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चंचल - 071

ELECTIVE - II
Water Power Engineering
(1311)

P. Pages : 2

Time : Three Hours

Max. Marks : 100

Instructions to Candidates :

1. Do not write anything on question paper except Seat No.
2. Answer sheet should be written with black ink only. Graph or diagram should be drawn with the same pen being used for writing paper or black HB pencil.
3. Students should note, no supplement will be provided.
4. Attempt **any two** questions from each unit.
5. Draw neat sketches wherever necessary.
6. Figures to right indicates full marks.

UNIT - I

1. Explain in detail that how water power potential of stream at particular site is estimated. **10**
2. a) Discuss relative advantages of water power as compared to the power obtained from other sources. **5**
b) Discuss the current status of electrical power in India. **5**
3. Define : **10**
i) Load factor. ii) Capacity factor.
iii) Utilization factor. iv) Diversity factor.
v) Plant factor.

UNIT - II

1. a) Discuss the advantages & disadvantages of tidal power plant. **5**
b) What are the basic features of PSP plant ? State the advantages & limitations. **5**
2. a) Explain with neat sketch one complete cycle of operation for double cycle system in case of single basin arrangement of tidal power generation. **5**

चंचल - 071

- b) Explain storage & pondage of reservoir. 5
3. Explain : 10
- i) Run of river plant. ii) Valley dam plant.

UNIT – III

1. Describe the surface power stations. How these power houses are located. What are there types, describe in brief. 10
2. What are the purpose of providing surge tank ? How the surge tank are classified ? Describe the behaviour of surge tank with the help of neat sketch. 10
3. What is intake ? What are the functions of intakes ? Describe the following in brief. 10
- i) Run of river intake. ii) Dam intake.

UNIT – IV

1. Define biomass energy. Explain classification of biofuel. 10
2. Explain : 10
- i) Solar Chimney.
- ii) Solar water heater.
3. Explain the function of flat plate solar collector with the help of neat sketch. 10

UNIT – V

1. Prove the case of horizontal axis wind turbine maximum power can be obtained when. 10
- exit velocity = $\frac{1}{3}$ x wind velocity
- Maximum power = $\frac{8}{27}$ x mass density x swap area x (wind velocity)³.
2. Explain : 10
- a) Advantages & disadvantages of WES.
- b) Wind energy storage.
3. Describe with neat sketch the working of wind energy system. 10

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ELECTIVE - II
Water Power Engineering
(1311)

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- b) Wind energy storage.
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Seat Number

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Construction Management - II (1290)

P. Pages : 2

Time : Three Hours

Max. Marks : 100

Instructions to Candidates :

1. Do not write anything on question paper except Seat No.
2. Answer sheet should be written with black ink only. Graph or diagram should be drawn with the same pen being used for writing paper or black HB pencil.
3. Students should note, no supplement will be provided.
4. Solve **any two** questions from each unit.
5. Assume additional suitable data, if necessary.
6. Figures to the right indicate full marks.
7. Use of non-programmable calculator is allowed.
8. Answers to all the questions should be written in the same answer book.

UNIT - I

1. a) i) A contractor employs an average of 300 men, 48 hours per week for a duration of 80 weeks and has 10 disabling injuries which resulted in a total of 90 days loss of work. Find the injury frequency rate, Injury severity rate and Injury Index. 5
- ii) Write the salient features of a safety programme. 5
- b) Explain in detail workmen's compensation act. 10
- c) i) Explain about cost of an accident. 5
- ii) What are safety precautions to be adopted in demolition of buildings ? 5

UNIT – II

2. a) i) Cement is used in a precast plant at the rate of 30 tons per month. The cost of cement is Rs. 4,000 per ton. The ordering cost per order is Rs. 300 and the holding cost including wastage and pilferage is about 4.5% of the average inventory cost. Estimate the economic order quantity of cement. 5
- ii) What is necessity of inventory ? 5
- b) Explain in detail ABC analysis. 10
- c) What is sampling ? Explain about different sampling techniques. 10

UNIT – III

3. a) What are different types of contract ? Explain percentage rate contract and lump-sum contract in detail. 10
- b) Explain in detail about essentials of contract. 10
- c) i) Explain about work order. 5
- ii) Explain about earnest money. 5

UNIT- IV

4. a) Explain about draglines in detail. 10
- b) i) Explain about power shovels. 5
- ii) Explain about bull-dozers. 5
- c) Explain in detail about clamshells. 10

UNIT – V

5. a) Explain in detail about tower crane. 10
- b) i) Explain about sheepsfoot roller. 5
- ii) Explain about vibrating compactors. 5
- c) Explain in detail about safety in crane operation. 10

Seat Number

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Structural Design & Drawing - III (1280)

P. Pages : 2

Time : Four Hours

Max. Marks : 100

Instructions to Candidates :

1. Do not write anything on question paper except Seat No.
2. Answer sheet should be written with black ink only. Graph or diagram should be drawn with the same pen being used for writing paper or black HB pencil.
3. Students should note, no supplement will be provided.
4. Solve **any one** question from each unit.
5. Use of IS 456, IS 1343, IS3370 is allowed.
6. Use of non programmable calculator is allowed.

