END TERM EXAMINATION

FOURTH SEMESTER [B.TECH] MAY-JUNE 2018

Paper Code: ETCE-202	Subject: Water Engineering (Batch 2013 Onwards)
	Maximum Marks: 75

Time: 3 Hours

Note: Attempt five questions in all including Q no.1 which is compulsory. Select one question from each unit. Assume suitable missing data if any.

Q1 (a) Complete the following statements by inserting appropriate words/figures/sentences- **(10x1.5=15)**

(i) The per capita water demand of an unsewered city with population 0.30 lakh is _____ and for a modern Indian City with population 40 lakh the recommended per capita water demand will be _____ because —.

(ii) Fire demand of a City is dependent on the following _____

(iii) The following are waterborne viral diseases ____. In order to ensure the absence of virus in water supply we must check the following __

(iv) The adsorption capacity of an Adsorbent is found by __ and calculated using _____ equations.

(v) The population of a town in 3 consecutive decades are 40 lakh, 80 lakh, 125 lakh respectively. The saturation population will be _ and population of the town in 4th and 5th consecutive decades will be __ and ____ by geometric increase.

(vi) Presence of Nitrate in drinking water above ___ causes ___, whereas ___ could be caused due to the presence of sulphate in Concentration above__.

(vii) The difference between Type I, Type II and Type III sedimentation is the following __

(viii) Coagulant like FeSO₄ and FeCL₃ work well in following situation__. Activated silica and polyelectrolyte serve following purposes _. The mechanism of polyelectrolyte action is _.

(ix) MPN is a measure of density/concentration of ___.

(x) The factor affecting disinfection efficiency of chlorine are the following__.

(b) Comment critically (answer **any five**)- **(5x2=10)**

(i) pH is a very important parameter for coagulation and disinfection of water.

(ii) The mechanism of filtration remains same in slow sand and rapid gravity filter despite widely different sand media size.

(iii) Coagulation and flocculation are same.

(iv) It can be a good idea to use a rectangular shaped long tank (L/B=5) for plain sedimentation of raw water.

(v) Disposal of Heavy metals and pesticides even in small concentrations can have adverse effects on the water bodies.

(vi) Intermittent system of water supply results in reduced water consumption and better public health.

UNIT-I

Q2 (a) Write short note on **(6)**
(i) Well development
(ii) Infiltration well, Infiltration gallery and Ranney wells.

(b) An artesian well is being pumped @96 m³/hr. Measurement made as follows:**(6.5)**
(i) Draw down in a test well 150m away = 0.75 m
(ii) Draw down in a test well 300 m away = 0.6 m
(iii) Thickness of Aquifer = 6 m
Determine the Transmissibilitiy of the well.

OR

Q3 (a) What are the standards for discharge of treated wastewater in natural water bodies? **(3)**

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P₁/₂

(b) Explain the difference between different types of Surface water intakes and their specific suitability. **(3.5)**

(c) Mention the common impurities in water, which should be taken into account while deciding the potability of water. State the harmful effects if these impurities exceed the prescribed limits. **(6)**

UNIT-II

Q4 (a) Name and briefly describe the major physical and chemical processes involved in helping or obstructing the natural purification process in water courses. **(4)**

(b) A city discharges 1500 lps of waste water into a stream with minimum discharge 6000 lps. BOD_5 of waste water is 200 mg/l.& BOD_5 of stream water = 1.0 mg/l. DO of waste water=00. Assume the stream to be 90% saturated with oxygen. Take K_1=0.10 d^{-1}, K_2=0.3 and DO saturation of stream water=9.2 mg/l. If, minimum DO to be maintained in all the stretches of stream is 4.5 mg/l., Find the required degree of treatment of BOD_5. **(8.5)**

OR

Q5 (a) Discuss thermal stratification and its importance in temperature of stream and lakes. **(5)**

(b) What do you understand by Oxygen-Sag Curve? Derive Streeter-Phelps Equation. **(7.5)**

UNIT-III

Q6 (a) Find the aeration time required to treat water with iron conc.=2.4 mg/l to level 0.3 mg/l. **(7.5)**

Given: saturation Conc. of O_2 at 28°C=7.92 mg/l.
Gas transfer coeff (base 10)=70 cm/hr.
Diameter of spray aerator nozzle=25 mm.

(b) What is an ideal sedimentation tank? Derive an expression for overflow rate for discrete particle settling in a rectangular tank. **(5)**

OR

Q7 (a) Explain the mechanism of coagulation. List various coagulants giving special emphasis on the chemistry of water treatment using alum. **(7.5)**

(b) Write short notes on:- **(5)**
   (i) Water softening methods
   (ii) Rapid mixing and Flocculator design

UNIT-IV

Q8 Write notes on:- **(4+4.5+4=12.5)**
   (a) Balancing storage
   (b) Hydraulic analysis of pipe network
   (c) Layout of distribution system

OR

Q9 Write short notes:- **(3+3+3.5+3=12.5)**
   (a) Appurtenances in Water supply
   (b) Components of distribution system
   (c) Calculating the capacity of distribution reservoir from Hourly Supply, demand data.
   (d) Optimal design of rising main

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END TERM EXAMINATION

FOURTH SEMESTER [B.TECH] MAY-JUNE 2018

Paper Code: ETCE-204	Subject: Structural Analysis

[Batch 2013-Onward]

Time : 3 Hours	Maximum Marks :75

Note: Attempt all question as directed. Internal choice is indicated. Assume missing data suitably.

Q1 Attempt **any five** parts:

   (a) What is equivalent length of a column? What is the relation between equivalent length and actual length of a column. **(5)**

   (b) State the assumptions used in Euler's column theory. **(5)**

   (c) What is the use of influence line diagram (ILD)? State Muller Breslau's principle. **(5)**

   (d) Name the type of rolling loads for which the absolute maximum bending moment occurs at the mid span of a beam? **(5)**

   (e) Define carry over moment and distribution factor. What are the quantities in terms of which the unknown moments are expressed in slope deflection methods? **(5)**

   (f) How do you account for sway, in slope deflection method, for portal frames? What are the situations wherein sway will occur in portal frames? **(5)**

   (g) A simply supported beam carries two equal concentrated loads W at distances L/3 from either support. Find the maximum bending moment M. **(5)**

Q2 A hollow circular column of internal diameter 20 mm and external diameter 40 mm has a total length of 5m. One end of the column is fixed and the other end is hinged. Find out the crippling stress of the column if $E = 2 \times 10^5 N/mm^2$. Also find out the shortest length of this column for which Euler's formula is valid taking the yield stress equal to 250 N/mm². **(12.5)**

OR

Q3 A long closed cylinder has an internal radius a = 100 mm and an external radius b = 250 mm. It is subjected to an internal pressure of 80 MPa. Determine the maximum radial, circumferential and axial stresses in the cylinder. **(12.5)**

Q4 A simply supported beam has a span of 16 m is subjected to a UDL (dead load) of 5 kN/m and a UDL (live load) of 8 kN/m (longer than the span) traveling from left to right. Draw the ILD for shear force and bending moment at a section, 4 m from the left end. Use these diagrams to determine the maximum shear force and bending moment at this section. **(12.5)**

OR

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Q5 A live load of 15 kN/m, and 5m long moves on a girder simply supported on a span of 13 m. Find the maximum bending moment that can occur at a section 6 m from the left end. **(12.5)**

Q6 A single bay single storey portal frame ABCD is fixed at A and D. AB and DC are the columns and BC is the beam. The height of the column AB is 6 m and that of DC is 7 m. Span of the beam BC is 10 m. A uniformly distributed load of 60 kN/ m is acting on the span BC. All members have the same flexural rigidity. Calculate the support reactions and draw the bending moment diagram for the portal frame. Use slope deflection method. **(12.5)**

OR

Q7 Show the analyses of the building frame for vertical loads using approximate methods. **(12.5)**

