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

Irrigation Engineering

P. Pages : 3 **NRT/KS/19/3612**

Time : Three Hours * 0 6 6 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. 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.

1. a) What do you understand by flow irrigation? **6**

b) The base period, intensity of irrigation & duty of water for various crops under the canal system are given. Determine the reservoir capacity if the culturable command area is 4000 hectares. Canal losses are 25% and reservoir losses are 15%. **7**

Crop	Base Period (Days)	Duty at field (hec/cumes)	Intensity of irrigation
Wheat	120	1800	20%
Sugarcane	360	1700	20%
Colton	180	1400	10%
Rice	120	800	15%
Vegetable	120	700	15%

OR

2. a) Distinguish between **any two**. **6**

i) Drip irrigation & Sprinkler irrigation.

ii) Base period & Kor period.

iii) Border strip method & Furrow irrigation.

b) After how many days will you supply water to soil, in order to ensure efficient irrigation of the given crop if; **7**
i) Field capacity of soil = 27%
ii) Permanent Wilting point = 14%
iii) Dry density of soil = 15 kN/m^3.
iv) Effective depth of root zone = 75 cm
v) Daily consumptive use of water for the given crop = 11 mm.

3. a) Explain Brune's method of estimation of useful life of a reservoir. **5**

b) Find the probable life of a reservoir from following data: **8**

i) Initial reservoir capacity = 30 M m^3.
ii) Annual flood in flow = 60 M m^3.
iii) Average annual sediment in flow = 3600000 kN.
iv) Specific weight of sediment = 12 kN/m^3.
v) The useful life of reservoir will terminate when 80% of initial capacity is filled with sediments.
vi)

Capacity inflow Ratio	Trap efficiency (%)
0.1	87
0.2	93
0.3	95
0.4	95.5
0.5	96
0.6	96.5

OR

4. a) Distinguish between gravity dam and Earthen dam. **5**

b) Define man cure. Explain the method to determine storage capacity of a reservoir using man curve. **8**

5. a) Explain the elementary profile of a gravity dam. Derive $B = H/\sqrt{\rho - c}$ **6**

b) From the analysis of gravity dam, the following results were obtained. **7**

i) Summation of resisting moments = 1548000 kNm
ii) Summation of overturning Moments = 1208050 kNm
iii) Summation of vertical forces = 32550 kN
iv) Summation of Horizontal forces = 31340 kN
v) Box width of dam = 55 m
vi) Coefficient of friction of dam material = 0.7
vii) Shear strength of joint = 1.4 N/mm^2.

Calculate Normal stresses at foc & Heel factor of safety against overturning & shear friction factor.

OR

6. a) Define phreatic line. Explain the procedure for drawing phreatic line by Casagrande method. **7**

b) Explain in brief seepage control measures in earthen dam. **6**

7. a) Explain salient features of Blighs Creep theory? **7**

b) Explain with neat sketches **any two**. **6**

i) Still excluder
ii) Divide wall
iii) Undersluices

OR

8. a) Write short notes on Spillway Gates. **6**

b) "Design criteria of ogee Spillway" Explain. **7**

9. a) Derive an expression for Balancing depth of a canal with neat sketch. **6**

b) Design a contact lined canal to carry a discharge of 45 m3/s with side slope of 1.25:1 & mannings N of 0.016. The maximum permissible velocity is 1.8 m/sec and section is triangular. **8**

OR

10. a) Explain Lacey's regime theory. **6**

b) Design a channel section using Lacey's theory for discharge 15 cumecs, mean diameter of silt particles = 3 mm & side slope 1/2:1. Also find the longitudinal slope. **8**

11. a) Distinguish between **7**
i) Syphon & super passage
ii) Level crossing & inlet

b) State under what circumstances you will recommend use of following cross drainage works? **7**
i) Syphon
ii) Inlet along with neat sketch.