UNIT – I

1. Design the interior panel of flat slab 5.6m x 6.6m in size, for a super imposed load 7 kN/m². Use M20 concrete and Fe415 steel. Draw details of reinforcement. 25
2. Design a combined rectangular footing for two columns A & B, carrying loads of 500 kN and 700 kN respectively. Column A is 300 mm x 300 mm and column B is 400 mm x 400 mm. The centre to centre of spacing of column is 3.4m. The SBC of soil is 150 N/m² use M20 and Fe415 steel. 25

UNIT – II

3. Design an circular tank resting on ground. The water storage capacity should be 50,000 liters and the maximum depth should be 3.0m Assume tank wall to be fixed at base and free at top use M20 & Fe415. 25
4. Design a cantilever retaining wall to retain earth material 3m high above ground level, the unit wt of earth is 18 kN/m³ and its angle of repose is 30°. The embankment is horizontal at its top. The SBC of soil may be 100 kN/m². Use M20 & Fe 415. 25

UNIT – III

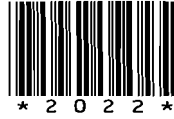
5. a) Write short note on full prestressing & partial prestressing. 7
- b) A prestressed concrete beam of rectangular section 300mm wide and 600 mm deep of span 10m. The effective prestressing force is 980kN at an eccentricity of 120mm. The dead load of beam is 4.5 kN/m and beam has to carry a live load of 7.5 kN/m. Determine extreme stresses. 18
- i) At end section.
- ii) At mid section without action of live load.
- iii) At mid section with action of live load.
6. a) Explain various profile of tendons. 7
- b) A prestressed concrete girder of 40m span is prestressed by parabolic cable eccentric at supports and having an eccentricity of 1000 mm at centre of span the stress in wire is 1200 N/mm^2 . Ultimate Shrinkage strain = 0.0002 $E_s = 210 \text{ kN/mm}^2$, coefficient of friction = 0.5 Anchorage slip = 8mm Estimate the percentage loss of stress in wire. 18

UNIT – IV

7. a) Explain magnet Blaton system. 9
- b) Explain lower and upper tern point. 8
- c) Explain design of end bloc in detail. 8
8. Design a post tensioned prestressed concrete beam for following data. 25
- Effective span = 20m
- Live load = 12 kN/m
- Loss ratio = 0.85
- Use M50 grade concrete & 12 wires of 7mm diameter
- ($f_p = 1500 \text{ N/mm}^2$)

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Water Resources Engineering - II (1300)

P. Pages : 2

Time : Three Hours

Max. Marks : 100

Instructions to Candidates :

1. Do not write anything on question paper except Seat No.
2. Answer sheet should be written with black ink only. Graph or diagram should be drawn with the same pen being used for writing paper or black HB pencil.
3. Students should note, no supplement will be provided.
4. All questions are compulsory.
5. Attempt **any two** bits from each question.
6. Figures to right indicates full marks.
7. Use of non programmable calculator is permitted.
8. Assume suitable data if required.

1. a) What do you mean by Elementary profile of a gravity dam. Derive formula for base width, principal stress at toe and heel. 10
- b) Compute the maximum stress developed in an elementary profile of a gravity dam 45m high assuming triangular uplift with an uplift factor 0.8. Take R.D. of masonry 2.25. 10
- c) Write short note on : 10
 - i) Galleries.
 - ii) Grouting of dam foundation.
2. a) A spillway is to discharge $20 \text{ m}^3/\text{sec}/\text{m}$ length. If the maximum water level is 50m above river bed obtain the profile of spillway crest (Down stream only) using U.S.W.E.S. method. Take upstream face vertical and downstream has a slope of 0.8H to 1V. 10
- b) Write short note on :
 - i) Cavitation in ogee spillway. 5
 - ii) Spillway crest gate. 5
- c) Explain in detail various methods of energy dissipation. 10

3. a) Explain Swedish slip circle method for stability of side slopes. 10
- b) A homogeneous earth dam 20m high with top width 6m upstream slope 4:1 and down stream slope 3:1 retains water upto a depth of 15m. An inverted filter bed provided extends to 30m from toe. Locate the phreatic line and estimate the seepage flow. Take coefficient of permeability $k = 5 \times 10^{-4}$ cm/sec. 10
- c) What are different causes of failure of earth dam ? 10
4. a) i) Define Regime channel, Initial regime, final regime, Bed load, suspended load. 5
- ii) Explain Garret diagram. 5
- b) Design an irrigation channel according to Lacey's theory for following data. 10
- i) Full supply discharge = $50 \text{ m}^3/\text{sec}$.
- ii) Silt factor = 1.00.
- iii) Side slope of channel = $\frac{1}{2}(H) : 1(V)$.
- c) Give the steps of design of stable channel in alluvium by Kennedy's theory. 10
5. a) i) How will you select most suitable type of cross drainage work. 5
- ii) Explain super passage and canal syphon. 5
- b) What are different methods of river training and bank protection. Explain in detail. 10
- c) What are important components of typical hydropower plant ? Draw neat layout of medium head hydropower plant. 10

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**ELECTIVE - I**
**Open Channel & Conduit Flow
(1045)**
P. Pages : 3**Time : Three Hours****Max. Marks : 100****Instructions to Candidates :**

1. Do not write anything on question paper except Seat No.
2. Answer sheet should be written with black ink only. Graph or diagram should be drawn with the same pen being used for writing paper or black HB pencil.
3. Students should note, no supplement will be provided.
4. Answer **any two** questions from each of five units.
5. Ten marks are allotted to each question.
6. Assume suitable data wherever required and mention it clearly.
7. Figures to the right indicate full marks.
8. Use of non programmable pocket calculator is allowed.