Q8 Determine the end moments of member of frame as shown in figure-1 below by moment distribution method. EI is constant for all members. **(12.5)**
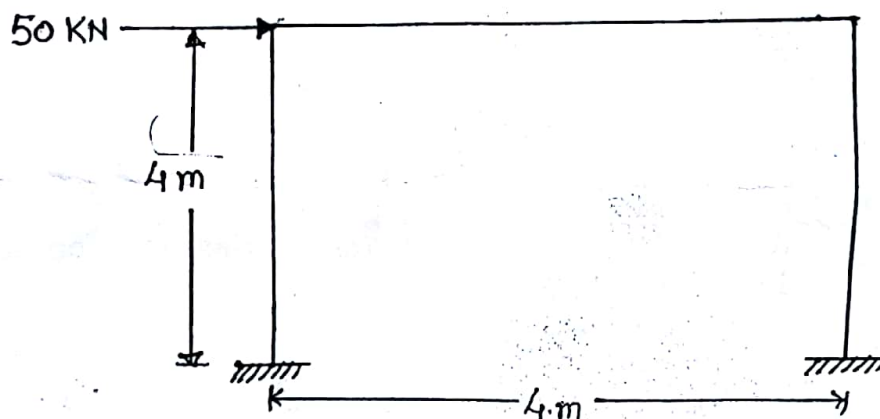
Figure 1

OR

Q9 Analyse the continuous beam as shown in figure-2 below, using moment distribution Method. Draw shear force and bending moment diagram for the continuous beam. **(12.5)**
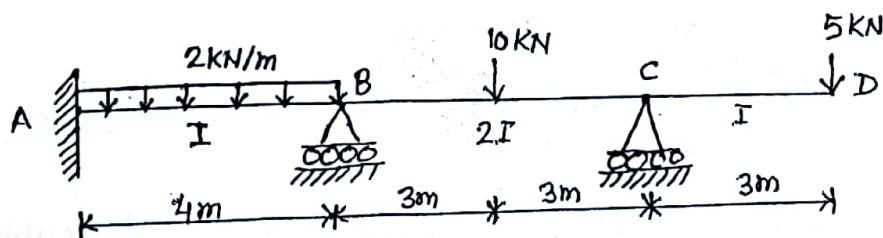
Figure-2

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END TERM EXAMINATION

FOURTH SEMESTER [B.TECH.] MAY-JUNE-2018

Paper Code: ETCE-206	Subject: *Hydraulics & Hydraulic Machines*
Time: 3 Hours	*Maximum Marks: 75*

Note: Attempt five questions in all including Q.No 1 which is compulsory. Select one question from each unit. Make necessary assumptions and clearly state them.

Q1 (a) Give conditions and draw a diagram for the Boundary layer separation.**(5x5=25)**
(b) Write a short note on Magnus Effect.
(c) Explain the concept of Equivalent pipe.
(d) Draw a neat and labeled diagram for the Hydro-electric plant.
(e) Differentiate between Centrifugal pump and reciprocating pump.

UNIT-I

Q2 (a) An oil having viscosity of 7 poise and specific gravity 0.85 flows through a horizontal 50 mm diameter pipe with a pressure drop of 18 KN/m² per meter of pipe length. Determine (i) Flow rate of oil and the center line velocity. (ii) total friction drag over 100 meter length of pipe and the power required to maintain the flow (iii) Velocity and shear stress at 8 mm from the wall. **(6.5)**
(b) Derive an expression for Kinetic Energy Correction Factor for Laminar flow in a circular pipe. **(6)**

Q3 (a) Explain the velocity distribution in the boundary layer and express the same for a flat plate.
Use momentum integral equation to develop an expression for boundary layer thickness, wall shear stress and skin friction coefficient, dag force on one side of the plate and the drag coefficient in terms of Reynolds number. **(6.5)**
(b) Describe the various methods for control of separation of boundary layer. **(6)**

UNIT-II

Q4 (a) A pipe line 60 cm diameter and 5 kg long, connects two reservoirs whose constant difference of level is 15 m. A branch pipe taken from a point distant 2 km from the reservoir. A leads to a third reservoir C. A regulating valve on this branch helps to control the quantity of water entering the reservoir C. Determine the rate of flow of water to reservoir B when (i) no water is discharged to reservoir C, (ii) The quantity of water discharged to reservoir C is 125 litres per sec. Consider only frictional losses. Take coefficient of friction 0.001. **(7.5)**
(b) For the given pipes in series as shown in figure A, draw hydraulic gradient line and total energy line. Take a coefficient of friction as 0.01. Consider all the minor losses. **(5)**
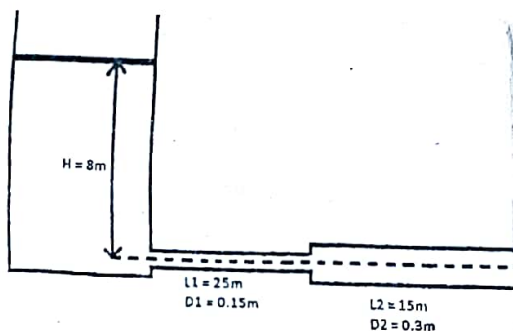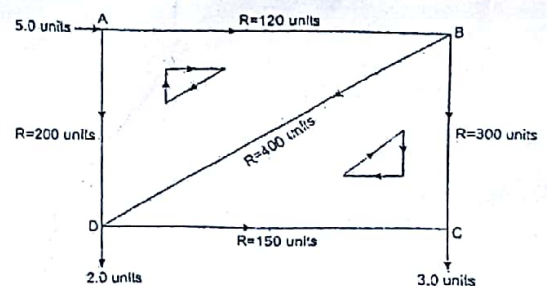
H = 8m
L1 = 25m
D1 = 0.15m
L2 = 15m
D2 = 0.3m

Figure A

5.0 units A R=120 units B
R=200 units
R=400 units
R=300 units
D R=150 units C
2.0 units 3.0 units

Figure B

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P-1/2

Q5 (a) A pipe network with two loops is shown Figure B. Determine the flow in each pipe. **(7.5)**

(b) Explain how the drag coefficient changes with (i) Surface roughness (ii) Turbulence level. Also explain why golf balls are designed to have dented surface. **(5)**

UNIT-III

Q6 (a) A pelton wheel of 1.2 m mean bucket diameter works under a head of 650 m. The jet deflection is 165°C and its relative velocity is reduced over the bucket by 15% due to friction. If the water used to leave the bucket without any whirl, find (i) the rotational speed of the wheel, (ii) ratio of bucket speed to jet velocity, (iii) impulsive force and the power developed by the wheel, (iv) Available water power and the power input to the buckets, (v) efficiency of the wheel. Take $C_v=0.97$. **(7.5)**

(b) Explain the governing mechanism for Francis Turbine with diagram **(5)**

Q7 In an inward flow reaction turbine having vertical shaft, water enters the runner from the guide vanes at an angle of 155 °C with the runner blade angle at entry being 100°. Both these angles are measured from the tangent at runner periphery drawn in the direction of runner rotation. The flow velocity through the runner is constant; water enters the draft tube from the runner without whirl and the discharge from the draft tube into the tail race takes place with a velocity of 2.5 m/sec. The runner has the dimensions of 40 cm external diameter and 3.8 cm inlet width. The turbine works with a net head of 35 m and the loss of head in the turbine due to fluid resistance is 4 m of the water. Draw the vector diagrams and calculate: (i) speed of the runner, (ii) runner blade angle at point on the outlet edge where the radius of rotation is 9cm, (iii) power generated by the turbine and its specific speed, (iv) inlet diameter of the draft tube. **(12.5)**

UNIT-IV

Q8 (a) Explain the different efficiencies of centrifugal pump. **(4.5)**

(b) A centrifugal pump having an overall efficiency of 72%, delivers 0.03 m³/sec of water to a height of 20 m through a 10 cm diameter pipe 80 m long. Taking friction coefficient 0.01, calculate the power required to run the pump. **(8)**

Q9 (a) What do you understand by Cavitation? What is Thomas cavitation factor, what is its significance for turbines? **(5)**

(b) A single acting reciprocating pump has a stroke length of 15 cm, the suction pipe is 7 m long and the ratio of suction pipe diameter to the plunger diameter is ¾. The water level in the sump is 2.5 m below the axis pump cylinder and the pipe connecting the pump and the pump cylinder is 7.5 cm diameter. If the crank is running at 75rpm determine the pressure head on the piston at beginning and at the end of suction stroke. Take friction coefficient 0.01. **(7.5)**

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P₂/2

(Please write your Exam Roll No.)   Exam Roll No. 40813003416

END TERM EXAMINATION

FOURTH SEMESTER [B.TECH] MAY-JUNE 2018

Paper Code: ETCE-208   Subject: Advanced Surveying

(Batch 2013 Onwards)

Maximum Marks: 75

Time: 3 Hours

Note: Attempt all questions as directed. Internal choice is indicated. Assume any missing data suitably, if not given.

