

(Please write your Exam Roll No.)

Exam Roll No. 0031 8003473

# END TERM EXAMINATION

SIXTH SEMESTER [B.TECH] MAY-JUNE 2016

Paper Code: ETCE-304

Subject: Applications of Remote Sensing  
& GIS in Civil Engineering

Time: 3 Hours

Maximum Marks: 75

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

- Q1 (a) State and explain the components of GIS. (5)  
(b) State the laws pertaining to Thermal IR Remote sensing. (4)  
(c) Differentiate between: (5)  
(i) Satellite images & maps.  
(ii) Geostationary & Sun-synchronous satellites.  
(d) Plot and explain the density vs. Exposure curve. (5)  
(e) A tower was identified on a perfectly vertical photograph and the distance between its top and its bottom was measured to be 14.3 mm and that from the photo centre to the top of the displaced tower was measured to be 85.6 mm. If the flying height of the aircraft is 1500 m above MSL and the base of the building is 400 m above MSL, how tall is the building? (4)  
(f) Define focal length for an analog camera. (2)
- Q2 (a) Explain the working of Global Positioning system. (6)  
(b) Explain the terms: Spatial resolution, pixel size & scale. (6.5)
- Q3 (a) Explain the different categories of Microwave remote sensing. (6)  
(b) What are the alternatives for merging datasets through data fusion? (6.5)
- Q4 Explain various methods of weather analysis, forecasting and Modelling. Comment on the use of Geo-spatial technology in the field of weather analysis, forecasting & modeling. (12.5)
- Q5 (a) How can image enhancement be carried out? Explain. (8.5)  
(b) What are the types of distortions observed in aerial photography? (4)
- Q6 (a) Define spectral signature. How do the wavelengths interact with targets? (6.5)  
(b) Write a note on various available GIS softwares. (6)
- Q7 Write notes on SPOT, IRS and Landsat. (12.5)
- Q8 (a) Explain the principle behind cartographic design. (7)  
(b) Write a note on Object based image classification system. (5.5)

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# END TERM EXAMINATION

SIXTH SEMESTER [B.TECH] MAY-JUNE 2016

Paper Code: ETCE-306

Subject: Quantity Surveying and  
Cost Estimation

Time: 3 Hours

Maximum Marks: 75

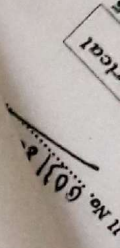
Note: Attempt any five questions including Q.no.1 which is compulsory.  
Assume missing data suitably, if not given.

- Q1 (a) Attempt **any five** parts from the following: (5x5=25)
- (i) Plinth area
  - (ii) Carpet area
  - (iii) Circulation area
  - (iv) Floor area
- (b) Explain the following detailed estimate/
- (i) Individual wall method
  - (ii) Centre line method
- (c) Briefly explain the various methods for calculating depreciation.
- (d) What are the various methods for the calculation of present-day cost.
- (e) Define valuation. What are the different purposes of valuation? Write the different methods of valuation.
- (f) Explain the detailed specifications for any four items of work?
- (g) Explain the different types of estimates & differentiate detailed estimate from cube rate estimate?
- Q2 A three-storied building is standing on a plot of land measuring 800 sq m. the plinth area of each storey is 400 sq m. the building is of rcc framed structure and the future life may be taken as 70 years. The buildings fetches a gross rent of Rs. 50,000 per month. Work out the capitalized value of property on the basis of 6% net yield. For sinking fund 3% compound interest maybe assumed. Cost of land may be taken Rs. 20,000 per sq m. Other data required may be assumed suitably. (12.5)
- Q3 Calculate the annual rent of a building with the following data. (12.5)
- Cost of land = Rs. 20000/-
- Cost of building = Rs. 80000/-
- Estimate life = 80 years
- Return expected = 5% on land 6% on building
- Annual repairs are expected to be 0.7 % of the cost construction and other out goings will be 25% of the gross rent. There is no proposal to set up a sinking fund.
- Q4 Estimate the following quantity for the figure given below? (12.5)
- (a) Earth work excavation
  - (b) PCC
- Q5 Estimate the following quantity for the figure given below? (12.5)
- (a) Brickwork above & below Ground level
  - (b) RCC work

P.T.O.