UNIT - I

1. Find out the dimensions of most efficient triangular section. The discharge through the channel is $15 \text{ m}^3/\text{sec}$ and the bed slope is 1 in 2500. Take $n = 0.02$. **10**
2. The water flows through the rectangular channel of 2.5 m wide @ 7.6 cumec. The depth of flow of water is 0.5 m. Calculate the height of a flat top hump required to cause the critical flow on it. The energy loss due to hump may be taken as 0.12 times the velocity head on u/s side of hump. **10**
3. Obtain an expression for first hydraulic exponent for critical flow in the form **10**

$$M = \frac{y}{A} \left[3T - \frac{A}{T} \frac{dT}{dy} \right]$$

Also find the value of M for the triangular and rectangular channel.

UNIT – II

4. A wide rectangular channel of width 10.00 m carries water @ 30 cumec. The bed slope of the channel is 0.0001. If at a section in the channel the depth of flow is 1.6 m. How far U/S or D/S from this section the depth will be 1.9 m. Consider the manning's coefficient $n = 0.015$. 10
5. Explain the standard step method for computation of GVF profiles in open channel. 10
6. Starting from the basic principles, show that the dynamic equation of GVF for wide rectangular channel, by using manning's formula takes the form 10
- $$\frac{dy}{dx} = S_0 \frac{1 - (y_0/y)^{3.33}}{1 - (y_c/y)^3} \text{ where } y, y_c, y_0 \text{ and } x \text{ are usual notations.}$$

UNIT – III

7. The water flows through a rectangular channel in super critical condition with Froude Number 2.5. Find the end depth ratio at a free over fall in this channel. Also find the discharge intensity, if the end depth is found to be 1.0 m. 10
8. The R.L. of the crest of an overflow spillway is 145.000 m. The horizontal floor on the D/S side is at RL 105.00 m. Assuming coefficient of discharge equal to 0.70 and neglecting the energy losses due to flow over spillway, find out the tail water elevation required to form hydraulic jump, when the elevation of TEL on just U/S side of the spillway is 147.000 m. 10
9. A rectangular, frictionless, horizontal channel 3.0 m wide carries a discharge of $9 \text{ m}^3/\text{s}$ at a depth of 2.0 m. Calculate the height and velocity of a surge produced when the flow is suddenly stopped completely by full closure of a sluice gate at the downstream end. 10

UNIT – IV

10. Discuss in detail the stepwise procedure for estimating the economical diameter of rising main of a water supply system of a town. 10
11. The economical diameter of rising main of a village water supply system is 140 mm of class 6 kg/cm², with wall thickness of 6.00 mm. The pipe is supplying water to the village of population 4300 @ 40 10

LPCD. The static head on pipe is 22 m and the length of the same is 3600 m.

Estimate the following :

- Frictional head
- Water hammer head
- Total head.

The other design parameters are as under :

Permissible losses in the WSS = 15%

C value for PVC pipe = 145

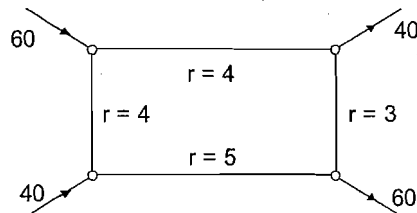
$E_{PVC} = 2.95 \text{ GPa}$

$K_W = 2.00 \text{ GPa}$

Pumping hours = 8.00 hours per day

Check the design for the different conditions.

12. Determine the distribution of discharge in the pipe network shown in figure. Take $H_f = r.Q^2$. Take two trials only. 10



UNIT - V

13. What is the celerity of pressure wave ? State the equations for elastic and rigid pipe ? Derive the equation for celerity of pressure wave in rigid pipe. 10
14. A 15.00 cm dia, 2.1 km long pipe takes off from a large reservoir to an outlet which is 20 m below the reservoir's water level. If the valve at the pipe outlet is suddenly opened, find the time required to reach 99% of steady state discharge. Find out the velocity in the pipe is second after opening the valve. Take $f = 0.018$ and minor losses as $8.0 v^2/2g$, where v = velocity of flow through pipe. 10
15. A penstock connects a simple cylindrical surge tank and a reservoir. The dia of surge tank is 7.5 m, dia of penstock is 3.0 m and the length of penstock is 1950 m. Calculate the maximum up surge and time required to attain it, when the valve at d/s and is closed suddenly and completely. The water was flowing through the penstock @ 20 cumec before closure of valve. Also find the minimum required height of the surge tank above the static reservoir level. Find out period of oscillation too. 10

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ELECTIVE - I
Water Shed Management
(1252)

P. Pages : 2

Time : Three Hours

Max. Marks : 100

Instructions to Candidates :

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2. Answer sheet should be written with black ink only. Graph or diagram should be drawn with the same pen being used for writing paper or black HB pencil.
3. Students should note, no supplement will be provided.
4. Solve **any two** questions from each unit.
5. Assume suitable data, if necessary.