(5x5=25)

Q1 Attempt **any five** parts:-
(a) Write the steps involved in measurement of horizontal angle by repetition method?
(b) Obtain an expression for the difference in level between two points by reciprocal vertical angle readings from two stations.
(c) Explain the procedure to set out circular curve using Rankine's method of deflection angle using necessary sketch.
(d) Briefly explain the different sequences of route surveying.
(e) What is equation of time? Show how it vanishes four times in a year?
(f) Define the following:-
   (i) Air base
   (ii) Tilt displacement
   (iii) Isocentre
(g) Derive the parallax equation for determining height from a pair of vertical photographs.

Q2 A theodolite was set up at a distance of 200m from a tower. The angle of elevation to the top of the parapet was 8°20 while the angel of depression to the foot of the wall was 2°26'. The staff reading on the B .M having R.L. of 248.345 with the telescope horizontal of 1.248m. Find the height of the tower and R.L of the top of the parapet   **(12.5)**

OR

Adjust the angles A and B, observations of which give
   A=20°10'10"   weight 6
   B=30°20'30"   weight 4
   A+B=50°30'50"   weight 2

Q3 Explain the setting out of sewers and pipelines with suitable figures?   **(12.5)**

OR

How is the computation of earthwork is computed for a civil work? Explain briefly.

Q4 What are parallax and refraction and how do they affect the measurement of vertical angles in astronomical works? Give rough values of corrections necessary when measuring a vertical angle of 45°.   **(12.5)**

OR

Find L.S.T at a station in longitude 76°20'E at 9.30 AM (Indian Zone Time) on August 10.0. On that date at G.M.N. the R.A of mean sun is 9h13m30.09s.

Q5 How do you determine the scale of an aerial photograph? What do you understand by the term datum scale and average scale, explain briefly?   **(12.5)**

OR

A line PQ 2100m long, lying at an elevation of 400m measures 10.09cm on vertical photograph. If the focal length of the lens is 24cm determine the scale of the photograph in the area. The average elevation of which is 600m.

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END TERM EXAMINATION

FOURTH SEMESTER [B.TECH] MAY-JUNE 2018

Paper Code: ETCE-210	Subject: Soil Mechanics
	(Batch 2013 Onwards)
Time: 3 Hours	Maximum Marks: 75

Note: Attempt any five questions including Q no.1 which is compulsory.

Q1   (a) Fill in the blanks-   (10x1=10)
   (i) Relative density is defined as ......
   (ii) The liquid limit and plastic limit of soil are 65% and 35% respectively. The soil is classified as ....
   (iii) The dry density of a saturated soil with water content 16% and specific gravity 2.66 will be .....
   (iv) With the increase in liquid limit of the soil, compressibility will of the soil ....
   (v) In the dam body the exit gradient of a soil is 0.67. The specific gravity and void ratio of the soil are 2.67 and 0.67 respectively. The condition of the dam in downstream side will be ...
   (vi) The water content of the soil at the site is determined by ....
   (vii) The applications of flow net in soil mechanics are ...
   (viii) In zoned dam the core section is compacted on .... side of OMC.
   (ix) In UU test on saturated clay, the angle of shearing resistance will be ....
   (x) The methods adopted for finding the coefficient of consolidation are ...

   (b) (i) Define quick sand and quick clay   **(3)**
       (ii) Explain how the shrinkage limit is obtained   **(3)**
       (iii) Explain assumptions of Terzaghi's theory of one dimension consolidation.   **(3)**
       (iv) How the permeability of silty clay is obtained.   **(3)**
       (v) What are the limitation of Boussinesq's theory.   **(3)**

Q2   (a) Derive relation between dry density, air porosity, specific gravity and water content of the soil.   **(6.5)**
      (b) Explain clay minerals with neat sketches.   **(6)**

Q3   (a) A 60 gm of oven dried soil passing through 75 micron sieve was used for hydrometer test. In one litre soil suspension the corrected hydrometer reading after 3 min was 25. The effective depth corresponding to this reading is 12.2 cm. If the viscosity of water is 0.012 Poise, determine the coordinates of the point on gradation curve. Assume specific gravity of the soil is 2.68.   **(6.5)**
      (b) Explain plasticity chart for classification of fine grained soils.   **(6)**

Q4   (a) Explain the electrical analogy method for the construction of flow net.   **(6)**
      (b) What is soil suction? What are its ill effects?   **(6.5)**

Q5   (a) A standard Proctor's compaction test was conducted on a soil sample, and the following observations were made: **(6.5)**

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P 1/2

Water Content (%)	8.12	11.71	14.83	17.60	20.21	21.71
Mass of wet Soil (kg)	1.68	1.91	2.05	1.98	1.94	1.89

The diameter and height of the mould used were 10 cm and 12.5 cm respectively. Plot the compaction curve and find maximum dry density and optimum moisture content. Determine void ratio, degree of saturation and zero air void line. Also draw zero air void line

(b) A layer soil saturated clay 6m thick is overlain by sand 4m deep. The water table is 3m below the top surface. What will be increase in effective stress at 1om, if the soil get saturated by capillary action upto a height of 1m above water table. The saturated unit weight of sand and clay are 19.0 kN/m³ and 17.5 kN/m³ respectively. The unit weight of sand above water table is 17.0 kN/3.m **(6)**

Q6 (a) Discuss vane shear test. **(6)**
.(b) Discuss the factors affecting shear strength of coarse grained soil. **(6.5)**

Q7 (a) Direct shear test was performed on a sample of dry sand. Under a normal stress of 1.5 Kg/cm², failure occurred when the shear stress reached 0.7 Kg/cm². Draw the Mohr's circle and Mohr's envelope also determine the orientation of principal planes and the magnitude of principal stresses. **(6.5)**

(b) Two clay specimens A and B of thickness 2.5cm and 3.5cm, has equilibrium void ratios 0.63 and 0.73 respectively under a pressure of 200kN/m². If the equilibrium void ratios of the soils reduced to 0.46 and 0.61 respectively when the pressure was increased to 400kN/m². Find the ratio of hydraulic conductivities of the two specimens. The time required by the spectrum A to reach 50% degree of consolidation is one fourth of that of specimen B for the same degree of consolidation. **(6)**

Q8 Write short notes on following:-
(a) Pore pressure parameters **(3.5)**
(b) Pre consolidation pressure **(3)**
(c) Effective stress principle **(3)**
(d) Proctor's needle **(3)**

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FINE
GRADE

ETCE-210
P-2/2

END TERM EXAMINATION

FOURTH SEMESTER [B.TECH] MAY-JUNE 2018

Paper Code: ETCE-212	Subject: Design of Concrete Structures
	(Batch 2013 Onwards)

Time: 3 Hours   Maximum Marks: 75

Note: Attempt any five questions including Q no.1 which is compulsory. Use of IS:456:2000 is permitted. Make necessary assumptions, if required, and clearly state them.