ETCE-306





- 12

- (12.5)



- (12.5)

FTCE-306



**END TERM EXAMINATION**

SIXTH SEMESTER [B.TECH] MAY-JUNE 2016

Paper Code: ETCE-308

Subject: Open Channel Flow and Numerical Hydraulics

Time: 3 Hours

Maximum Marks: 75

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

Q1 Answer any five questions:

(5x5=25)

- (a) Define specific energy and critical depth, and explain the concept of alternate depth with the aid of specific energy diagram. A rectangular channel of width 2.5 m conveys a discharge of  $5 \text{ m}^3\text{s}^{-1}$  at a depth of 5.0 m. If the kinetic energy correction factor  $\alpha$  is 1.20, compute the specific energy. Show that with  $\alpha$  being 1.0 for the alternate flow, the alternate depth would be 0.413 m.
- (b) A trapezoidal channel of bed width 3.0 m and side slope 1.5 horizontal : 1 vertical carries a full supply of  $10^3 \text{ s}^{-1}$  at a depth of 1.5 m. What would be the discharge at half of full supply depth? Check if a depth of 1.043 m would be required to convey half of the full supply discharge.
- (c) Sketch the Gradually Varied Flow profiles produced on the upstream and downstream of a sluice gate introduced in a steel slope, a mild slope and a horizontal-bed channel. A rectangular channel 15 m wide and 10 m long as a slope of 1 in 10,000 and connects two reservoirs. The water depth at the upstream and the downstream ends of the channel are 1.5 m and 2.0 m respectively. If Manning's roughness coefficient is 0.015, determine the type of Gradually Varied Flow profile.
- (d) A sluice gate in a 3.0 m wide rectangular, horizontal channel releases a discharge of  $18 \text{ m}^3\text{s}^{-1}$ . The gate opening is 0.67 m and the coefficient of contraction is 0.6. What would be the type of hydraulic jump formed when the tailwater is (i) 3.60 m, (ii) 5.00 m and (iii) 4.09 m?
- (e) On what sediment properties the entertainment, transportation and deposition of sediments depend? Define critical velocity for the initiation of sediment motion and write down Lacey's definition of a regime channel in the context of flow in a mobile boundary channel.
- (f) What do you mean by laminar and turbulent diffusion, dispersion, and advection in the context of mixing of pollutants in open channel flow?

- Q2 (a) Using the concept of linear momentum, derive the momentum equation relating the forces acting on a control volume in a steady open channel flow. Hence write an expression of specific force and draw the general shape of a specific force diagram by clearly indicating the location of the critical depth. (4)
- (b) Show that, for a rectangular channel, the specific energy at critical depth is 1.5 times the critical depth. Hence derive an expression relating critical depth to the discharge per unit width, and write the expression of Froude number for a rectangular channel. (4)

P.T.O.

ETCE-308



- (c) For the purpose of discharge measurement in a rectangular channel, the width is reduced gradually from 3.0 m to 2.0 m and the bed is raised by 30 cm at a section. When the depth of approaching flow is 2.0 m, what discharge would be indicated by a drop of 15 cm in water surface elevation at the contracted section? (4.5)

OR

- Q3 (a) Derive Chezy's equation for estimating uniform flow in an open channel and express Chezy's coefficient in terms of Manning's roughness coefficient. (4)
- (b) A rectangular channel with Manning's roughness coefficient 0.015 is laid on a bottom slope of 0.0064. The channel is to carry a discharge of  $20 \text{ m}^3\text{s}^{-1}$ . Check if a width of 2.41 m would be required in order to cause the flow in the channel to be in critical condition. (4)
- (c) What should be the proportion of a hydraulically efficient trapezoidal section with a given side slope and what would be the proportion of the hydraulically most efficient trapezoidal section to convey a given discharge? Design a hydraulically efficient trapezoidal channel section having side slope of 1.5 horizontal : 1 vertical and longitudinal slope of 1 in 2500 to carry a discharge of  $25 \text{ m}^3\text{s}^{-1}$ . Take the value of Manning's roughness coefficient as 0.017. (4.5)
- Q4 (a) Writing clearly the assumptions made, derive the dynamic equation of gradually varied flow in a prismatic channel. (4)
- (b) A vertical sluice gate introduced in a rectangular channel spanning the entire width 3.5 m has the vertical opening section of height 0.75 m. The *vena contracta* of the flow jet issuing under the gate is located approximately 0.75 m downstream of the gate, coefficient of contraction for the gate flow section being 0.62. The channel has a bed slope of 1 in 600, the Manning's roughness coefficient of 0.017, and carries a steady flow of  $15 \text{ m}^3\text{s}^{-1}$ . (8.5)
- (i) Calculate the critical depth and check if the normal depth would be 1.9 m.
- (ii) Calculate the associated critical slope and the Froude Number at the normal depth.
- (iii) Using each of your results for parts (i), and (ii), determine whether the channel is of steep, mild or critical slope.
- (iv) Show whether the flow at and immediately downstream of the *vena contracta* is subcritical, supercritical, or critical.
- (v) Identify the form of flow profile immediately downstream of the *vena contracta* of the gate.

