(Please write your Exam Roll No.) Exam Roll No. 05125603414

END TERM EXAMINATION

FOURTH SEMESTER [B.TECH] MAY-JUNE 2016

Paper Code: ETCE-202 Subject: Water Engineering

Time: 3 Hours Maximum Marks: 75

Note: Attempt any five questions including Q.no.1 which is compulsory. Explain the answer with figure wherever necessary.

Q1 Attempt **any five** of the following: **(5x5=25)**

(a) What is fire demand? Give suitable allowance in water supply scheme?

(b) Discuss the variations in water demand of a town?

(c) What points should be kept in mind while selecting a site for a intake work?

(d) What do you understand by the term Detention Period and give reasonable values of it with respect to sedimentation basin?

(e) Enumerate the chemicals used in coagulation. Discuss their merits and demerits?

(f) Explain in brief the different methods of distribution of water used in Municipal Water Supply schemes?

(g) What are the factors to be considered in selecting a site for location of distribution reservoir?

Q2 (a) Mention different methods of forecasting population? Describe in detail any one of the methods (except Arithmetic, Incremental Increase Method). **(7.5)**

(b) Estimate the population in the year 2011 from the following census data for a town by using *Incremental Increase Method*? **(5)**

Year	1941	1951	1961	1971
Population	30,000	42,000	53,000	58,000

Q3 Municipal wastewater-treatment plant discharge secondary effluent to a surface stream. The worst conditions are known to occur in the summer months when stream flow is low and water temperature is high. Under these conditions, measurements are made in the laboratory and in the field to determine the characteristics of the wastewater and stream flows. The wastewater is found to have a maximum flow rate of 15,000 m^3/day, a BOD of 40 mg/L, a dissolved oxygen concentration of 2 mg/L, and a temperature of 25°C. The stream (upstream from the point of wastewater discharge) is found to have a minimum flow rate of 0.5 m^3/s, a BOD of 3 mg/L, a dissolved concentration of 8 mg/L, and a temperature of 22°C. Complete mixing of the wastewater and stream is almost instantaneous, and the velocity of the mixture is 0.2 m/s. From the flow regime, the reaction constant is estimated to be 0.4 day^{-1} for 20°C conditions.

Sketch the dissolved oxygen profile for a 100 km reach of the stream below the effluent discharge. **(12.5)**

Q4 (a) Explain in brief the aerobic nitrogen, carbon and sulphur cycle in metabolic process? **(7.5)**

(b) Explain any two physical process involved in natural purification of water system? **(5)**

P.T.O.

Q5 (a) Draw a neat sketch of a Rapid Gravity Filter and describe how it works. What are its advantages over the slow sand filter? **(7.5)**

(b) Explain in brief about: **(5)**

(i) Break point chlorination

(ii) Super chlorination

Q6 (a) The population of a city is 50,000 and the per day capita consumption is 130 l/day. Calculate the following in respect of the rapid sand filter for the above data: **(7.5)**

(i) Total area of filters;

(ii) Number and dimension of each filter bed;

(iii) Back wash water per filter bed after air wash.

(b) Explain the kinetics of disinfections. **(5)**

Q7 (a) Explain the Hardy Cross method used for pipe network analysis in water distribution system. **(7.5)**

(b) Explain various layout of distribution networks in distribution system? **(5)**

Q8 Write short notes on the following:

(a) Hourly variation in water demand. **(4)**

(b) Advantages and disadvantages of metering policy of water supply. **(4)**

(c) Head loss estimation in a pipe network. **(4.5)**

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END TERM EXAMINATION

FOURTH SEMESTER [B.TECH.] MAY-JUNE 2016

Paper Code: ETCE-204 **Subject: Structural Analysis**

Time: 3 Hours **Maximum Marks: 75**

Note: Attempt any five questions including Q no.1 which is compulsory. Assume any missing data suitably.