Q1 Attempt **any five** from below:-   **(5x5=25)**
  (a) State the assumptions made in limit state of flexure.
  (b) What are the factors of Governing Concrete Mix Design?
  (c) What do you understand by characteristics strength of concrete?
  (d) What is the creep and shrinkage of concrete? How does water-cement ratio effects creep and shrinkage of concrete.
  (e) Differentiate between Nominal concrete mix and Design concrete mix with suitable examples.
  (f) Write a short note on "Problems associated with transportation, pumping and placing of concrete".

Q2 (a) Determine the percentage of tension reinforcement for a balanced design in a singly reinforced rectangular beam. **(4.5)**
  (b) Determine the anchorage length of bars for a 300 mm X 500 mm beam, reinforced with 3-25 mm dia. bars as tension reinforcement and 2-12 mm dia. bars as compression reinforcement being simply supported at 300 mm thick brick masonry. The beam is subjected to an Ultimate Shear of 320 KN at the centre of support. Consider M20 grade of concrete and Fe415 grade of steel. **(8)**

Q3 (a) Explain behavior of beams without shear reinforcement. **(4.5)**
  (b) Design a rectangular beam section of 300 mm X 500 mm, subjected to Ultimate Moment of 180 KN-m. Use suitable grades of steel and concrete. **(8)**

Q4 (a) Write a short note on behavior of column under uniaxial and biaxial bending. **(2.5)**
  (b) Design a circular column of 500 mm in dia. with spiral reinforcement for below mentioned data: **(10)**
   (i) Ultimate axial load : 3500 KN.
   (ii) Unsupported length of column between fixed ends : 3.4m
   (iii) Concrete Grade : M 20
   (iv) Steel Grade : Fe 415

Q5 (a) Differentiate between one way and two way slabs. Also draw load distribution patterns/diagram for both. **(3.5)**
  (b) A rectangular beam of section 300 X 500 mm is reinforced with 5 bars of 20mm dia. at bottom. The beam has a clear span of 5.5m and supported on 230mm wide brick masonry at both ends. Design shear and end anchorage for the beam if it is subjected to a uniformly distributed load of 12 KN/m. Consider M25 concrete and Fe 415 Grade of steel. **(9)**

P.T.O.

ETCE-212

P1/2

Q6 Design slab for 2.8m X 6m room with 300mm thickness of walls. The slab will be finished with 800 mm thick cement concrete floor topping. Take live load of 4 kN/m², Concrete Grade M25 and Steel Grade Fe 415. Check the slab in deflection and shear. **(12.5)**

Q7 Design an isolated footing for a column section 300 X 500mm in size and subjected to an axial load of 1600 KN. Consider following in design: **(12.5)**
(i) Unit weight of soil : 20 kN/m³
(ii) Angle of repose : 30 degree
(iii) Allowable bearing capacity of soil : 170 KN/m²
(iv) Concrete Grade : M 25
(v) Steel Grade : Fe 500

Q8 Analyze T-beam section of 300 mm width of web, 1500 mm width of flange, 100mm thickness of flange and 600 m effective depth to determine the ultimate moment of resistance for 4-25 mm dia. of steel in tension and 2-14 mm dia. of steel in compression. Take Concrete Grade M 20 and Steel Grade Fe 415. **(12.5)**

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P2/2

END TERM EXAMINATION

SIXTH SEMESTER [B.TECH] MAY-JUNE 2018

Paper Code: ETIT-302	Subject: Decision Science
Time: 3 Hours	Maximum Marks: 75

Note: Attempt five questions in all including Q no.1 which is compulsory. Select one question from each unit.

Q1 Attempt **any five** parts from the following:- (5x5=25)

(a) Given $P(A)=.6$, $P(B)=.1$, $P(C)=.2$, $P(A \cap C)=.1$ and $P(B \cup C)=.3$, solve the following-

(i) $P(A \cap B)$

(ii) $P(B \cup B)$

(iii) If A and B are mutually exclusive, $P(A \cap B)$

(b) Calculate the mean, median and mode of following series.

Class Interval	0-9	10-19	20-29	30-39	40-49	50-59	60-69	70-79
No. of Students	27	14	55	32	15	4	17	6

(c) Does the following linear program involved infeasibility, unboundedness, and/or alternative optimal solutions? Explain-

Max $4A + 8B$

s.t. $2A + 2B <= 10$

$-1A + 1B >= 8$

$A, B >= 0$

(d) Explain PERT. How it is different from CPM?

(e) Solve the fame given below in Table after reducing it to 2x2 game.

Player B

$$\begin{array}{c} & 1 \quad 2 \quad 3 \\ \text{Player A} \begin{array}{c} 1 \\ 2 \\ 3 \end{array} \begin{pmatrix} 1 & 7 & 2 \\ 6 & 2 & 7 \\ 5 & 1 & 6 \end{pmatrix} \end{array}$$

(f) Two dice are rolled. Find the probability of sum being 7.

(g) Explain zero sum game with example.

UNIT-I

Q2 (a) Explain Bayes Theorem. (5)

(b) Solve using the Simplex method the following problem: (7.5)

Maximize $Z = f(x, y) = 3x + 2y$

subject to : $2x + y \le 18$

$2x + 3y \le 42$

$3x + y \le 24$

$x \ge 0, y \ge 0$

Q3 (a) A committee of 5 people is to be formed randomly from a group of 10 women and 6 men. Find the probability that the committee has (7.5)

(i) 3 women and 2 men,

(ii) 4 women and 1 men

(iii) 5 women

(iv) at least 3 women

(b) Explain the types of descriptive statistics. (5)

P.T.O.

ETIT-302
P_1

UNIT-II

Q4 Construct the decision tree for following table. Suppose the probabilities of the states of nature occurring are s1- 0.15, s2- 0.25, s3- 0.30, s4- 0.20. Use these probabilities and expected monetary values to reach a conclusion about the decision alternatives. **(12.5)**

Alternative/States	S1	S2	S3	S4	S5
D1	50	20	15	5	1
D2	75	50	20	-5	-20
D3	15	12	10	8	6

Q5 What is multicriterai decision making? **(12.5)**

UNIT-III

Q6 A two-server queueing system is in a steady-state condition and the steady state probabilities are $p0=1/16$, $p1=4/16$, $p2=6/16$, $p3=4/16$, $p4=1/16$, $pn=0$ if $n>4$. Calculate **(12.5)**
(i) L (the expected number of customers in the system) and Lq (the expected number of customers in the queue)
(ii) The expected number of customers being served.

Q7 Explain pure and mixed strategy in two person zero sum games. Elaborate the role of concept of dominance with example. **(12.5)**

UNIT-IV

Q8 A factory has three warehouse W1, W2 and W3 which supply to four stores S1, S2, S3 and S4. Monthly capacities of the warehouses are W1=100 units, W2=40 units and W3=60 units. Monthly demand at stores are S1=30 units, S2=50 units, S3=65 units and S4=55 units. The shipping cost in terms of rupees from warehouses to stores is as given below: **(12.5)**

Warehouse/stores	S1	S2	S3	S4
W1	14	16	12	20
W2	12	14	10	8
W3	10	16	8	15

The problem here is to determine the optimum distribution for the factory to minimize shipping costs.

(12.5)

Q9 Explain different network models.

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ETIT-302

P2/2

END TERM EXAMINATION

SIXTH SEMESTER [B.TECH] MAY-JUNE 2018

Paper Code: ETCE-304   Subject: *Applications of Remote Sensing and GIS*
(Batch 2013 onwards)

Time: 3 Hours   Maximum Marks: 75

Note: Attempt all questions as directed. Internal choice is indicated.