OR

12. a) What is water logging? Write the causes, effects & remedial measures of water lagging. **7**

b) Write short notes on **any two**. **7**
i) Land reclamation
ii) Tile drain
iii) Inlet and level crossing

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

Elective-II : Pavement Analysis & Design

P. Pages : 3 **NRT/KS/19/3615**

Time : Three Hours * 0 6 6 9 * Max. Marks : 80

Notes :
1. All questions carry marks as indicated.
2. Solve Question 1 OR Questions No. 2.
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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. 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) With neat sketches, explain the Airport Traffic Areas. **6**

b) Estimate total fatigue in a service life of 15 years in terms of standard axle load of 8000 kg average. Assume growth rate of traffic as 7.5% per annum and delay in opening to traffic as 3 years. Also find the equation of axle load factors:- **7**

Axle load	< 1000	1000-3000	3000-5000	5000-7000	7000-9000	9000-11000	11000-13000	13000-15000	> 15000
ADT	165	210	178	156	193	105	87	62	08
Eq, factor	0.0025	0.03	0.35	0.60	1.00	2.32	4.5	7.6	12.8

OR

2. a) Estimate ESWL for dual in tandem wheel assembly for an aircraft. Data:- **8**
- i) Gear load = 35000 kg.
- ii) Tyre pressure = 10.5 kg/cm^2
- iii) Tandem spacing = 250 mm
- iv) Dual spacing = 180 mm
- v) Flexible crust thickness = 65 cm, 80 cm, 115 cm

b) Draw typical cross - sections of flexible and rigid pavements. **5**

3. a) Explain in detail Marshall's method of Bituminous Mix Design. **4**

b) CBR test was conducted on subgrade soil. The following results were noted in a laboratory. **10**

Penetration (mm)	0	0.5	1.0	1.5	2.0	3.0	4.0	5.0	7.0	7.5	10	12.5
Load (kg)	0	6	18	32	50	60	65	78	82	95	100	110

It is desired to use the following materials for different pavement layers:
- i) Compacted soil subgrade having CBR = 12%
- ii) Poorly graded gravels having CBR = 28%
- iii) Well graded gravels having CBR = 93%

The traffic survey indicates present ADT of commercial vehicle as 1500 with construction period of 3 years. The design life is 10 years with the expected traffic growth rate of 12%. Suggest the suitable crust composition with neat sketch.

OR

4. a) Estimate the group index of subgrade soil from following data and discuss the rating as subgrade. **7**

i) Passing 425 micron = 78% ii) Passing 75 micron = 65%
iii) Liquid limit = 53% iv) Plastic limit = 26%

b) Calculate the cone bearing value from the following data of North cone test. Assume that the angle of cone is 7º45'. **7**

Load (kg)	4.5	9.0	18.0	36.0
Penetration (mm)	2.86	4.09	6.03	8.46

5. a) A plate load test was conducted on subgrade and also on 20 cm thick base with 30 cm dia. plate. Pressure at 5 mm deformation in both the test was recorded as 2.1 kg/cm^2 and 4.5 kg/cm^2 respectively. for a flexible pavement of 30 cm vertical and radial stress, stress at the subgrade under the wheel load of 5800 kg acting at a tyre pressure of 6 kg/cm^2. Assume Poisson's ratio of subgrade as 0.36. **7**

b) Design a flexible pavement for design traffic volume of 3570 CUD, if the permissible deflection is 0.5 cm by triaxial method. Data :- **7**

i) Wheel load = 5200 kg
ii) Tyre pressure = 6.5 kg/cm^2
iii) Annual rainfall = 92 cm
iv) Modulus of elasticity of :-
Subgrade = 80kg/cm^2
Subbase = 415 kg/cm^2
Base = 1950 kg/cm^2
Bituminous surfacing = 4400 kg/cm^2.
v) Traffic coefficient = 8/6
vi) Rainfall coefficient = 0.9

OR

6. a) Explain AASHTO method of flexible pavement design. **7**

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

7. a) From the yield line theory estimate the load factors at all regions of rummy concrete pavement of 300 mm thickness under a ESWL = 17000 kg at 10.5 kg/cm2 tyre pressure. Assume the grade of concrete M : 30 and 'k' for subgrade soil = 6 kg/cm^2/cm. **6**

b) Write short note on LCN method of Airfield pavement design. **7**

OR

8. a) Explain FAA method of rigid pavement design. **6**

b) Design a Dowel bar joint of a rigid pavement from the given data:- **7**

i) Thickness of pavement = 20 cm
ii) Wheel load = 3500 kg.
iii) Expansion gap = 2 cm
iv) Permissible shear stress in steel = 1000 kg/cm^2,
v) Permissible bending stress in steel = 1400 kg/cm^2,
vi) Permissible bearing stress in steel = 100 kg/cm^2,
vii) Radius of relative stiffness = 55 cm,
viii) Load transfer required = 40%