Q1 (a) What is middle one third rule? Differentiate between middle third and middle fourth rule in rectangular and circular cross sections. **(5)**

(b) Differentiate between thick and thin cylinder and derive hard stress for spherical shells. **(5)**

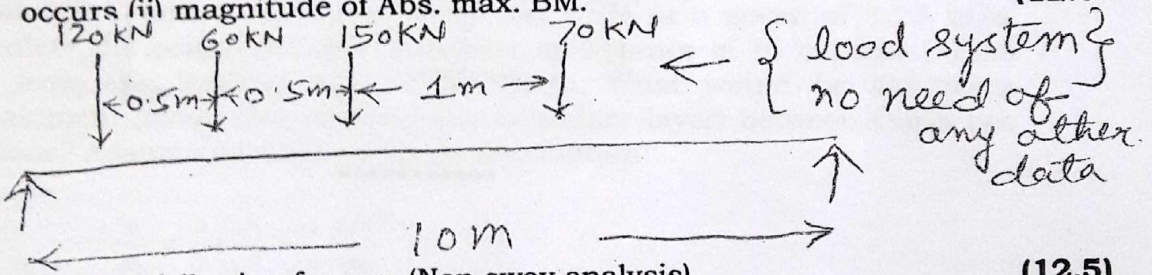
(c) What is Muller Breslau principle? Explain with neat sketch. **(5)**

(d) Differentiate between assumptions of portal and cantilevers method of appropriate analysis of buildings. **(5)**

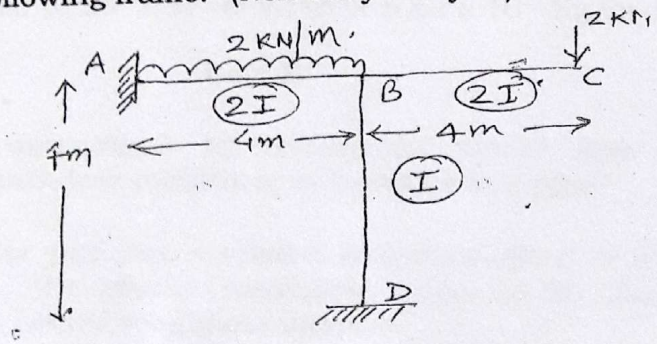
(e) What is Castigliano's second theorem? Explain with suitable examples. **(5)**

Q2 A masonry dam 8m high, 1.5m wide at top and 5m wide at base retains water upto depth of 7.5m. The water face of dam is vertical. Find maximum and minimum stress intensities at base and specify nature of stress $Y_w = 10KN/m^3$ $Y_{mas} = 22.4\ KN/m_3$ **(12.5)**

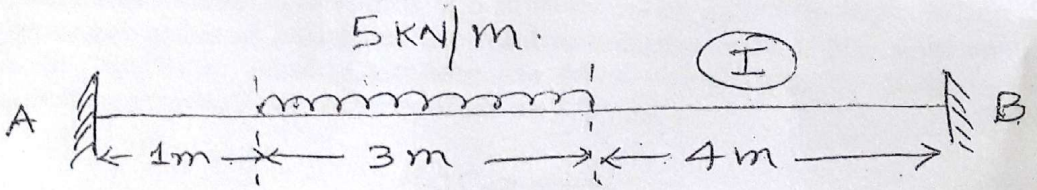
Q3 The load system shown in fig(1) crosses a simply supported system from left to right. Find (i) location of section at which Absolute maximum BM occurs (ii) magnitude of Abs. max. BM. **(12.5)**