Q1 (a) Write down different frequencies of EM spectrum in tabular form. **(5)**
    (b) Explain the applications of GIS in geotechnical engineering. **(5)**
    (c) What are the merits and demerits of GPS? **(5)**
    (d) Differentiate the active and passive sensing. **(5)**
    (e) What are the true and false colour composites? **(5)**

UNIT-I

Q2 Discuss spectral reflectance curves for rocks, soils, vegetation and water.
    (12.5)

OR

Q3 What are the laws of radiations? Explain image characteristics.

UNIT-II

Q4 Discuss the salient features of some of operating remote sensing satellites. **(12.5)**

OR

Q5 What are the difference between restoration and enhancement of remote sensing images? Explain any two image enhancing operations.

UNIT-III

Q6 Explain the principle of cartography and cartographic design. **(12.5)**

OR

Q7 Discuss the merits and demerits of raster data format and vector data format. Illuminate different types of GIS data.

UNIT-IV

Q8 What is geo-spatial technology? Explain how the assessment of cyclones and rainfall are made. **(12.5)**

OR

Q9 Explain the applications of geo-spatial technology in-
    (a) Inventory and monitoring
    (b) Coastal zone management

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P

END TERM EXAMINATION

SIXTH SEMESTER [B.TECH] MAY-JUNE 2018

Paper Code: ETCE-306 **Subject: Quantity Surveying and Cost Estimation**
(Batch 2013 Onwards)

Maximum Marks: 75

Time: 3 Hours

Note: Attempt all questions as directed. Internal choice is indicated.
Assume any missing data suitably, if not given.

Q1 Attempt **any five parts** from the following:- **(5x5=25)**
(a) Discuss the importance of quantity survey and valuation techniques in civil construction projects.
(b) Describe various factors that influence the accuracy of estimates of building construction project.
(c) What are the main components of culverts?
(d) Explain the detailed specifications for any five items of work?
(e) Explain the various methods for calculating depreciation.
(f) What are the important factors influencing the value of building?

Q2 Estimate the quantities of brickwork and plastering required in a wall 4m long, 3m high and 30 cm thick. Calculate also the cost if the rate of brickwork is Rs. 32.00 per cu.m and of plastering is Rs. 8.50 per sq.m. **(12.5)**

OR

Q3 Write detailed specification for:
(a) U:C:R masonry in C.M.(1:6)
(b) (1:4:8)P:C:C work for foundation

Q4 Give the detailed specification for **(12.5)**
(a) Laterite wall 25cm thick in cement mortar 1:3 for load bearing wall
(b) RCC roof slab for residence

OR

Q5 Write detailed specification for
(a) 3-coat O.B.D. (oil bound distemper) work on to new plastered surface foundation trench excavation work.

Q6 Write sample specifications for a 'white wash work' or a 'painting work' of an office building. **(12.5)**

OR

Q7 Write sample specifications about Laying and Consolidation of stone metal and Kankar material.

Q8 What do you mean by valuation? What is its necessity? List various methods of valuation and describe any three of them giving examples.**(12.5)**

OR

Q9 A building is situated on ambala –Kalka road Rs. 38000/- considered its scrap value as 10% of the cost and life as 80 years. Find out depreciated value if the life of the building is 20 year.

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END TERM EXAMINATION

SIXTH SEMESTER [B.TECH] MAY-JUNE 2018

Paper Code: ETCE-308	Subject: Open Channel, Flow And Numerical Hydraulics

[Batch-2013 Onward]

Time: 3 Hours   Maximum Marks: 75

Note: Attempt **five** questions in all including Q. no.1 which is compulsory.
Select one question from each unit. Assume suitable missing data if any.

Q1 Attempt **any five** questions:

(a) Starting with the expression of shear stress in rigid-boundary channels, derive Chezy's equation and derive the relation between the Chezy's and the Manning's coefficients in open channel flow. **(5)**

(b) Define gradually varied flow and rapidly varied flow giving examples. Designate using conventional symbols the types of channel slopes as used for describing profile of open channel flows. **(5)**

(c) Define sequent depths. Starting with assumptions, derive an expression for calculating the sequent depth for a hydraulic jump in a rectangular channel. **(5)**

(d) What are the modes of sediment movement in a mobile boundary channel? Define critical velocity ratio. **(5)**

(e) Write down the steps in designing a mobile-boundary channel using Kennedy's theory if the design discharge, the rugosity coefficient, the bed slope and critical velocity ratio are known. **(5)**

(f) What are the principle hydrodynamic processes that determine the fate of pollutants in a stream? Explain with sketches. **(5)**

(g) What are the advantages of the finite volume method for solving diffusion problems over finite difference method in numerical hydraulics? **(5)**

UNIT-I

Q2 (a) Starting with the energy equation, derive an expression of critical depth at a section in a channel. Show that, for a rectangular channel, the velocity head under critical condition is half the depth of flow. **(6)**

(b) Define subcritical and supercritical flow giving examples. Show the regions of these two types of flow on a specific energy curve. **(2.5)**

(c) Water flows at a depth of 2.0 m and a velocity of 1.5 ms⁻¹ in a 4.0 m wide channel. Find the width at a contraction that just cause critical flow without change in the upstream depth. **(4)**

Q3 (a) What is 'conveyance' of a channel. What is the unit of manning's roughness coefficient? What are the factors on which this coefficient depends? **(2+2+2=6)**

(b) A trapezoidal channel carrying a discharge of $25\,m^3s^{-1}$ with a bed slope of 1 in 1500 has side slopes 1:1 at the most efficient section. Design the section if manning's coefficient is 0.0135. **(3)**

(c) For a constant specific energy of 1.8 kg-metre/kg in a rectangular open channel, calculate the maximum discharge that may be conveyed if the channel is 5 m wide. **(3½)**

P.T.O.

UNIT-II

Q4 (a) Derive the differential equation governing gradually varied flow, and hence define backwater and drawdown curves giving one example of each. **(3+3=6)**

(b) Using the equation derived in (a) above, show that the slopes of all surface profiles in zone 1 and zone 3 are positives indicating rising curves, and those in zone 2 are negative indicating falling curves. **(3½)**

(c) A rectangular channel 3.0 m wide has a longitudinal slope of 150 mm/km and Manning's coefficient 0.02. When the discharge in the channel is 0.85 m^3s^{-1}, determine the slope of the water surface in the channel relative to the horizontal, i.e. $(dy/dx - S_0)$ at a location where the depth of flow is 0.75 m. **(3)**

Q5 (a) Derive an expression for estimating the loss of energy in a hydraulic jump. What are the five classifications of hydraulic jumps based on the Froude No. of the supercritical flow? **(3+3=6)**

(b) A rectangular channel carrying supercritical flow is provided with a hydraulic jump type energy dissipater. If it is desired to dissipate 5 m head of water in the formation of the jump and if the inlet Froude number is 8.5, Find the sequent depths. **(3)**

(c) A rectangular channel carries a discharge of $2\,m^3s^{-1}$ per metre width. if the loss of energy in the hydraulic jump is 2.75 m, show that the conjugate depths before and after the jump would be 0.214 m and 1.849 m respectively. **(3½)**

UNIT III

Q6 (a) Define a regime channel. Describe the design procedure for determining dimensions of a regime channel by Lacey's Theory. **(2.5+4=6.5)**

(b) Design a regime channel by Lacey's theory to be constructed in an alluvial soil of median size 0.6 mm. The side slopes of the channel may be adopted as ½ Horizontal: 1 Vertical. **(6)**

Q7 (a) Define 'entrainment function' according to Shield's tractive force approach for the initiation of sediment motion in a mobile boundary channel. **(2)**

(b) Draw typical sections of a lined canal, one in embankment and one in excavation following the provisions as indicated in Indian Standard Code IS: 10430-2000. **(2+2=4)**

