Civil Engineering) Seventh Semester (C.B.C.S.)

Elective-VI : Design of Earthquake Resistant Structures

P. Pages : 2 **PSM/KW/23/2842**

Time : Three Hours * 2 2 7 4 * Max. Marks : 70

Notes :
1. All questions carry marks as indicated.
2. Solve Question 1 OR Questions No. 2.
3. Solve Question 3 OR Questions No. 4.
4. Solve Question 5 OR Questions No. 6.
5. Solve Question 7 OR Questions No. 8.
6. Solve Question 9 OR Questions No. 10.
7. Due credit will be given to neatness and adequate dimensions.
8. Assume suitable data whenever necessary.
9. Illustrate your answers whenever necessary with the help of neat sketches.
10. Use of non programmable calculator is permitted.
11. Is 1893:2016, IS 13920, IS 456 : 2000 is permitted.

1. a) Explain in brief Strong Ground Motion Characteristics. **7**

b) Write a note on Tsunami and Richter Scale. **7**

OR

2. a) Describe plate tectonics theory in detail. What are the major plate tectonics on the earth surface? **9**

b) Explain in brief Response Spectra. **5**

3. a) Explain in detail various deficiencies (irregularities) in RC building with neat sketch. **7**

b) Explain how architectural features affect the seismic behavior of building. **7**

OR

4. a) Explain in detail various structural failures occurred during last past earthquake in India. **7**

b) Explain the effect of earthquake ground motion on structure. **7**

5. a) Explain in detail soil foundation by Winkler model. **7**

b) Explain in detail how the mathematical modeling of multistoried RC building is done for 2D frame structure. **7**

OR

6. a) Write a note on mathematical modeling of 3D space frame & reduced 3D model. **7**

b) Enlist the various seismic methods of analysis & explain any one in detail. **7**

7. a) Explain Capacity based design of RC building. **7**

b) Write down Codal provisions related to ductile detailing of a beam-column joint. **7**

OR

8. A Single bay three Storey frame building is situated at Roorkee. Determine the Total base Shear using Equivalent Lateral Load procedure for the following details. **14**

i) The height between floor = 3.2m
ii) Total height of building = 9.6m
iii) D. L. & L. L (Lumped at each floor) = 3400 KN
iv) D. L. & L. L (Lumped at Roof level) = 1500 KN
v) Soil below foundation is Hard Rock
vi) Assume building is intended to used as Hospital building
vii) The length along X direction & Width along Y direction of building plan at plinth level = 15m

9. a) Write a note on various local and global level retrofitting methods. **7**

b) What are the different failure modes of Masonry structures. **7**

OR

10. a) Explain Base Isolation in detail. **7**

b) Explain various repairing techniques for Masonry structures. **7**

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B.Tech. (Civil Engineering) Seventh Semester (C.B.C.S.)

Elective-VI : Advanced Engineering Geology

P. Pages : 1 **PSM/KW/23/2843**

Time : Three Hours * 2 2 7 5 * Max. Marks : 70

Notes : 1. All questions carry marks as indicated.
2. Solve Question 1 OR Questions No. 2.
3. Solve Question 3 OR Questions No. 4.
4. Solve Question 5 OR Questions No. 6.
5. Solve Question 7 OR Questions No. 8.
6. Solve Question 9 OR Questions No. 10.
7. Assume suitable data whenever necessary.
8. Illustrate your answers whenever necessary with the help of neat sketches.

1. a) What is role of minerals in engineering geology? **7**

b) What are the engineering properties of rocks in engineering geology. **7**

OR

2. a) Explain field permeability test in detail. **7**

b) Explain the In-situ test on rocks. **7**

3. a) Give the engineering classification of rocks based on strength and weathering resistance. **7**

b) Explain the effect of climate on formation of soil. **7**

OR

4. a) Explain the effect of over exploitation of tube wells. **7**

b) What are various methods of artificial groundwater recharge? **7**

5. Write short note on Evaluation tunnel alignment. **14**

OR

6. a) What are the geological problems encountered during tunneling? **7**

b) What are the factors which affect the choice of tunneling methods? **7**

7. What are the various methods of geophysical explorations? **14**

OR

8. Explain physical properties and mechanical properties of rock. **14**

9. a) What are the main objective of geological investigations of tunning. **7**

b) Explain the different types of tunnel for different purpose. **7**

OR

10. a) Write short note on steel fiber shotcreting. **7**

b) What are the objective & special. Techniques for bridge foundation. **7**

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B.Tech. (Civil Engineering) Seventh Semester (C.B.C.S.)