Q4 Analyse following frame:- (Non sway analysis) **(12.5)**

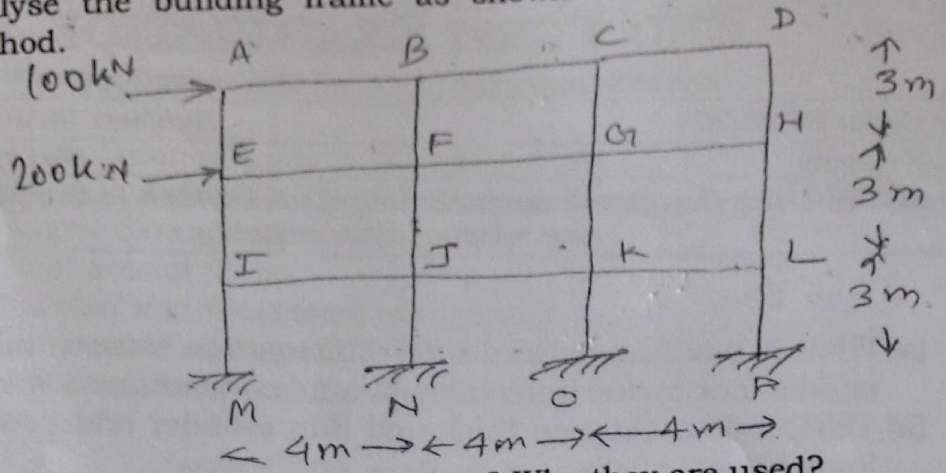


Q5 Anlayse following beam:- **(12.5)**



P.T.O.

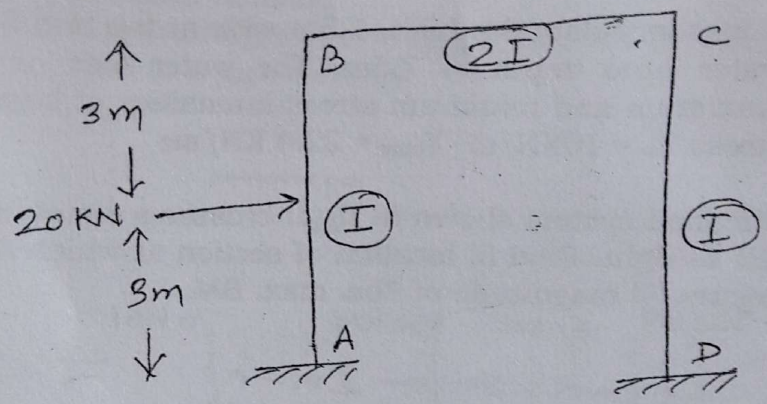
Q6 Analyse the building frame as shown in figure by any approximate method. **(12.5)**



Q7 (a) What are wire wound cylinders? Why they are used? **(5)**

(b) Derive stress formula's for wire wound cylinder if they are subjected to internal fluid pressure 'P'. **(7.5)**

Q8 Using Moment distribution method determine the end moments of frame ABCD. **(12.5)**



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END TERM EXAMINATION

FOURTH SEMESTER [B.TECH] MAY-JUNE 2016

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

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

Q1 Attempt all the questions: **(5x5=25)**

(a) What is the concept of boundary layer and what are the different boundary layer parameters?

(b) Discuss different types of drags on immersed bodies.

(c) What is cavitation and how it effects can be reduced?

(d) What is net positive suction head (NPSH)?

(e) Classify hydraulic turbines on the basis of head, discharge and specific speed.

Unit-I

Q2 Determine the direction and amount of flow per meter width between two parallel plates when one is moving relative to the other with a velocity of 3 m/s in the negative x-direction, if $\frac{dp}{dx} = -100\ N/cm^2cm$, μ is 0.4 poise and the distance between the plate is 1 mm. **(12.5)**

Q3 Air at 25^0 C and 1 bar flows over a flat plate at a speed of 1.25 m/s. Calculate the boundary layer thickness at distance of 15 cm and 30 cm and from the leading edge of the plate. What would be the mass entrainment (mass flow entering the boundary layer) between these two sections? Assume parabolic velocity distribution.

$$\frac{u}{U_0} = \frac{3}{2}\left(\frac{y}{d}\right) - \frac{1}{2}\left(\frac{y}{d}\right)^3$$

The viscosity of air at 25^0 C is stated to be 6.62 x 10^{-2} Kg/hr-m. **(12.5)**

Unit-II

Q4 What do you understand by commercial pipes? How would you determine the equivalent roughness of a commercial pipe?