UNIT - I

1. a) Explain in detail Network and channel Morphology in detail. 10
- b) Explain watershed characteristics in detail. 10
- c) State importance of watershed with examples. 10

UNIT - II

2. a) State hydrological cycle with flow diagram. 10
- b) Explain interception and evapotranspiration. 10
- c) Explain about precipitation and water balance in detail. 10

UNIT - III

3. a) Explain in detail land capability classification in detail. 10
- b) Explain in detail waste water treatment and septic system. 10
- c) Explain in detail planning and objective of watershed management. 10

UNIT – IV

- | | |
|--|----|
| 4. a) Explain about non point source pollution and point source pollution. | 10 |
| b) Explain in detail soil and water conservation. | 10 |
| c) Explain benefit cost analysis in watershed management. | 10 |

UNIT – V

- | | |
|--|----|
| 5. a) Explain the concept of rain water harvesting from urban structures with suitable examples. | 10 |
| b) State goals and strategies of urban watershed management. | 10 |
| c) Describe in detail urban storm water pollution. | 10 |

Seat Number

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Construction Management - I (1210)

P. Pages : 3

Time : Three Hours

Max. Marks : 100

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3. Students should note, no supplement will be provided.
4. Attempt all **five** questions.
5. Solve **any two** questions from each unit.
6. Use of non-programmable calculator is allowed.
7. Answer all the questions of a unit at one place.
8. Assume suitable data if necessary.

UNIT - I

1. a) Explain construction industry and need of management in construction. 10
- b) State the forms of organization and explain any one in detail. 10
- c) Explain job layout with example in detail. 10

UNIT - II

2. a) Explain bar chart and CPM with examples in detail. 10
- b) Explain about PERT and PERT time in detail. 10

- c) Identify the critical path in the network given and determine project completion time in weeks. 10

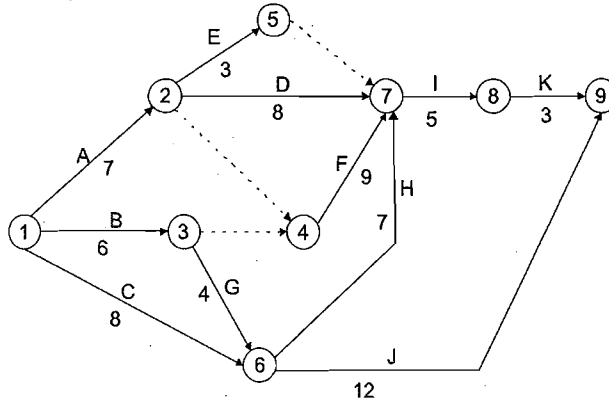


Fig.1

UNIT – III

3. a) Explain cost analysis and cost curve in detail. 10
- b) Explain : 10
- Line of balance.
 - Updating of network.
- c) For the project network shown in figure and data given below 10
determine the optimum time and optimum cost.

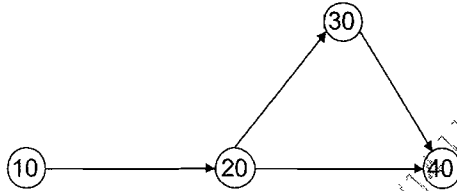


Fig.2

Data given : Indirect cost = 250 / per day

Activity	Normal Time	Crash Time	Normal Cost	Crash Cost
10 - 20	4	3	400	600
20 - 30	5	2	300	750
20 - 40	7	5	360	540
30 - 40	4	2	500	1000

UNIT – IV

- | | |
|---|----|
| 4. a) Explain Engg. economics and its importance in detail. | 10 |
| b) Explain bank, its type, uses and function. | 10 |
| c) Explain demand and supply and profit and loss account. | 10 |

UNIT – V

- | | |
|---|----|
| 5. a) List the pile driving Equipments & explain any one in detail. | 10 |
| b) List the types of crushers & explain any one in detail. | 10 |
| c) Explain central mixed and concrete pumps. | 10 |

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Quantity Surveying & Valuation (1230)

P. Pages : 4

Time : Four Hours

Max. Marks : 100

Instructions to Candidates :

1. Do not write anything on question paper except Seat No.
2. Answer sheet should be written with black ink only. Graph or diagram should be drawn with the same pen being used for writing paper or black HB pencil.
3. Students should note, no supplement will be provided.
4. Solve **any two** sub questions from each unit.
5. Figures to right indicate full marks.
6. Use of non- programmable calculator is allowed.
7. Assume suitable data, if necessary.
8. Answer to all questions of same unit, should be written at one place.

UNIT – I

1. a) Define estimate? What data are required to prepare detailed estimate, Explain. 10
- b) Write short notes on 10
 - i) Contingencies
 - ii) W. C. establishments.
- c) A person constructed a building of plinth area 140 sqm in a certain locality at a cost of Rs 5,00,000/-. The height of building from ground level to the top of the roof is 3.5 m and the height of parapet wall is 80 cm. Determine cost of similar building of area 125 sqm. Proposed to be constructed in the same locality by plinth area rate and also by volume rate method. 10