OR

- Q5 (a) Derive expressions for conjugate depths and the energy loss in hydraulic jump in a horizontal, frictionless, rectangular channel. (4)
- (b) Water discharging into a 10 m wide rectangular horizontal channel from a sluice gate is observed to have undergone a hydraulic jump. The flow depth and velocity before the jump are 0.9 m and  $7 \text{ ms}^{-1}$  respectively. Determine: (8.5)
- (i) The flow depth and the Froude number after the jump.
- (ii) The head loss and the energy dissipation ratio, and
- (iii) The wasted power production potential due to the hydraulic jump.
- (iv) Explain the use of hydraulic jump as an energy dissipater.

P.T.O.

ETCE-308

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- Q6 (a) What are the steps involved in the critical tractive force approach of design of stable alluvial channels carrying clear water? (6)  
 (b) Design a stable non-erodable channel to carry  $10 \text{ m}^3\text{s}^{-1}$  clear water through a bed having 10 mm rounded gravel. The longitudinal slope of the channel would be 0.0008 and the side slope would be 2 horizontal : 1 vertical. Adopt the angle of repose of the bed material as  $32^\circ$ . Check if the bed width of the channel would be 12.4 m. (6.5)

OR

- Q7 (a) Write down the equations describing the Kennedy's and the Lacey's theories of design of stable channels and state the differences between the two theories. (6)  
 (b) Design a Lacey's regime channel to convey  $5 \text{ m}^3\text{s}^{-1}$  discharge through sand of mean particle size 0.5 mm. (6.5)
- Q8 (a) What do you mean by the finite volume method of solution of a partial differential equation? What are the steps involved? (4)  
 (b) Derive the one-dimensional steady state diffusion equation starting with the concept of mass balance on an infinitesimal stretch of the system. Identify Fick's first and second law as you proceed with the derivation. (4.5)  
 (c) What do you mean by finite volume method of solution of a convection-diffusion problem? What are the steps involved? (4)

OR

- Q9 (a) An industry discharges an effluent containing 250 ppm of a conservative substance at rate of  $0.1 \text{ m}^3\text{s}^{-1}$  at the side of a river. The river is very wide and straight. The depth of flow, the slope and the manning's roughness coefficient are 5.0 m, 0.0004 and 0.025 respectively. Estimate the width of the plume and the maximum concentration 250 m downstream from the point of discharge. (6.5)  
 (b) Write down the mass-balance equations for the mathematical treatment of the transport of a conservative pollutant in streams. How would the equation change if the pollutant is non-conservative? What are the assumptions made in the case of longitudinal dispersion? (6)

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**END TERM EXAMINATION**

SIXTH SEMESTER [B.TECH] MAY-JUNE 2016

Paper Code: ETCE-310

Subject: Advanced Structural Design

Time: 3 Hours

Maximum Marks: 75

Note: Attempt any five questions including Q.no.1 which is compulsory.  
Assume missing data suitably. Use of IS 1983:2002 & IS 800:2007 is permitted.

- Q1 Answer the following: (5x5=25)
- Discuss general principles of seismic analysis.
  - Explain Lee-McCall System of prestressing in detail. (10)
  - What are various loads acting on Transmission towers?
  - Write design steps for underground rectangular tank.
  - What do you understand by ductile detailing of Building. Explain with neat sketches?

- Q2 (a) What are various advantages and disadvantages of prestressed concrete? (4)
- (b) A prestressed concrete beam of section 200 mm x 300 mm is used over an effective span of 7 m to support an effective load of 5 kN/m, density of concrete is 24 kN/m<sup>3</sup>. Find the followings: (8.5)
- Prestressing force required for zero extreme fibre stresses at centre of span.
  - Prestressing force required for zero Extreme fibre stresses at centre of span, if cable is eccentric at 100 mm from bottom.