(c) What are the advantages of lining an irrigation canal? Design a concrete lined canal to carry a discharge of 350 m^3s^{-1} at a longitudinal slope of 1 in 5,000. The side slope of the canal may be adopted as 1½:1. The value of manning's roughness coefficient for lining is 0.014. Assume a limiting velocity in the canal as 2 ms^{-1}. **(6.5)**

ETCE-308

UNIT-IV

Q8 (a) What are diffusion, dispersion, convection and advection in the context of pollutant transport in open channel? Use sketches to explain. **(4)**

(b) What are Fick's first and second laws of molecular diffusion? **(2½)**

(c) Describe the steps in the finite volume method of solution of one-dimensional steady state diffusion equation. **(6)**

Q9 (a) Write down the one-dimensional equations of the advection diffusion, turbulent diffusion and longitudinal dispersion of the pollutant transport process in open channel describing the terms used in each equation. **(2+2+2)**

(b) The effluent from an industrial plant in a town is discharged along the centre line of a slowly meandering channel. The width of the channel is 50 m and the depth of flow is 1.0 m. The longitudinal slope of the channel is $2x10^{-4}$ and the value of Manning's roughness coefficient is 0.02. Find the length of the channel in which complete mixing over the cross section will be expected. Use the expression for the distance for complete mixing as given by Fischer et al. for longitudinal dispersion. **(6.5)**

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END TERM EXAMINATION

SIXTH SEMESTER [B.TECH] MAY-JUNE 2018

Q1 (a) Write short note on fatigue effects in gantry girders.   (5)
     (b) Explain various types of seismic waves.   (5)
     (c) Classify different types of earthquakes.   (5)
     (d) Define the following terms:-   (5)
         (i) Tendon
         (ii) Strands
         (iii) Cables
         (iv) Bonded tendons
         (v) Post tensioning
     (e) Write short note on Box Culvert.   (5)

Unit-I

Q2 State the objectives and guidelines of earthquake resistant design as per IS-specification. Discuss on dynamic analysis of structure.   (12.5)

OR

Q3 Discuss ductile detailing for columns subjected to bending and axial loads. Explain horizontal and vertical distribution of seismic forces, with analysis on assumed data.   (12.5)

Unit-II

Q4 Explain the method and design steps for designing vertical stem, toe slab and heal slab for a T shaped cantilever retaining wall. What will be the change in design if counterforts are provided at regular interval towards the side of backfill?   (12.5)

OR

Q5 For an underground water tank 4 m x 10 m x 3 m deep, the subsoil consists of sand having angle of repose of 30°, and saturated unit weight of 17 kN/m³. The water table is likely to rise up to ground level. Use M20 concrete and HYSD bars. Design-   (12.5)
     (i) Long wall
     (ii) Short wall

Unit-III

Q6 A simply supported prestressed concrete beam of rectangular cross-section 400mm x 600 mm, is loaded with a uniform distributed load of 256 kN over a span of 6m. Sketch the distribution of stresses at mid span and end sections if the prestressing force is 1920 kN and tendon is eccentric, located at 200mm above the bottom fibre.   (12.5)

OR

P.T.O.

ETCE-310

P-1/2-

Q7 (a) Explain   (2)
        (i) Stress concept   (3)
        (ii) Strength concept   (3)
        (iii) Balanced load concept
    (b) What are the advantages of prestressed concrete?   (4.5)

Unit-IV

Q8 For an elevated cylindrical steel tank with hemispherical bottom for 160000 litres capacity, the tank has conical roof. The ring beam of the tank is at a height of 10m from the ground level. The tank is to be built at Delhi. Take f_y=250N/mm². Design-   (12.5)
    (i) Thickness of plate in cylindrical and hemispherical portion.
    (ii) Joints of tank for cylindrical and hemispherical portion.
    (iii) Connection for hemispherical bottom to cylindrical portion.

OR

Q9 (a) What are the different types of load acting on transmission line towers? Explain.   (4)
    (b) Explain the two design condition of transmission towers.   (3)
    (c) What is the effect of temperature variation in cable geometry? (3)
    (d) Write short note on analysis of transmission towers.   (2.5)

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(Please write your Exam Roll No.)   Exam Roll No. ....

END TERM EXAMINATION
SIXTH SEMESTER [B.TECH] MAY-JUNE 2018

Paper Code: ETCE-312	Subject: Transportation Engineering-I
Time: 3 Hours	Maximum Marks: 75

Note: Attempt all questions as directed. Internal choice is indicated. Assume missing data, if any.

Q1 Answer the following:-   (5x5=25)
  (a) Compare roadways and railways.
  (b) What are the instruments required for reconnaissance survey, preliminary survey and detailed survey?
  (c) Explain three classes of Kerbs.
  (d) What is meant by bituminous concrete Premix treatment? What are its advantages?
  (e) What are the objectives and features of traffic engineering? Explain with appropriate examples.

Q2 (a) What is the importance of Nagpur road planning of our country? Explain the plan formulae and the salient features of the plan.   **(6)**
  (b) Explain sight distance and factors causing restrictions to sight distance. Explain the significance of stopping, intermediate and overtaking sight distances.   **(6.5)**

<center>OR</center>

Q3 (a) The speeds of overtaking and overtaken vehicle are 80 and 60 kmph respectively. if acceleration of the overtaking vehicle is 2.5 kmph per second, calculate the safe passing sight distance for the following conditions: **(6)**
  (i) One-way traffic
  (ii) Two-way traffic
  (b) While aligning a high way in a built up area, it was necessary to provide a horizontal circular curve of radius 325 metre. The design speed is 65 kmph, length of wheel base of largest truck = 6.0 m and width of pavement is 10.5 m. Design the following geometric features: (i) Superelevation (ii) Extra widening of pavement (iii) Length of transition curve.   **(6.5)**

Q4 (a) Explain and differentiate among spot speed, running speed, space-mean speed, time-mean speed, average speed and 98 percentile speed.   **(6)**
  (b) Explain and differentiate among the term capacity, possible capacity, practical capacity, 85 percentile speed, 15 percentile speed.   **(6.5)**

<center>OR</center>

Q5 (a) Classify the different types of traffic signs and mention the general objective of each type of sign; with sketch. Also show the general shape of these types of signs.   **(6)**
  (b) The average normal flow of traffic on cross road 1 and 2 during design period are 440 and 280 PCU per hour respectively. The all-red time required for pedestrian crossing is 12 sec. Design two phase traffic signal with pedestrian crossing by Webster's method.   **(6.5)**

[handwritten margin notes: Saturated flow value on these roads are estimated as 1300 & 1000 PCU/hr.]

Q6 (a) Explain the principle of the various tests on road stones. Specify the desirable values of the test results.   **(6)**
  (b) Explain how the elastic modulii of subgrade and base course are estimated using plate bearing test data.   **(6.5)**

<center>P.T.O.</center>

ETCE-312
P-1/2

OR

Q7 (a) Compute the radius of relative stiffness of 25 cm thick cement concrete slab using the following data;
Modulus of elasticity of cement concrete = 3×10^5 Kg/cm^2
Poisson's ratio for concrete = 0.15
Modulus of subgrade reaction, K=20kg/cm^3 **(6)**

(b) What are the applications of: (i) liquid limit (ii) plasticity index and (iii) free swell index of soils for highway construction works? **(6.5)**

Q8 (a) What are the causes of frequent failures in old flexible road pavements in India? **(6)**

(b) Explain the objectives, type of material and method of application of; (i) prime coat (ii) tack coat. **(6.5)**

OR

Q9 (a) Write explanatory notes on (i) Penetration Macadam base (ii) Built-up spraygrout base. **(6)**

(b) Write brief notes on the following types of distresses in bituminous pavements: (i) Ravelling (ii) Rutting (iii) Corrugations (iv) Edge breaking (v) Aligator Cracks (vi) Shear failures (vii) Reflection Cracking. **(6.5)**

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END TERM EXAMINATION

EIGHTH SEMESTER [B.TECH] MAY-JUNE 2018

Paper Code: ETHS-402	Subject: Human Values and Professional
(Batch 2013 Onwards)	Ethics-II
Time: 3 Hours	Maximum Marks: 75

Note: Attempt all questions as directed. Internal choice is indicated.