9. a) Design a bituminous overlay for a pavement section 3 km long the Benkelman Beam test is conducted at a rate of one test for 250m length over a two 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 CUD. Assume growth rate of 9.5% per year for service life of 10 years with delay of 1 year. **7**

b) Explain Serviceability Index. **6**

OR

10. Design a pavement in M : 300 concrete for 2 lane highway expected to carry projected traffic of 1870 CUD of ESWL = 5100 kg at 6.8 kg/cm^2 tyre pressure from following data:- **13**

i) K for subgrade = 5.7 kg/cm^2/cm
ii) E for concrete = 3.1x10^4 kg/cm^2
iii) Poisson's ratio of concrete = 0.18
iv) Contraction joint spacing = 5.25 m
v) Temperature gradient = 0.95ºC/cm
vi) Subgrade Restraint coefficient = 1.35
vii) Temperature coefficient: -

Lx : y	4	5	6	7	8	9	10	11	12 & more
Cx, y	0.44	0.72	0.92	1.03	1.07	1.08	1.07	1.05	1.02

11. a) Explain the various methods used for the maintenance and rehabilitation of flexible and Rigid pavements. **8**

b) Discuss the factors affecting pavement design. **5**

OR

12. Check the adequacy of rigid pavement from IRC criteria. **13**

i) Slab thickness = 150 mm.
ii) E of concrete = 3x10^5 kg/cm^2
iii) Poisson's ratio of concrete = 0.15
iv) Thermal expansion coefficient = 10x10^{-6}/ºC
v) M.O.R. of concrete = 48 kg/cm^2.
vi) Anticipated thermal gradient slab 0.5ºC/cm
vii) K of subgrade soil 6.5 kg/cm^2/cm
viii) Cx & Cy 0.82 & 0.45 resp.
ix) Wheel load 3000 kg
x) Tyre pressure 4.5 kg/cm^2.

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

Elective-III : Water & Waste Water Treatment

P. Pages : 2 **NRT/KS/19/3628**

Time : Three Hours * 0 6 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. Diagrams and chemical equations should be given whenever necessary.
11. Illustrate your answers whenever necessary with the help of neat sketches.
12. Use of non programmable calculator is permitted.

1. a) Draw a flowsheet of conventional water treatment plant. **7**

b) What points should be kept in mind while selecting a location of treatment? **6**

OR

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

b) Design the cascade type aerator for the design flow of 20 MLD. **7**

3. a) Write down the factors affecting coagulation & Flocculation. **6**

b) Design a suitable flash mixer for a design flow of 25 MLD. **7**

OR

4. a) State the types of coagulants used in water treatment plant & explain any one. **6**

b) Water zig – zag through the battled channel having 21 around the end baffles. The velocity of water in the channel is 0.2 m/s and the speed upto 0.60 m/s in the slots. The displacement time is 30 minutes and flow of water is 500 m^3/hr. Determine : **7**
i) Loss of head neglecting normal channel friction.
ii) G & Gt values.

5. a) Explain in brief the theory of filtration. **7**

b) The sieve analysis of stock sand being given as follows : **7**

Sieve size (mm)	0.15	0.21	0.30	0.42	0.60	0.84	1.12	1.68	2.83	4.34
Cumulative weight passing (%)	1.15	4.0	10.0	19.0	31.0	49.0	63.0	83.0	89.0	100

What must be done to above stock sand in order to convert it into a filter sand of effective size 0.5 & uniformity coefficient of 1.7?

OR

6. Design a suitable rapid sand filter for a design flow of 25 MLD. **14**

7. a) Write down the characteristics of Waste water. **6**

b) The 5 day BOD of sewage sample is 110 mg/lit at 30ºC. Calculate its 5 day BOD at 20ºC. Assume BOD rate constant at 30ºC is 0.1/d. **7**

OR

8. a) What is 'oxygen sag curve' in stream pollution. Explain with sketch. **6**

b) Find BOD rate constant and ultimate BOD for following data by using 'Least square method' **7**

Time (days)	2	4	6	8	10	12
BOD (mg/lit)	11	18	22	24	26	27

9. a) Draw a flow sheet of conventional waste water treatment plant & explain working of each unit in brief. **7**

b) Design a suitable bar screen for design of 30 MLD. **7**

OR

10. a) Explain working of PST with neat sketch. **7**

b) Design a suitable grit chamber for a sewage treatment plant having capacity 18 MLD. **7**

11. a) Explain the working of sludge drying beds with neat sketch. **6**

b) Explain in brief stabilization ponds. **7**

OR

12. a) What is activated sludge process? State & explain various modification in activated sludge process. **6**

b) Explain working of trickling filter. Draw neat sketch state advantages & disadvantages. **7**