A 20 cm diameter pipe has a relative roughness (R/ε) of 100. After 10 years of service, the relative roughness drops to 80. Determine the magnitude of the rate of roughness increase. **(12.5)**

Q5 What is Magnus effect? Cite some practical examples which illustrate the manifestation of this effect.

A ship has two vertical rotors, 2.5 m in diameter and 8 m high. When the rotors are spun at 240 rpm, the relative motion of air to the ship results in 50 km/hr of wind. Calculate the force exerted on the ship by the spinning rotors. Take density of air as 1.24 kg/m^3. **(12.5)**

P.T.O.

Unit-III

Q6 Explain the characteristic features of the cup of a Pelton wheel. What are the limitation in keeping the deflection angle of the cup as 180^0?
A Pelton wheel semi-circular buckets function under a head of 150 m and consumes 50 liters/sec of water. If 60 cm diameter wheel turns 600 revolutions per minute, make calculations for the power available at the nozzle and the hydraulic efficiency of the wheel. Presume coefficient of Velocity K_v as unity. **(12.5)**

Q7 How the slow, medium and fast runners of a Francis turbine are specified?

A reaction turbine works at 450 rpm under a head of 120 meters. Its diameter at inlet is 120 cm and the flow area is 0.4 m^2. The angles made by the absolute and the relative velocities at inlet are 20^0 and 60^0 respectively with the tangential velocity. Determine (i) the volume flow rate (ii) the hydraulic power developed and (iii) the efficiency. Assume whirl at outlet to be zero. **(12.5)**

Unit-IV

Q8 How does a centrifugal pump impart pressure energy to the flowing fluid?

The axis of a centrifugal pump is 2.5 m above the water level in the sump and the static lift from the pump centre is 32.5 m. The friction losses in the suction and delivery pipes are 1 m and 8 m respectively; suction and delivery pipes are each 12 cm in diameter. At outlet the diameter and width of the impeller are 30 cm and 1.8 cm respectively and the vanes are set back at an angle of 30^0 with tangent to the wheel. For the speed of 1800 rpm, mechanical efficiency 0.75 and monometric efficiency 80%, make calculations for the discharge and the power required to drive the pump. Assume radial entry. **(12.5)**

Q9 Explain the working principal of reciprocating pump. Why a reciprocating pump is called a positive displacement pump?

A single acting reciprocating pump has the plunger diameter of 20 cm and stroke of 30 cm. The pump discharges 0.53 m^3 of water per minute at 60 rpm. Find the theoretical discharge, co-efficient of discharge, and percentage slip of pump. Further, if suction and delivery heads are 4 m and 12 m respectively work out power required to run the pump. **(12.5)**

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P2/2

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END TERM EXAMINATION

FOURTH SEMESTER [B.TECH] MAY-JUNE 2016

Paper Code: ETCE 208 **Subject: Advanced Surveying**

Time : 3 Hours **Maximum Marks :75**

Note: Attempt any five questions including Q. No. 1 which is compulsory. Assume any missing data suitably, if not given.

Q1. Attempt the following: **(5x5=25)**

a) Obtain an expression for the difference in level between two points by reciprocal vertical angel readings from two stations. Height of object and targets should not be ignored.

b) Define weight of an observation and discuss the laws of weights.

c) Discuss the instruments used in the reconnaissance surveying.

d) What are the system of coordinates employed to locate the position of a heavenly body?

e) Explain how the equation of time, apparent time and mean time are related to each other?

Q2. Discus the essential parts of an aerial camera with neat sketch. Derive the relation between principal point, Plumb point and isocentre. **(12.5)**

Q3. (a) Define Air base, Principal point, Isocentre and Isometric parallel. **(4)**

(b) Two points A and B having elevations of 500m and 300m above datum appear on the vertical photograph having focal length of 20cm and flying altitude of 2500m above datum. Their corrected photographic coordinates are as follows:

Point	Photographic Co-ordinates X(cm)	Y(cm)
A	+2.65	+1.36
B	-1.92	+3.65

Find the length of ground line AB. **(8.5)**

Q4. (a) The standard time meridian in India is 82°30'E. If the standard time at any instant is 20 hours 24 minutes 6 seconds, find the local mean time for two places having longitudes (a) 20°E, (b) 20°W. **(6)**