UNIT - II

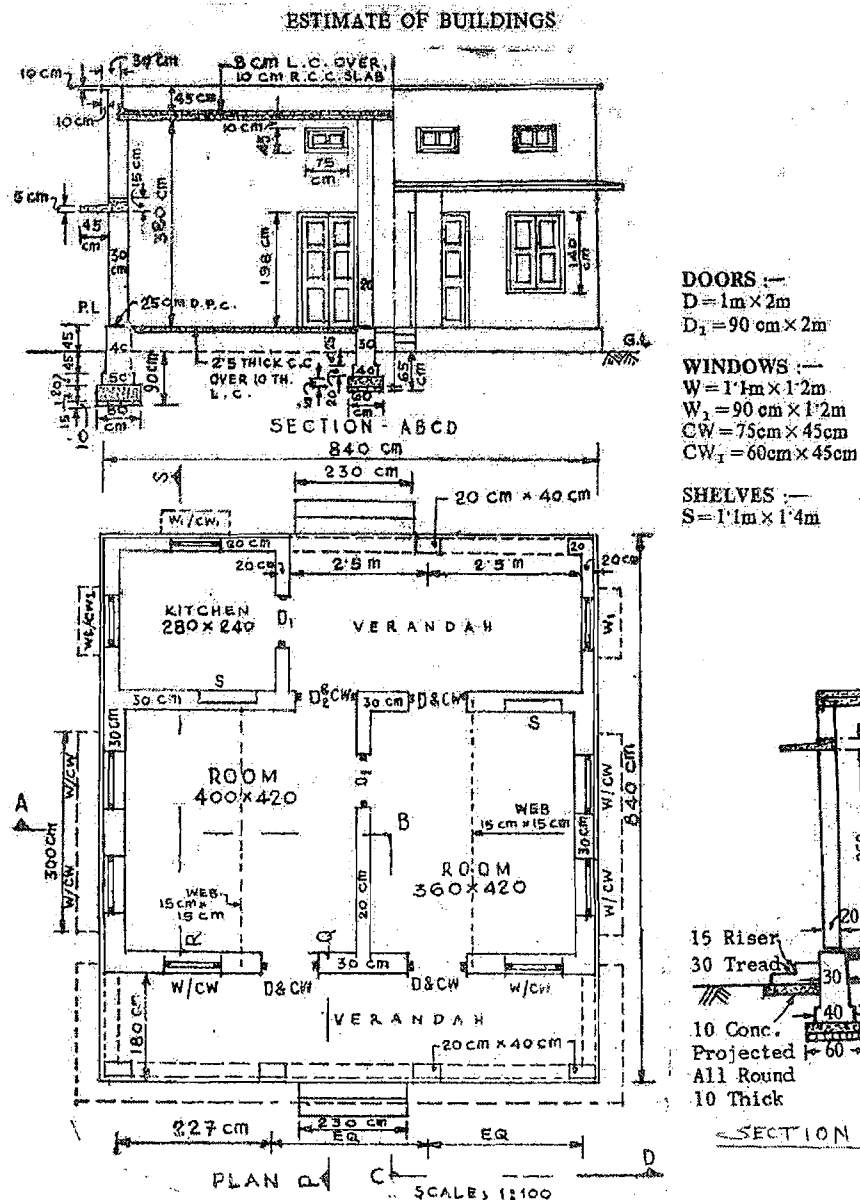
2. Fig. 1 shows plan and section of residential building calculate quantities of the following items and enter them in standard measurement sheet **any two**

- Earth work in excavation.
- First class brickwork in 1:6 in Foundation & plinth
- 2.5 cm thick damp proof course

10

10

10



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UNIT - III

3. Fig.2. work out quantities of steel in R. C. C column.

- | | |
|---|----|
| a) Quantity of steel in footing. | 10 |
| b) Work out quantity of steel for column in | 10 |
| i) Vertical main bars. | |
| ii) Splice bars. | |
| c) Work out quantity of steel in column stirrups. | 10 |