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

Construction Economics & Finance

P. Pages : 3 **NRT/KS/19/3630**

Time : Three Hours * 0 6 6 * Max. Marks : 80

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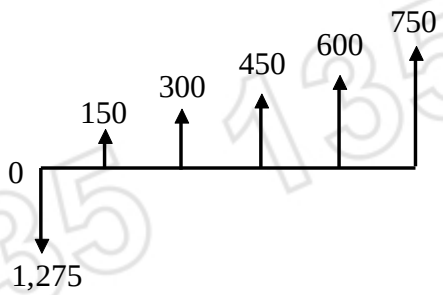
6. Solve Question 9 OR Questions No. 10.
7. Solve Question 11 OR Questions No. 12.
8. Due credit will be given to neatness and adequate dimensions.
9. Assume suitable data whenever necessary.
10. Illustrate your answers whenever necessary with the help of neat sketches.
11. Interest Tables are allowed.

1. a) For the cash flow diagram shown below, compute the rate of return. The amounts are in rupees. **7**



b) Explain the importance of construction and infrastructure in economic development growth. **6**

OR

2. a) Explain the following concepts.
i) Time value of money. **4**
ii) Discounted cash flow. **3**

b) A company is trying to diversify its business in a new product line. The life of the project is 10 years with no salvage value at the end of its life. The initial outlay of the project is ₹20,00,000. The annual net profit is ₹ 3,50,000. Find the rate of return for the new business. **6**

3. a) What do you understand by 'Land'? Assess the importance and significance of land with reference to construction industry? **7**

b) A finance company KTP accepts ₹10,000 at the end of every year for 20 years and pays the investor ₹ 8,00,000 at the end of the 20th year. Another finance company MPT accepts ₹ 10,000/ at the end of every year for 20 years and pays the investor ₹ 15,00,000 at the end of 25th year. Which is the best investment alternative? Use present worth base with i=12 percent. **6**

OR

4. a) Discuss the nature and importance of Turnkey construction projects. **7**

b) A granite company is planning to buy a fully automated granite cutting machine. If it is purchased under down payment, the cost of machine is ₹ 16,00,000. If it is purchased under installment basis, the company has to pay 25% of the cost at the time of purchase and the remaining amount in 10 annual equal instalments of ₹ 2,00,000 each. Suggest the best alternative for the company using present worth basis at i = 18% compounded annually. **6**

5. a) What is inflation? Explain the causes of inflation in details. **7**

b) Explain the following-

i) Oligopoly market. **3**

ii) Recession. **4**

OR

6. a) Explain the following-

i) Stagflation and its impact on construction industry. **4**

ii) Features of monopoly market. **3**

b) Explain in details as to how inflation in brought under control. **7**

7. a) Explain the significance of foreign Direct investment in development of infrastructure in India. **7**

b) Explain the short term and medium term sources of finance for the construction companies. **6**

OR

8. a) What do you understand by the term project cash flow? Explain in details. **7**

b) Discuss in details the long term financial sources available for construction companies in India. **6**

9. a) What do you understand by income statement? Explain it in the context of construction company. **7**

b) The following is the extract of a firm. **6**

	₹
Equity share capital	2,00,000
10% preference share capital	1,00,000
Reserve & Capital	1,00,000
20% Debentures	1,00,000
Loan (long term)	50,000
Current Liabilities	1,50,000

From the above data compute the following ratios.

i) Debt equity ratio

ii) Debt to capital ratio

OR

10. a) Discuss the importance of affordable housing scheme of the Government. **7**

b) Extract of the firm is an follows - **6**

Net Profit before interest and tax	₹ 16,500
Capital employed	₹ 35,000
Sales	₹ 85,000
Gross Profit	₹ 34,000

From the above data, compute the following profitability ratios.

i) Return on investment ii) Net profit ratio

iii) Gross profit ratio

11. a) What is working capital? Explain the factors which influence working capital. **7**

b) Explain the meaning of cost of capital. What are the different considerations taken into account while ascertaining cost of capital. **7**

OR

12. a) Explain the meaning of capital structure. Discuss the factors that influence capital structure. **7**

b) ABC company Ltd. expects its cost of goods sold for 2018-19 to be ₹ 612 lakhs. The expected operating cycle in 90 days. If wants to keep a minimum cash balance of ₹ 1 Lakh. What is the expecting working capital requirement (Assume 360 days in a year). **7**

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