- Q3 A prestressed concrete beam of rectangular section 150 mm x 300 mm is prestressed by 7 mm wires located 100 mm from bottom of beam. If wires are initially tensioned to a stress of 1100 N/mm<sup>2</sup>, calculate their stress at transfer and the effective stress after all losses. (12.5)

Given data:	up to time of transfer	Total
Relaxation of steel	35/mm <sup>2</sup>	70 N/mm <sup>2</sup>
Shrinkage of concrete	100 x 10 <sup>-6</sup>	300 x 10 <sup>-6</sup>
Creep coefficient	-	1.6
E <sub>s</sub>	10 kN/mm <sup>2</sup>	
E <sub>c</sub>	31.5 kN/mm <sup>2</sup>	

- Q4 Design following components of an intze tank for 8 lakh litre capacity. (12.5)
- (a) Upper dome (b) Upper ring beam (c) Cylindrical wall
- Q5 (a) What are various types of retaining walls, explain with sketches? (4)
- (b) Find out the section of cantilever retaining wall & check it against overturning for following data. Use M20 & Fe 415. (8.5)

Height of earth embankment	:	3 m above GL
Unit weight of soil	:	18 kN/m <sup>3</sup>
Angle of repose	:	30°
Safe bearing capacity	:	120 kN/m <sup>2</sup>
Coefficient of friction	:	0.5

P.T.O.

ETCE-310

P1/2



Q6 Design a gantry girder of 7 m span for a mill building to carry an electric overhead travelling crane having the following data: (12.5)

- |                           |   |        |
|---------------------------|---|--------|
| 1. Crane capacity         | : | 250 KN |
| 2. Weight of crab         | : | 60 KN  |
| 3. Span of crab b/w rails | : | 2 m    |
| 4. Weight of crane        | : | 200 KN |
| 5. Hook approach          | : | 1.1 m  |
| 6. Wheel base distance    | : | 3 m    |

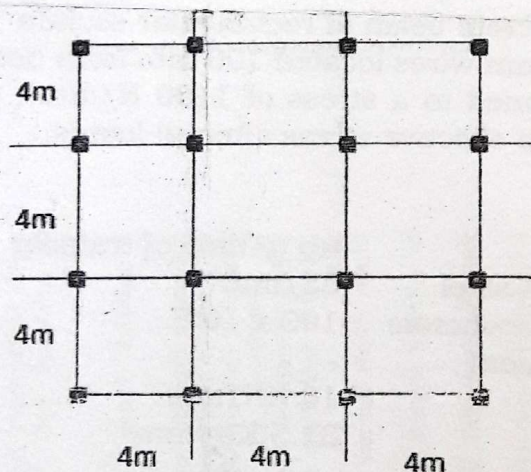
Q7 (a) What is pressed rectangular steel tank & why it is preferred over other steel tanks. (3)

(b) Write a short note on design of box culvert. (3)

(c) Write design steps involved in design of rectangular steel tanks. (6.5)

Q8 Perform equivalent static analysis for a five storey building and calculate storey shear and base shear (plan shown in fig.). (12.5)

- |                          |   |                      |
|--------------------------|---|----------------------|
| Beam size                | : | 300 x 500 mm         |
| Column Size              | : | 400 x 400 mm         |
| Slab thickness           | : | 150 mm               |
| Weight of Brick masonry: | : | 19 KN/m <sup>3</sup> |
| Storey height            | : | 3.5 m                |
| Location of building     | : | Noida                |



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claw load  
= 2

170.5 x 19  
slab wt. 12 KN.  
total load



# END TERM EXAMINATION

SIXTH SEMESTER [B.TECH] MAY-JUNE 2016

Paper Code: ETCE 312

Subject: Transportation Engineering -I

Time : 3 Hours

Maximum Marks : 75

Note: Attempt any five question including Q.No. 1 which is compulsory.  
Select one question from each unit. IRC-37 and 58 are allowed.

Q1. Answer any five:

(5x5=25)

- Write standards for different camber in highway engineering.
- What is grade compensation in high way engineering?
- What are factors on which S.S.D depends?
- What is overtaking zone?
- State the concept of any method of pavement evaluation.
- Why are joints provided in cement concrete road?
- Define the concept of CBR.

## Unit-I

Q2. Briefly describe the process of engineering surveys for a highway alignment through conventional and modern methods. (12.5)

Q3. Calculate the absolute minimum sight distance required to avoid a head on collision of two cars approaching from the opposite directions at 100km/h and 80km/h. Assume a reaction time of 2.5 seconds, coefficient of friction of 0.85 and brake efficiency of 50percent, in either case. (12.5)

## Unit-II

Q4. a) Explain spot speed, running speed, space mean speed, time-mean speed and average speed. (6)  
b) What are various objectives and applications of spot-speed studies? (6.5)

Q5. a) Estimate the basic capacity of traffic lane at a speed of 60kmph. Assume that all the vehicles are of average length 6m. (6)  
b) What are the various types of traffic markings commonly used? What are the uses of each? (6.5)

## Unit-III

Q6. Calculate the stresses in rigid pavement from the following data:  
Thickness of the slab,  $h = 30\text{cm}$   
Size of the slab =  $4.5 \times 3\text{m}$   
Sub-grade CBR = 10%  
Design of wheel load = 5100 kg  
Radius of contact area,  $a = 15\text{cm}$

Find the stresses at interior, edge and corner as per wastergaard's formulas. (12.5)

P.T.O.