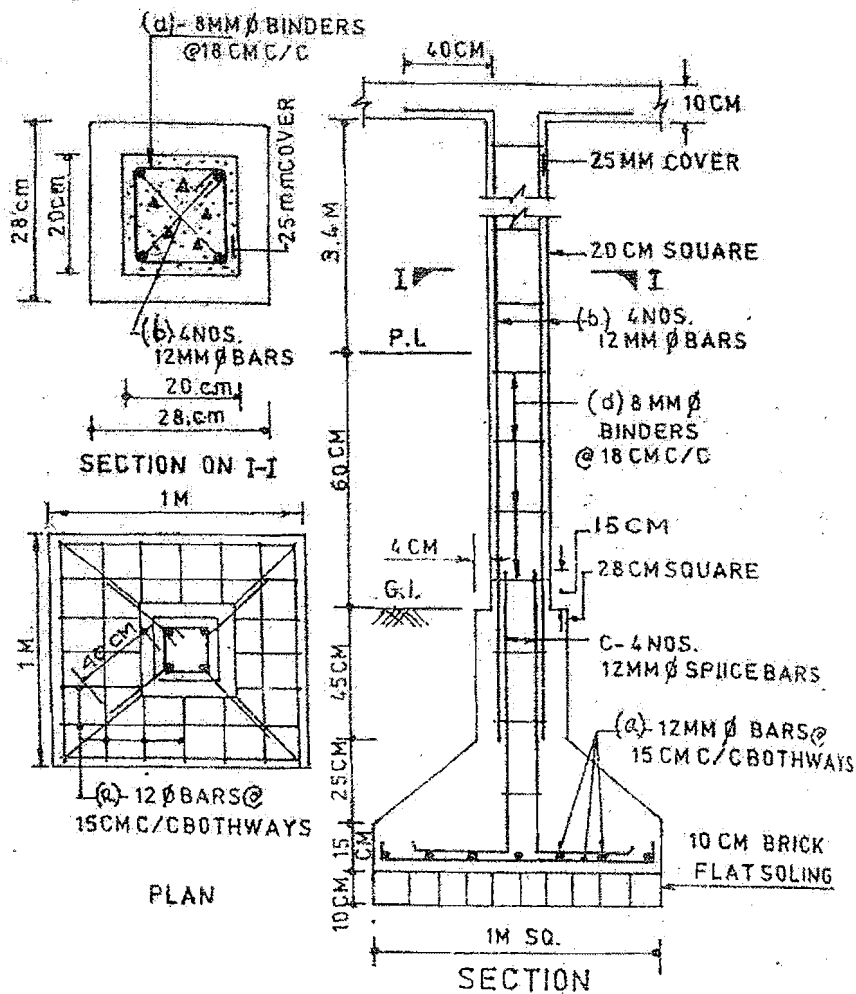


FIG.2

UNIT – IV

4. a) What is specification? Explain different types of specification 10
- b) Prepare analysis of rates for R. C. C column proportion 1:2:4 with steel reinforcement 10
- c) Draft a specification for 1st class burnt brick masonry in cm (1:6) for superstructure brick work. 10

UNIT – V

5. a) State various methods of valuation. Explain any one in detail. 10
- b) Differentiate between 10
- i) Scrap value & salvage value
- ii) Depreciation & obsolescence
- c) Define deprecation? Explain various methods of depreciation. 10

Seat Number

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Environmental Engineering - II (1240)

P. Pages : 4

Time : Three Hours

Max. Marks : 100

Instructions to Candidates :

1. Do not write anything on question paper except Seat No.
2. Answer sheet should be written with black ink only. Graph or diagram should be drawn with the same pen being used for writing paper or black HB pencil.
3. Students should note, no supplement will be provided.
4. Assume suitable data wherever necessary and clearly mention it.
5. Solve **two** questions from each unit.
6. Draw neat sketches, wherever necessary.
7. Use of non-programmable pocket calculator is allowed.

UNIT - I

1. a) Explain the importance of determination of solids in sewage. How do you determine the suspended solids in a given sample of sewage. 5
- b) The per capita contribution per day of the suspended solids and BOD are 90 gm and 73 gm respectively. Find the equivalent populations of : 5
 - i) A combined sewer system serving 5475 persons and having 80 gm per capita daily of BOD.
 - ii) An industrial unit contributing 60,000 litres daily of the industrial waste water containing 1800 mg/litre of the suspended solids.
2. a) Differentiate between BOD, COD and TOD. 5
- b) Deduce an expression for first stage BOD with respect to time. 5
3. a) Describe the various actions involved in self purification process of a stream. 6

- b) If 2.50 ml of raw sewage has been diluted to 250 ml and DO concentrations of the diluted sample at the beginning of the BOD test was 8.0 mg/lit and 5.0 mg/lit after 5 days incubation at 20°C, find BOD of raw sewage. 4

UNIT – II

4. a) What do you understand by dry weather flow? Mention briefly various factors affecting it. 5

- b) A city with a population of 1,00,000 has an area of 100 hectares. Find the ratio of DWF and WWF for the sewer line for the following data –

i) Rate of water supply = 200 LPCD

ii) Average run – off coefficient for the entire area = 0.50

iii) Time of concentration = 50 minutes.

Assume that 75% of water supplied reaches the sewer. Use the following formulae for computing rainfall intensity and discharge with usual notation

$$I = \frac{a}{t+b}$$

For $t = 50$ minutes.

$$a = 1016$$

$$b = 20$$

$$Q = 2.8 C I A \quad Q \text{ (LPS), } I \text{ (mm/hr), } A \text{ (Hect)}$$

5. a) What are the factors to be considered, before making selection for the material for sewers? 5
- b) Why the sewers to be ventilated? Mention the various methods employed for ventilation of sewer and explain any one of them in brief. 5
6. a) What do you understand by the terms "self cleansing velocity" and "limiting velocity" in sewer. Explain in brief. 5
- b) Calculate the diameter and discharge of a circular sewer laid at a slope of 1 in 400, when it is running half full and with a velocity of 1.90 m/s. Use Manning's formula with $n = 0.012$. 5

UNIT – III

7. a) Discuss the broad classification of sewage treatment processes. 4
- b) Design a screen for an average discharge of $0.20 \text{ m}^3/\text{s}$ for following data – 6
 Peak factor = 2.0, permissible vel. of flow = 1 m/s
 Depth = 800mm, size of opening = 40mm, Thickness of bar = 5 mm
8. a) What is grit chamber? Describe with the help of neat sketches a horizontal flow grit chamber. 5
- b) Design a grit chamber for a maximum waste water flow of 10 MLD. The settling velocity of the particle is found 0.02 m/s . The constant flow of 0.30 m/s will be maintained in chamber through the provision of a proportional flow weir. 5
9. a) Under what conditions chemical aided sedimentation is preferred over the plain sedimentation. 4
- b) In a continuous flow settling tank 3.50 m deep and 65 m long, if the flow velocity of sewage is observed as 1.22 cm/s , what size of the particles of specific gravity 2.65 may be effectively removed? Assume the kinematic viscosity of water as $0.01 \text{ cm}^2/\text{s}$. 6