Elective-VI : Water and Wastewater Treatment

P. Pages : 2 **PSM/KW/23/2844**

Time : Three Hours * 2 2 7 6 * Max. Marks : 70

Notes :
1. All questions carry marks as indicated.
2. Solve Question 1 OR Questions No. 2.
3. Solve Question 3 OR Questions No. 4.
4. Solve Question 5 OR Questions No. 6.
5. Solve Question 7 OR Questions No. 8.
6. Solve Question 9 OR Questions No. 10.
7. Due credit will be given to neatness and adequate dimensions.
8. Assume suitable data whenever necessary.
9. Diagrams and chemical equations should be given whenever necessary.
10. Illustrate your answers whenever necessary with the help of neat sketches.
11. Use of non programmable calculator is permitted.

1. a) Explain the factors to be considered while selecting the site for water treatment plant. **6**

b) Draw the flow diagram of conventional water treatment plant and explain the function of each unit in brief. **8**

OR

2. a) Explain various types of aerators in water treatment. **6**

b) Design the cascade type aerator for the design flow of 38 MLD. **8**

3. a) State the difference between slow sand and rapid sand filter. **6**

b) Design a rapid sand filter (size only) for treating water required for 70000 persons with demand being 150 lpcd. Assume rate of filtration. Provide five units, out of which, one is to be kept as stand by and used while repairing other units. **8**

OR

4. a) State type of coagulants used in water treatment plant & explain any two. **6**

b) Calculate the quantity of bleaching powder required per day for disinfecting 4 million liters/ day. The dose of Chlorine has to be 0.5 ppm and the bleaching powder contains 30% of available chlorine. **8**

5. a) Write and Explain the characteristics of waste water. **6**

b) Draw Flow sheet of conventional waste water treatment plant. Explain the working of each unit in brief. **8**

OR

6. a) Explain various methods of land disposal. **6**

b) The 5 day BOD of sewage sample is 130 mg/lit at 30ºC. Calculate its 5 day BOD at 20ºC. Assume BOD rate constant at 30ºC is 0.1/d. **8**

7. a) Draw a neat sketch of trickling filter & explain its construction & working. **6**

b) Design of a grit chamber of rectangular cross section, if the maximum waste water flow rate is 8000 m^3/day to remove particles up to 0.2 mm diameter with specific gravity of 2.65 **8**

OR

8. a) Explain the various types of screens used in waste water treatment plant. **6**

b) Design a bar screen chamber for a maximum flow of 12 MLD. Assume suitable data. **8**

9. a) Explain Activated Sludge Process (ASP) with help of neat diagram? **6**

b) Write notes on **any three.** **8**

i) Sludge digestion tank.

ii) Sludge volume index.

iii) Aerated lagoon.

v) Sludge drying bed.

OR

10. a) Write down the factors affecting anaerobic digestion tank. **6**

b) Design the activated Sludge Treatment Unit with following data for town having Population of 75,000. **8**

i) Average Sewage Flow = 210 lit/cap/day.
ii) B. O. D. of Row Sewage = 170 mg/lit.
iii) Suspended solid in raw sewage = 335mg/lit.
iv) BOD Removed in Primary Treatment = 40%
v) Overall BOD Removal desired = 95%

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B.Tech. (Civil Engineering) Seventh Semester (C.B.C.S.)

Elective-VI : Forensic in Civil Engineering

P. Pages : 1 **PSM/KW/23/2845**

Time : Three Hours * 2 2 7 7 * Max. Marks : 70

Notes :
1. All questions carry marks as indicated.
2. Solve Question 1 OR Questions No. 2.
3. Solve Question 3 OR Questions No. 4.
4. Solve Question 5 OR Questions No. 6.
5. Solve Question 7 OR Questions No. 8.
6. Solve Question 9 OR Questions No. 10.
7. Assume suitable data whenever necessary.
8. Illustrate your answers whenever necessary with the help of neat sketches.

1. What is forensic Investigation? Discuss different tools and techniques used in forensic investigation. **14**

OR

2. Discuss the scope and extent of application of forensic engineering in various field of civil engineering. **14**

3. Discuss the causes and prevention of failure of foundation system. **14**

OR

4. State how the failure of post tensioned concrete system is investigated. **14**

5. Write short notes on **any two.** **14**

i) Laser scanning
ii) Microscope
iii) Radio graphic evaluation

OR

6. Discuss Back analysis with respect to the model adopted and method. **14**

7. Explain as a case study, how will you design against failure of pre-structure including design details material selection & reliability checks. **14**

OR

8. Discuss the legal issues methods involved in forensic investigations. **14**

9. Discuss the professional practices & ethics in engineering. **14**

OR

10. What is the importance of quality control in designing against failure? Discuss selection of material & manpower. **14**

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B.Tech. (Civil Engineering) Seventh Semester (C.B.C.S.)