Q1   Write short notes on **any five** of the following:-   (5x5=25)

(a) Responsibility

(b) Living in harmony with society and nature

(c) Right conduct

(d) Accountability

(e) Safety and Risk

(f) Loyalty

(g) Truth

Q2   Human being is co-existence of self and body, explain.   (12.5)

OR

Explain the term "pluralism in India".

Q3   Describe the four different levels of our living in harmony.   (12.5)

OR

Be it television, magazines or the internet, media is omnipresent affecting various aspects of our lives. Describe the negative effects of such media on children and the society as a whole.

Q4   The term globalization refers to the process of escalating the connectivity and interdependence of the world markets and Business. Explain.   (12.5)

OR

Discuss business ethics in corporate governance.

Q5   Explain and discuss the two categories of Intellectual Property Rights (IPR). (12.5)

OR

Discuss various kinds of pollutions in our environment, with their causes.

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END TERM EXAMINATION

EIGHTH SEMESTER [B.TECH] MAY-JUNE 2018

| Paper Code: ETCE-404 | Subject: Planning and Management of |
| (Batch 2013 Onward) | Construction Projects |

Time: 3 Hours   Maximum Marks: 75

Note: Attempt any five questions. including Qno.1 which is compulsory. Assume any missing data suitably, if not given. Use relevant Indian Codes/Guidelines is permitted.

Q1 Attempt **any five** of the following:-   (5x5=25)
 (a) Explain building By-Laws?
 (b) Explain salient features of land Acquisition?
 (c) Explain the importance of security deposits?
 (d) Explain accounting procedure of stores?
 (e) Enlist pile driving equipments?
 (f) Explain various provisions for building regulation.

Q2 (a) Explain the factors required for the efficiency of the projects?   (6)
 (b) Differentiate between CPM and PERT type analysis?   (6.5)

Q3 (a) Three activities implemented in parallel have the following time cost relationship for direct cost component in each case. What would be the feasible range of total cost component for the three activities together. What is the minimum cost to complete these activities in Nine days?   (4.5)

Activity	Duration (days)	Cost (Rs.)
A	10 (normal)	800
	9	900
	8	1000
B	11 (normal)	1200
	10	1350
	9	1500
C	7 (normal)	500
	6	700
	5	900

 (b) Explain Normal cost, crash time and crash cost.   (4)
 (c) What do you mean by work breakdown structure? What is its importance in network planning?   (4)

Q4 (a) Explain critical path, supercritical path and sub-critical path.   (4)
 (b) Explain free float, independent float and interfering float.   (4.5)
 (c) Differentiate among 'forward planning' 'backward planning 'and 'combined planning'.   (4)

Q5 (a) Draw the network diagram and number the events for the following relationship.   (6.5)
 (i) Activity A,B,E can start together
 (ii) Activity C and D are concurrent and depends on completion of both A and B.

P.T.O.

(iii) Activity F and G are concurrent and depend upon completion of C

(iv) Activity H depends on completion of activity D, E and F.

(v) The project is completed when activities G and H are done.

Also indicate the duration of all activities so that the total float is zero at all nodes/activities.

(b) Explain elements of network diagram. **(6)**

Q6 For the given network the estimated time in days for each activity is shown in the network diagram. Find the critical path and the probability of completing the work in 35 days. **(12.5)**
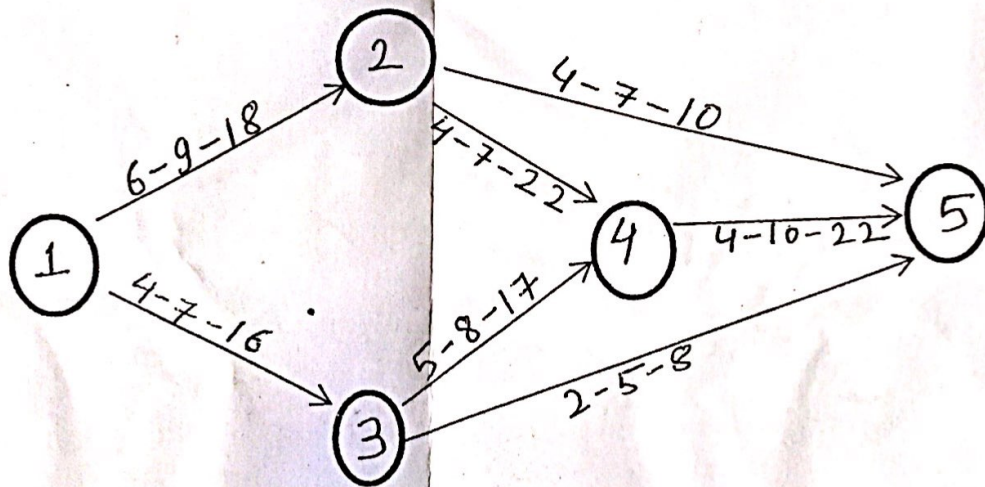
z	0	+1	+2	+3	-1	-2	-3
Probability(%)	50	84.13	97.72	99.87	15.87	2.28	0.13

Q7 (a) Explain the difference between Administrative approval and expenditure sanction. **(4)**

(b) What are the different methods of executing works? **(4)**

(c) Write note on different types of contracts. **(4.5)**

Q8 (a) Discuss various tenders and its types **(3)**

(b) Discuss various types of contracts **(3)**

(c) Explain different types of earth moving, hauling and hoisting equipments. **(6.5)**

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END TERM EXAMINATION

EIGHTH SEMESTER [B.TECH] MAY-JUNE 2018

Paper Code: ETCE-406	**Subject: Analysis and Design of Bridges** (Batch 2013 Onwards)
Time: 3 Hours	**Maximum Marks: 75**

Note: Attempt five questions in all including Q no. 1 which is compulsory. Select one question from each unit. Assume any data suitably if missing and mention it before solving the question.

Q1 Attempt the **any five** questions:-   (5x5=25)
 (a) What is the function of bearing in bridges?
 (b) Describe Courbon's method for load distribution and indicate its limitation.
 (c) What are the components of a bridge?
 (d) Explain the factors influencing the flood discharge in a river.
 (e) How the afflux is caused and how its value estimated.
 (f) What is economical span?

UNIT-I

Q2 What is racking force? Explain how the dynamic-effect is considered in railway bridge design, giving suitable example/case/data.   (12.5)

Q3 (a) A bridge is a proposed to be constructed across an alluvial steam carrying a discharge of 300 m³/s. Assuming the value of silt factor=1.1, determine the maximum scour depth when the bridge consists of (i) Two span of 30 m each (ii) Three span of 30 m each.(7.5)
 (b) Explain how you would measure the discharge of a river using any suitable method.   (5)

UNIT-II

Q4 Write short note on:-   (4+4+4.5=12.5)
 (a) Balanced Cantilever bridge
 (b) Box-culvert bridge
 (c) T-Beam bridge

Q5 Explain different kinds of arch a bridges. What are the various forces considered while designing an arch bridge? Give suitable example with typical values.   (12.5)

UNIT-III

Q6 Describe the main features of cable stayed bridge. Sketch the different types of towers for cable stayed bridge.   (12.5)

Q7 What are the various kinds of expansion bearing for girder bridge? State the circumstances under which each would be appropriate.   (12.5)

UNIT-IV

Q8 What are the advantages of pre-stressed concrete bridges? Describe the pre-stressing assembly of steel.   (12.5)

Q9 Write the different steps for design of a longitudinal girders for design of post-tensioned prestressed concrete T-Beam slab bridge deck with relevant formulate.   (12.5)

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END TERM EXAMINATION

EIGHTH SEMESTER [B.TECH] MAY-JUNE 2018

Paper Code: ETCE-412	Subject: Ground Water Assessment, Development and Management

(Batch 2013 Onwards)

Time: 3 Hours

Maximum Marks: 75

Note: Attempt five questions in all including Q no.1 which is compulsory. Select one question from each unit.