UNIT – IV

10. a) Discuss the classification of biological treatment processes of sewage. 5
- b) Draw the flow diagram of an activated sludge plant with high degree of treatment showing all the processes. 5
11. What do you understand by sewage filtration? Explain in brief. 10
 What are the different types of sewage filters, explain the working of any one of them in brief with the help of neat sketch.
12. a) What is an oxidation pond? How they are classified? 4
- b) A colony of 12,500 people is supplied with water @ 200 LPCD. An oxidation pond is proposed for sewage treatment. The BOD and suspended solids are each of 300 mg/lit . Calculate the dimension of the pond, if the daily flow is for 9 hours and the average velocity of sewage is 0.9 m/s . What will be the diameter of inlet pipe required for the oxidation pond? Assume the following data. 6

Operational depth = 1.20 m
 Organic loading = 300 kg / ha / day
 Length to width ratio = 2 : 1
 Assume sewage flow to be 80% of water supplied.

UNIT – V

13. a) Discuss the solid wastes found in society with respect to their sources. 4
- b) Discuss the generalized flow of materials and the generation of the solid waste in the society with the help of flow diagram. 6
14. A total of 11 apartment complexes and commercial establishments have entered into a contract with a solid waste collection firm to collect their solid wastes. The discarded volume of solid wastes to be collected is 96m^3 per day (collection day). Determine the number of trips required on collection day, the size of collection vehicle, and the size of container to be provided. Assume that compaction ratio = 2.5. Make any additional assumption necessary. Each of the 11 sources contributes the same amount of solid wastes. $a = 0.1$ hour, $p = 0.20$ hour, $s = 0.10$ hour, round trip distance = 60 km, speed limit = 55 mph, $w = 0.15$, $H = 8$ hour, $t_1 = 20$ min and $t_2 = 25$ minute. 10
15. a) Describe any one of the land filling technique for solid waste management. 5
- b) Explain with the help of block diagram the interrelationship of functional elements comprising of solid waste management system. 5

Seat Number

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Water Resources Engineering - I (1220)

P. Pages : 6

Time : Three Hours

Max. Marks : 100

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6. Assume suitable data, wherever necessary.
7. Neat diagrams must be drawn wherever necessary.
8. Use of Non-programmable pocket calculator is allowed.

UNIT - I

1. a) Explain the "hydrologic cycle" with the help of neat sketch indicating its various phases. 5
- b) Raingauge station "X" did not function for a part of a month during which a storm occurred. The storm produced rainfalls of 84, 70 and 96 mm at three surrounding stations A, B and C respectively. The normal annual rainfalls at the stations X, A, B and C are respectively 770, 882, 736 and 944 mm. Estimate the missing storm rainfall at station "X". 5
2. a) What are the different types of recording type rain gauges? Discuss any one of them in brief. 5
- b) The values of annual precipitation at raingauge station in mm per year, in chronological sequence from 2001 to 2012 are indicated below – 5
 475, 377, 731, 1066, 361, 305, 926, 628, 409, 236, 337, 853
 Estimate the value of precipitation which has a recurrence interval of 6 years using the statistical method.

3. a) Explain briefly the "infiltration process". What are the factors which influences the process of infiltration. 5
- b) The rainfall rates for successive 30 minutes intervals upto 4 hours are given below. If the surface run off is 3.6 cm, determine ϕ and W index. 5

Time (minutes)	0	30	60	90	120	150	180	210	240
Rain fall Intensity (cm/hour)	0	1.3	2.8	4.1	3.9	2.8	2.0	1.8	0.9

UNIT – II

4. a) Distinguish between : 5
- i) Maximum probable flood and design flood.
- ii) Return period and exceedance probability.
- b) In to a stream, with no trace of salt initially, a salt solution with a concentration of 20 mg/cc is introduced at a constant rate of 2 Litres per minute. The samples collected at a downstream section sufficiently far away indicated an equilibrium salt concentration of 0.05 ppm. Determine the discharge in the stream from this data. 5
5. Derive the unit hydrograph for a drainage basin of area 104 km^2 from the observed run – off hydrograph given below – 10

Date June 10	Time (hr)	Run - off (m^3/s)
	2.00 -- 16.00	
	4.00 -- 15.00	
	6.00 -- 14.20	
	8.00 -- 158.50	
	10.00 -- 260.00	
	12.00 -- 286.00	
	14.00 -- 221.00	
	16.00 -- 186.50	
	18.00 -- 157.00	
	20.00 -- 133.00	
	22.00 -- 113.00	
	24.00 -- 93.40	

Date June 11	Time (hr)	Run - off (m^3/s)
	2.00 -- 76.40	
	4.00 -- 65.00	
	6.00 -- 55.20	
	8.00 -- 46.70	
	10.00 -- 39.60	
	12.00 -- 34.40	
	14.00 -- 28.30	
	16.00 -- 22.70	
	18.00 -- 21.50	
	20.00 -- 20.60	
	22.00 -- 19.90	
	24.00 -- 19.20	

The ordinates of the rainfall mass curve which produces the above run off are as given below –

Date June 10	Time (hr)	Cummulative Run - off (cm)
	2 --	0.00
	4 --	1.50
	6 --	3.00
	8 --	10.50
	10 --	19.00
	12 --	20.00
	14 --	20.00

6. The ordinates of a 4 hour unit hydrograph of a basin of area 300km² measured at 1.00 hour intervals are; 10

6, 36, 66, 91, 106, 93, 79, 68, 58, 49, 41, 34, 27, 23, 17, 13, 9, 6, 3, 1.5 m³/s.

obtain the ordinates of a 3.00 hour unit hydrograph for the basin using the S – curve technique.