(b) Write a note on "Azimuth by observation on Polaris. **(6.5)**

Q5. (a) Find the L.S.T. at place in longitude 85°20'E at 6^h30^m P.M., G.S.T. at G.M. N being $6^h32^m12^s$. **(7.5)**

(b) Write a note on Observation for time by meridian transit of star (or sun). **(5)**

Q6. Adjust the following angles closing the horizon: **(12.5)**

A= 110°20'48"	wt. 4
B= 92°30'12"	wt. 1
C= 65°12'00"	wt. 2
D= 100°57'04"	wt. 3

Find the error and the corrected angles.

P.T.O

ETCE-208

P/2

Q7. (a) An angle has been measured under different field conditions, with results as follows: **(6.5)**

28°24'20"	28°24'00"
28°24'40"	28°24'40"
28°24'40"	28°24'20"
28°25'00"	28°24'40"
28°24'20"	28°25'20"

Find i) the probable error of single observation ii) probable error of the mean.

(b) Explain the method of least squares with a suitable example. **(6)**

Q8. (a) A theodolite was set at a distance of 200m from a tower. The angle of elevation to the top of the parapet was 8°18' while the angle of depression to the foot of the wall was 2°24'. The staff reading on the B.M. having R.L. 248.362 with the telescope horizontal was 1.286m. Find the height of the tower and R.L. of the top of parapet. **(8.5)**

(b) Explain the term "shore line survey". **(4)**

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END TERM EXAMINATION

FOURTH SEMESTER [B.TECH] MAY-JUNE 2016

Paper Code: ETCE-210 **Subject: Soil Mechanics**

Time: 3 Hours **Maximum Marks: 75**

Note: Attempt any five questions including Q.no.1 which is compulsory. Make necessary assumptions wherever required and clearly state them.

Q1 Explain the following: **(5x5=25)**

(a) Degree of Saturation
(b) Factors affecting permeability
(c) Contact pressure distribution
(d) Concept of optimum moisture content
(e) Shear strength of soil

Q2 (a) Explain the utility of three phase diagram. **(3.5)**

(b) A soil sample has a diameter of 38 mm and height of 76 mm. Its wet weight is 1.15 N. Upon drying its weight reduced to 0.5 N. G_s is 2.7. In the wet state what was the Degree of Saturation and the water content of the soil sample. Comment on the values of w and S. **(9)**

Q3 (a) Explain why do we need to classify the soils. **(4)**

(b) Explain how the grain distribution of the soil is obtained in the laboratory. **(4.5)**

(c) Explain the concept of pore water pressure. **(4)**

Q4 (a) Explain the terms exit gradient and uplift pressure with respect to seepage through earth dams. Also explain what do you understand by piping failure. **(6)**

(b) Derive the expression for obtaining permeability by falling Head permeameter. **(6.5)**

Q5 (a) Explain the procedure for determination of pre-consolidation pressure. Also explain how it is determined. **(5)**

(b) From the fundamental principle, derive the condition of continuity and explain how it is used in Tezaghi's one dimensional Consolidation Theory. **(7.5)**

Q6 (a) A layer of clay 8 m thick is located between two sand layers. The Coefficient of Consolidation of the clay is 4.9×10^{-8} m^2/sec. Fill material was placed above the top sand layer over a very large area. After 3 years, what percentage of the additional stress due to the fill material will be carried by the soil grains at the middle of the clay layer? **(6.5)**

(b) The void ratios after complete consolidation had occurred at various effective stresses in a consolidation test were determined to be as follows:

σ' kN/m2	50	100	200	400	800
E	1.82	1.77	1.68	1.56	1.39

Determine the Coefficient of Volume Compressibility (m_v) for the effective stress range of 300 to 600 kN/m^2. **(6)**

P.T.O.