Elective-VI : Irrigation Management

P. Pages : 2 **PSM/KW/23/2846**

Time : Three Hours * 2 2 7 8 * Max. Marks : 70

Notes :
1. All questions carry marks as indicated.
2. Solve Question 1 OR Questions No. 2.
3. Solve Question 3 OR Questions No. 4.
4. Solve Question 5 OR Questions No. 6.
5. Solve Question 7 OR Questions No. 8.
6. Solve Question 9 OR Questions No. 10.
7. Due credit will be given to neatness and adequate dimensions.
8. Assume suitable data whenever necessary.
9. Illustrate your answers whenever necessary with the help of neat sketches.
10. Use of non programmable calculator is permitted.

1. a) Define irrigation? Explain its necessity & scope in India. **6**

b) Describe the different types of irrigation scheme. Explain each briefly. **8**

OR

2. a) What do you understand by flow irrigation. System. **6**

b) Discuss various environmental effects of irrigation. **8**

3. a) What is meant by Canal falls? Why are falls constructed in modern Canal systems? **7**

b) Explain economics of canal lining. **7**

OR

4. a) Explain Bligh's creep theory for design of weirs on permeable foundations. **7**

b) Using Lacey's theory, design a channel section for the following data, Discharge $40 m^3/sec$, silt factor = 1, side slopes 1 V : 0.5 H. **7**

5. a) Explain in short various losses through canals. **7**

b) Explain **any one** with neat sketch. **7**

i) Canal lining.

ii) Balanced depth of a lined canal.

OR

6. a) Explain Seepage loss in canal and its types. **7**

b) Write short notes on. **7**

i) Canal regulators, and.

ii) Components of head regulator.

7. a) Discuss the causes and preventive measures of water logging. **7**

b) Write short note on participatory irrigation management. **7**

OR

8. a) Write short note on role of engineers in irrigation system. **7**

b) How do you form a water user association? And also explain the role of association. **7**

9. a) Write short note on inter-state water dispute. **7**

b) Explain the concept of interlinking of rivers. **7**

OR

10. a) List the various irrigation policies in India. Explain any one of them. **7**

b) What are the various challenge for interlinking of rivers in India? **7**

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B.Tech. (Civil Engineering) Seventh Semester (C.B.C.S.)

Elective-VI : Pavement Analysis & Design

P. Pages : 2 **PSM/KW/23/2847**

Time : Three Hours * 2 2 7 9 * Max. Marks : 70

Notes :
1. All questions carry marks as indicated.
2. Solve Question 1 OR Questions No. 2.
3. Solve Question 3 OR Questions No. 4.
4. Solve Question 5 OR Questions No. 6.
5. Solve Question 7 OR Questions No. 8.
6. Solve Question 9 OR Questions No. 10.
7. Due credit will be given to neatness and adequate dimensions.
8. Assume suitable data whenever necessary.
9. Illustrate your answers whenever necessary with the help of neat sketches.
10. Use of non programmable calculator is permitted.
11. Relevant IRC codes are permitted.

1. a) With neat sketches enumerate the functions and importance of each component layer in flexible pavement. **7**

b) The axle load distribution of commercial vehicles on a highway is as under: **7**

Axle load group (kg)	Distribution	Axle load group (kg)	Distribution
< 1000	08	7000-9000	13
1000-3000	20	9000-11000	12
3000-5000	14	11000-13000	10.5
5000-7000	15	13000-15000	7.5

Calculate the standard axles to be used in design for strengthening the pavement when the current traffic on a two lane road is 1750 C. V. D. The rate of growth is 7.0% per annum and the period of construction is 2 years. The design life is 20 years after the construction. Assume the legal axle load as 8000 kg.

OR

2. a) Discuss the factors affecting pavement design? **7**

b) Calculate ESWL **7**

i) Wheel configuration = Dual in tandem
ii) Gear load = 42500 kg
iii) Tyre pressure = 11kg/cm^2
iv) Clear spacing of duels = 225 mm
v) Clear spacing of tandems = 375 mm
vi) Pavement thickness = 120 mm

3. a) Write short note on analysis of two layered flexible pavement. **7**

b) Distinguish between Boussinesq's and Burmister's layered theory. **7**

OR

4. a) Write in detail about different types of stresses in rigid pavement. **7**

b) Estimate the vertical compressive stress at depth 24 cm and surface deflection for a subgrade with the following data **7**

i) Wheel load = 3200 kg at 4.5 kg/cm^2 T. P.
ii) E of subgrade = 250 kg/cm^2
iii) Poisson's ratio = 0.47

5. Design a flexible pavement for two lane two way highway from the following. **14**

i) Present traffic = 3000 CVD
ii) Design life = 20 years
iii) Rate of growth of traffic = 6%
iv) Vehicle damage factor = 5.0
v) Effective CBR of subgrade = 10%
vi) Poisson's ratio = 0.35