UNIT – III

7. Derive an expression of general equation governing groundwater flow in confined aquifer. Also state all the assumptions made in derivation. 10
8. a) Explain the "water logging", and describe its ill effects. 5
- b) Design an open well in fine sand to give a discharge of 0.003 cumec when worked under a depression head of 2.5 m. Take (K/A) value 0.5m³/hour/m² of area under unit depression head. 5
9. a) Explain the following in brief : 4
- i) Darcy's law.
- ii) Coefficient of storage.
- b) A tube well of 30 cm diameter penetrates fully in an artesian aquifer. The strainer length is 15m. Calculate the yield from the well under a drawdown of 3.0m. The aquifer consist of sand having coefficient of permeability equal to 50 m/day. Assume radius of drawdown equal to 150 m. 6

Sr. No.	Name of Crop	Crop period (Days)	Area to be Irrigated (Hect)	Duty @ head of main canal (Hect / cumec)
1 (a)	Sugar cane	280	315	630
(b)	Overlap of sugarcane in hot weather	100	70	630
2	Jowar (Rabi)	120	4800	1600
3	Bajri (monsoon)	120	5600	2800
4	Vegetables (Hot season)	120	350	700

Find the discharge required at the head of the main canal, taking time factor for the main canal as 0.70

What should be the gross storage capacity of the reservoir

Assume suitable factors wherever needed.

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Water Resources Engineering - I (1220)

P. Pages : 6

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	14.00 --	28.30
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	8 --	10.50
	10 --	19.00
	12 --	20.00
	14 --	20.00

6. The ordinates of a 4 hour unit hydrograph of a basin of area 300km² measured at 1.00 hour intervals are; 10

6, 36, 66, 91, 106, 93, 79, 68, 58, 49, 41, 34, 27, 23, 17, 13, 9, 6, 3, 1.5 m³/s.

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 i) Darcy's law.
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- b) A tube well of 30 cm diameter penetrates fully in an artesian aquifer. The strainer length is 15m. Calculate the yield from the well under a drawdown of 3.0m. The aquifer consist of sand having coefficient of permeability equal to 50 m/day. Assume radius of drawdown equal to 150 m. 6

UNIT – IV

10. a) Describe in brief various types of investigations required for reservoir planning. 5

b) What do you understand by mass in flow curve and how it is prepared, explain in brief. 5

11. A multipurpose project has a total cost of 240 million rupees. For the data given below, calculate the allocations to each project purpose by the following methods. 10

i) Remaining benefits method.

ii) Alternate justifiable expenditure method.

Items	Cost in million rupees.		
	Flood control	Power generation	Irrigation
1) Separable cost	Rs. 32.00	Rs. 88.00	Rs. 72.00
2) Estimated Benefits	Rs. 40.00	Rs. 138.00	Rs. 112.00
3) Alternate single purpose cost	Rs. 47.00	Rs. 104.00	Rs. 101.00

12. The amount of water flowing from a certain catchment area at the proposed dam site from month January to December are as under, (in 10^5 m^3) 10

2.83, 4.25, 5.66, 18.40, 22.64, 22.64, 19.81, 8.49, 7.10, 7.10, 5.66, 5.66

Determine,

i) The minimum capacity of the reservoir, if water is to be used to feed the turbines of hydropower plant at an uniform rate and no water is to be spilled over,

ii) The initial storage required to maintain the uniform demand as above.

UNIT – V

13. a) Describe with the help of a diagram various forms of a soil moisture. What do you understand by the available moisture. 5
- b) A water course commands an irrigated area 1000 hectares. The intensity of irrigation of rice in this area is 70%. The transplantation of rice crop takes 15 days and during transplantation period, total depth of water required by crop on the field is 500 mm. During the transplantation period, the useful rain falling on the field is 120 mm. Find the duty of irrigation water for crop on the field during transplantation at the head of the field and also at the head of the water course, assuming loss of water to be 20% in the water course. Also calculate the discharge required in the water course. 5
14. a) Explain the term duty and delta. Derive a relationship between the two. 5
- b) The following data pertains to the healthy growth of a crop. 5
- i) Field capacity of soil = 30%
 - ii) Permanent wilting percentage = 11%
 - iii) Density of soil = 1300 kg/m^3
 - iv) Effective Depth of root zone = 700 mm
 - v) Daily consumptive use of water for the given crop = 12mm.
- For healthy growth the moisture content must not fall below 25% of the water holding capacity between the field capacity and the permanent wilting point. Determine the watering interval in days.
15. A main canal which off – takes from a storage reservoir has to irrigate crops in a certain area having three seasons in a year. Data for the irrigated crops are given in table below – 10

Sr. No.	Name of Crop	Crop period (Days)	Area to be Irrigated (Hect)	Duty @ head of main canal (Hect / cumec)
1 (a)	Sugar cane	280	315	630
(b)	Overlap of sugarcane in hot weather	100	70	630
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What should be the gross storage capacity of the reservoir

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