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END TERM EXAMINATION

FOURTH SEMESTER [B.TECH] MAY-JUNE 2016

Paper Code: ETCE 212 **Subject: Design of Concrete Structures**

Time : 3 Hours **Maximum Marks :75**

Note: Attempt any five questions including Q.No1 which is compulsory. Use of IS 456 is permitted.

Q1. Attempt **any five** parts: **(5x5=25)**

a) What is meant by sulphate attack on concrete? Which of the sulphate salts are most aggressive? How does one provide for conditions where the subsoil water has high sulphate content?

b) Enumerate the five limit states commonly used in limit state design and state briefly how they are provided for in design.

c) What is meant by characteristics strength of a material as used in IS456 (2000)?

d) Draw the stress-strain curve for M20 concrete and Fe415 steel(a) as obtained in the laboratory (b) as assumed is IS456. How do you determine yield point of Fe415 steel in the laboratory.

e) Explain how in most designs the depth of slabs or beams are taken larger than those obtained from bending moment considerations only. Does this produce an underreinforced, overreinforced or balanced section?

f) Which theory would you use for analysis of stresses for the serviceability conditions of an R.C.C. beam?

Q2. a) What is unsoundness of cement? Explain the testing procedure to determine the unsoundness of the cement. **(3.5)**

b) What is grading of aggregate and its significance. **(3)**

c) Determine the finess modulus of aggregate for the following result of sieve analysis. What does the result indicate? **(6)**

IS sieve size mm	10	4.75	2.36	1.18	0.6	0.3	0.15	0.075
% passing	100	92	74	55	23	12	9	7

Q3. a) Compare working stress method and limit state method for design of structures in respect of strength and serviceability requirements. **(4.5)**

b) A rectangular beam section of 300mm width and 500mm effective depth is reinforced with 5 bars of 20mm Φ, out of which 2 bars have been bent at 45^0. Determine the shear resistance of the bent up bars and additional shear reinforcement required if it is subjected to ultimate shear force of 300kN. Consider concrete of grade M20 and steel of Grade Fe415. **(8)**

P.T.O.

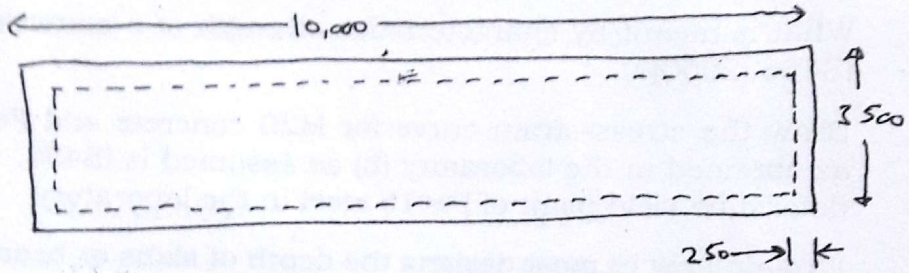
ETCE-212

P1/2

Q4. Design a rectangular beam section of 300mm width and 535 mm overall depth which is subjected to ultimate moments of (i)150 kNm and (ii) 300kNm. Consider concrete of grade M20 and steel of grade Fe415. **(12.5)**

Q5. Design a simply supported rectangular beam of clear span of 6m and subjected to a superimposed load of 50kN/m at service state. Consider support width of 30cm, concrete of grade M20 and steel of grade Fe415. **(12.5)**

Q6. Design a simply supported one way slab as shown in Fig. It is subjected to live load of 4kN//m^2 and surface finish of 1kN/m^2. Consider concrete of grade M20 and steel of grade Fe415. **(12.5)**



Q7. Design circular column section subjected to ultimate load of 2500 kN. Consider concrete of grade M25 and steel of grade Fe 415. **(12.5)**

Q8. Design a reinforced concrete square footing for a column of section 400 mm x 400 mm which is subjected to a load of 1200 kN at services state. Consider,

Weight of soil, We = 20 kN/m^3
Angle of repose, $\phi = 30^0$
Allowable bearing capacity of soil, q_0 = 150 kN/m^2
Concrete of grade: M 20 and steel of grade: Fe 415 **(12.5)**

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