OR

6. Design a four lane divided NH rigid pavement for traffic volume of 3000 CVD. **14**

i) Design period = 30 yrs
ii) Rate of growth of traffic = 5%
iii) Wheel load = 4600 kg
iv) Tyre pressure = 5.8 kg/cm^2
v) Grade of concrete = M30
vi) K of subgrade = 8.2 kg/cm^2/cm
vii) Panel dimension = (3.5x4.5) m
viii) Temperature difference between top and bottom of slab = 19ºC
ix) Ec = 30000 MPa
x) Poisson's ratio = 0.15
xi) Coefficient of thermal expansion of concrete = $10x10^{-6}/^{o}C$

7. a) With neat sketches enumerate the functions and importance of each component layer in rigid pavement. **7**

b) Explain in detail AASHO method of rigid pavement design. **7**

OR

8. Find the spacing of joints and design a tie bar joint for a highway pavement from following data. **14**

i) Pavement Thickness = 200 mm
ii) Lane width = 3.5m
iii) St = 1800 kg/cm^2
iv) S_B = 20 kg/cm^2
v) Subgrade restraint coff. = 1.6
vi) Sc = 0.85 kg/cm^2
vii) Width of expansion joint = 2.5 cm
viii) Temperature difference between top and bottom of slab = 35ºC
ix) $\alpha = 9.5 \times 10^{-6} / °C$

Draw a neat sectional view.

9. a) What are the types of failure in rigid pavements? **7**

b) Write short note on falling weight deflectometer. **7**

OR

10. a) Explain the various methods used for the maintenance and rehabilitation of flexible and rigid pavements. **7**

b) Design a bituminous overlay for a pavement section 3 km long. The Benkelman Beam test is conducted at a rate of one test for 250 m length over a length of a section. The following values of deflection are recorded 1.38, 1.52, 1.7, 1.31, 1.7, 1.92, 1.68, 1.2, 1.84, 1.93, 1.46, 1.55 mm. The test temperature of pavement is 26ºC. Present traffic volume is 750 CVD. Assume growth rate of 9.5% per year for service life of 10 years with delay of 1 year. **7**

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B.Tech. (Civil Engineering) Seventh Semester (C.B.C.S.)

Open Elective-II : Civil Engineering Materials, Testing and Evaluation

P. Pages : 2 **PSM/KW/23/2848**

Time : Three Hours * 2 2 7 3 * Max. Marks : 70

Notes :
1. All questions carry marks as indicated.
2. Solve Question 1 OR Questions No. 2.
3. Solve Question 3 OR Questions No. 4.
4. Solve Question 5 OR Questions No. 6.
5. Solve Question 7 OR Questions No. 8.
6. Solve Question 9 OR Questions No. 10.
7. Due credit will be given to neatness and adequate dimensions.
8. Diagrams and chemical equations should be given whenever necessary.
9. Illustrate your answers whenever necessary with the help of neat sketches.
10. Use of non programmable calculator is permitted.

1. a) Enlist the various usage of Sand, Cement, and Aggregate. **7**

b) Explain in short **any two.** **7**
- i) Grouts.
- ii) Clay Bricks.
- iii) Glass Wool.

OR

2. a) Difference Between Wetting agents and Waterproof agent. **7**

b) Describe various types of Cements briefly. **7**

3. a) Enlist the various basic properties of concrete. **7**

b) Explain in short **any two**. **7**
- i) Nano- Particle.
- ii) Composite material.
- iii) Thermal conductivity.

OR

4. a) Discuss the properties of glass, wood, ceramics that are considered for selection of these materials. **7**

b) Explain the importance of nano materials in civil engineering construction. **7**

5. a) Discuss the properties and application of AAC Blocks. **7**

b) Explain in short **any two**. **7**
- i) Self- healing concrete.
- ii) 3D printing.
- iii) Photo catalytic admixture.

OR

6. a) What is FRC? Enlist the various type of fibers used in Concrete. **7**

b) Explain in brief Self-Healing concrete. **7**

7. a) Explain briefly equipment requirement, necessity of material testing. **7**

b) Explain in short **any two**. **7**
i) Ultra sonic pulse Velocity test.
ii) Importance of visual inspection of site.
iii) Testing procedure for bricks.

OR

8. a) Explain briefly importance of various Nondestructive testing of concrete. **7**

b) Explain briefly various testing procedure for reinforcing steel bars. **7**

9. a) State the various factors affecting selection of timber in view of quality control. **7**

b) State the methods for interpretation of final result. **7**

OR

10. Explain in details codal practices and guidelines in regards for **any four**. **14**

i) Cement. ii) Aggregate.

iii) Timber. iv) Bitumen.

v) Concrete. vi) Asphaltic material.

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