(5x5=25)

Q1 Attempt all the questions:-
(a) State Darcy's Law and its validity.
(b) Explain specific yield and specific retention.
(c) Write a short note on well loss and specific capacity of well.
(d) Discuss in detail the procedure of installation of jet pump.
(e) 600 m³/day of water is to be obtained from a proposed infiltration gallery, which is placed at 6m depth from the sub-surface water table. The co-efficient of permeability of soil aquifer is 100 m/day. Find the length of the gallery if the drawdown in the gallery on pumping is not to exceed 4m. The radius of influence may be assumed to be 100m.

UNIT-I

Q2 What are the various methods of ground water investigation? Explain in details. (12.5)

Q3 (a) Write down the comparison between surface sources of water and ground water sources. (5)
(b) Explain the various causes of ground water pollution. (7.5)

UNIT-II

Q4 (a) During a recuperation test, the water level in an open well was depressed by pumping by 2.1 m and it recuperated 1.6m in 90 minutes. Find the diameter of well to yield 10 Ltr/sec under a depression head of 2m. (5)
(b) A 30m diameter well completely penetrates the confined aquifer of permeability 45 m/day. The length of the strainer is 20m. Under a steady state of pumping the drawdown at the well was found to be 3m and radius of influence was 300m. Calculate the discharge. (7.5)

Q5 (a) Design a tube well for following data:- (7.5)

Yield Required	0.08 cumec
Thickness of Confined Aquifer	30 m
Radius of Influence	300 m
Permeability co-efficient (k)	60 m/day
Drawdown	5 m

(b) Design an open well in fine sand to give a discharge of 0.003 cumec when worked under a depression head of 2.5m. (5)

P.T.O.

UNIT-III

Q6 What are the various types of screening used in tube wells? Explain with neat sketches. **(12.5)**

Q7 (a) Give classification of tube well as per boring methods. Also mention the procedure for each one. **(7.5)**

   (b) Compare the Cable tool method and hydraulic rotary method of drilling. **(5)**

UNIT-IV

Q8 Design a tube well to deliver 33,000 gallons per hour at a depression head of 5m. The average water level is 10m below the ground in October and 15m in July. The geological investigation have yielded the following results at the site of boring:- **(12.5)**

Depth (m)	Type of Strata
0-5	Surface Clay
5-20	Very fine sand
20-30	Clay with Kankar
30-50	Coarse sand
50-60	Clay
60-70	Medium sand
Below 70	Clay with hard strata

Q9 What are the different types of pump which can be used for lifting the water? Explain with neat and suitable diagrams. **(12.5)**

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ETCE 412

P2/2

END TERM EXAMINATION

EIGHTH SEMESTER [B.TECH] MAY-JUNE 2018

Paper Code: ETCE-422   Subject: Environment Engineering

Time :3 Hours   Maximum Marks :75

Note: Attempt any five questions including Q. no.1 which is compulsory.

(5x5=25)

Q1 Attempt **any five** parts:-
  (a) How do the meteorological phenomena influence the air quality? Describe in detail.
  (b) Name and describe five natural mechanism that work in atmosphere to remove air pollutant
  (c) Design criteria for standard dimensions of cyclones in centrifugal collectors.
  (d) What do you understand by the term leachate? What problems are posed by leachate and how it can be overcome?
  (e) Explain the salient provisions of the Municipal Solid Wastes (Management and Handling) Rules 2000, indicating their limitations.
  (f) Determine the air requirement to oxidize completely 3 tonnes of waste having chemical formula $C_{50}H_{100}O_{20}N$.
  (g) Define settling chambers. Describe the equation required to calculate the size of particles removed with 100% efficiency in a settling chamber.
  (h) Define frequency, time period, amplitude, power of sound and sound intensity.

Q2 Define the term sound pressure level with suitable equation. What value of sound velocity will you use for air as a medium at 20°C.? During noise sampling the value for fluctuating noise level 55dB(A) lasting for 10 minutes, followed by 75dB(A) lasting for 30 minutes, followed by 65 dB(A) lasting for 55 minutes, followed by 110 dB(A) for 4 minutes. What is Leq of this noise?   (12.5)

Q3 Describe in detail about Dusts, Smokes, Mists, Fumes and Vapor. In what size range do particles most effectively reduce vision? What is the mechanism by which acid mist can cause destruction of limestone surfaces? Show the chemical reaction.   (12.5)

Q4 Estimate the overall chemical composition of a solid waste sample. Derive an approximate chemical formula for the organic portion of a solid waste sample with the composition given in Table below. Use the resulting composition to estimate the energy content. Assume sample of 500 Kg with moisture content of 21%.   (12.5)

Component	Wet mass (Kg)	Composition, kg					
		C	H	O	N	S	Ash
Food wastes	75	2.16	0.29	1.69	0.12	0.02	0.23
Paper	225	18.40	2.54	18.61	0.13	0.08	2.54
Cardboard	50	4.18	0.56	4.24	0.03	0.02	0.48
Plastics	50	5.88	0.71	2.23	-	-	0.98
Garden Trimmings	50	1.91	0.24	1.52	0.14	0.01	0.18
Wood	25	1.98	0.24	1.71	0.01	-	0.06

Q5 Enumerate the various methods which can be used for disposal of municipal solid waste, and explain in detail with suitable sketch the two most widely adopted methods in India.   (12.5)

Q6 Describe in detail the methodology used for collecting particulate sample from a stack along with basic equations and sampling criteria used in stack monitoring. Estimate the theoretical volume of methane gas that would be expected from the anaerobic digestion of 1.5 tonne of a waste having the composition $C_{45}H_{90}O_{30}N$.   (12.5)

P.T.O.

Q7 Solid waste from commercial area of Dwarka is to be collected using stationary-container collection system having 5 m³ containers. Determine the appropriate truck capacity for the following conditions: (i) container utilization factor is 0.55 (ii) average number of containers per location is 4 (iii) collection vehicle compaction ratio is 2.5 (iv) container unloading time is 0.13 h/container (v) Average drive between container locations 0.1 h (vi) one way haul distance is 25 km with speed limit 88 km/h (vii) Time from garage to first container location = 0.3 h (viii) Time form last container location to garage is 0.35 h (ix) number of trips to disposal site per day is 3 and length of workday is 8 h. (12.5)

Q8 Differentiate between pyrolysis and incineration of solid waste management. Determine the heat available in the exhaust gases from the combustion of 250 tonnes/d of solid waste with an energy content 12,500kJ/kg and following composition. Assume the incinerator residue contains 5 percent carbon and the temperatures of the entering air and residue from the grate are 25 and 45 C respectively. The heat losses are given in Table 1 below.
Carbon=30%, Hydrogen= 6%, Oxygen =22, Nitrogen = 4%, Sulfur = 1%, Water = 20%, Inerts =20%. (12.5)

Table 1 Heat losses in combustion of solid waste

Type of losses	Remarks
$\bigcirc$	The heating value of carbon is about 32,789 kJ/kg.
Reactor	
1. Unburned carbon	Typically, the grate residue is assumed to contain from 4 to 8 percent carbon.
2. Radiation	Heat lost through the reactor walls and other appurtenances to surroundings is estimated as 0.003–0.005 kJ/kg of furnace input.
Latent heat	
3. Inherent moisture	Water content of waste. The latent heat of vaporization for water is approximately 2420 kJ/kg.
4. Moisture in bound water	
5. Moisture from oxidation of net hydrogen	
Sensible heat	
6. Sensible heat in residue	Specific heat of residue is taken as 1047 J/kg · K (10.25 Btu/lb · °F)
7. Stack gases	

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