ETCE-312



- Q7. a) How will you find the CBR of a subgrade soil in a laboratory? Give a critical appraisal of the CBR method of design of flexible pavement. (6)
- b) What are requirements of good aggregates used in bituminous construction? How do the aggregate properties affect the service behavior of bituminous surfacing? (6.5)

**Unit-IV**

- Q8. Write notes on the following: (4x2=8)
- a) (i) Map cracking (ii) Mud pumping  
(iii) Skidding of pavement surface (iv) Bitumen
- b) State the basic principle of deflection studies using Benkelman beam. (4.5)
- Q9. Discuss the following procedures for flexible pavement evaluation. (12.5)
- Benkelman beam deflection studies
  - Estimation of unevenness index
  - Pavement serviceability index
  - Present serviceability rating

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**END TERM EXAMINATION**

SIXTH SEMESTER [B.TECH] MAY-JUNE 2016

Paper Code: ETIT-302

Subject: Decision Science

Time: 3 Hours

Maximum Marks: 75

Note: Attempt any five questions. All questions carry equal marks.

- Q1 A company possesses two manufacturing plants, each of which can produce three products x, y and z from a common raw material. However, the proportions in which the products are produced are different in each plant and so are the plant's operation costs per hour. Data on production per hour and costs are given below, together with current orders in hand for each product.

Products			
	X	Y	Z
Plant A	2	4	3
Plant B	4	3	2
Orders on Hand	50	24	60

Operating Cost per hour
Rs
9
10

You are required to use the simplex method to find the number of production hours needed to fulfill the orders in hand at minimum cost.

- Q2 What do you understand by measures of Central Tendency? Discuss them with examples giving their merits and demerits.
- Q3 A physician purchases a particular vaccine on Monday of each week. The vaccine must be used within the week following, otherwise it becomes worthless. The vaccine costs Rs. 2 per dose and the physician charges Rs. 4 per dose. In the post 50 weeks the physician has administered the vaccine in the following quantities:

Doses per week:	20	25	40	60
Number of weeks:	5	15	25	5

Determine how many doses the physician should buy every week.

- Q4 The ABC company is faced with four decision alternatives relating to investment in a capital expansion programme. Since these investment are made in future the company foreseen different market conditions as expressed in the form of states of nature. The following table summarizes the decision alternatives the various states of nature and the rate of return associated with each state of nature:

Decision	States of Nature		
	$\theta_1$	$\theta_2$	$\theta_3$
D <sub>1</sub>	17%	15%	8%
D <sub>2</sub>	18%	16%	9%
D <sub>3</sub>	21%	14%	9%
D <sub>4</sub>	19%	12%	10%

P.T.O.

ETIT-302

P.L.



[-2-]

If the company has no information regarding the probability of the occurrence of the three states of nature, give the recommended decision for the decision criteria listed below:

- (a) Maximax
- (b) Maximin
- (c) Minimax regret
- (d) Rational/Laplace/Equally likely.

Q5 Explain the principle of dominance in Game Theory and solve the adjoining game:

8	10	9	14
10	11	8	12
13	12	14	13

Q6 A supermarket has a single cashier. During the peak hours, customers arrive at a rate of 20 customers per hour. The average number of customers that can be processed by the cashier in 24 per hour. Calculate:

- (a) The probability that the cashier is idle.
- (b) The average number of customer in the queuing system
- (c) The average time a customer spends in the system.
- (d) The average number of customer in the queue.
- (e) The average time a customer spends in the queue waiting for service.

Q7 Given the following information:

Activity	0-1	1-2	1-3	2-4	2-5	3-4	3-6	4-7	5-7	6-7
Duration	2	8	10	6	3	3	7	5	2	8

- (a) Draw the arrow diagram.
- (b) Identify critical path and find the total project duration.
- (c) Determine total, free and independent floats.

Q8 The departmental head has four subordinates and four tasks to be performed. The subordinates differ in efficiency and the tasks differ in their intrinsic difficulty. His estimates of the times each man would take to perform each task in given below in the matrix.

Subordinates	Tasks			
	I	II	III	IV
A	8	26	17	11
B	13	28	4	26
C	38	19	18	19
D	19	26	24	10

How should the tasks be allocated to subordinates so as to minimize the total man-hours?

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ETIT-302

P2/2