Heaven's Light is Our Guide

DEPARTMENT OF CIVIL ENGINEERING

RAJSHAHI UNIVERSITY OF ENGINEERING & TECHNOLOGY

B.Sc. Engineering **Third** Year **Even Semester** Examination, 2019

CE 3217

Reinforced Concrete - II

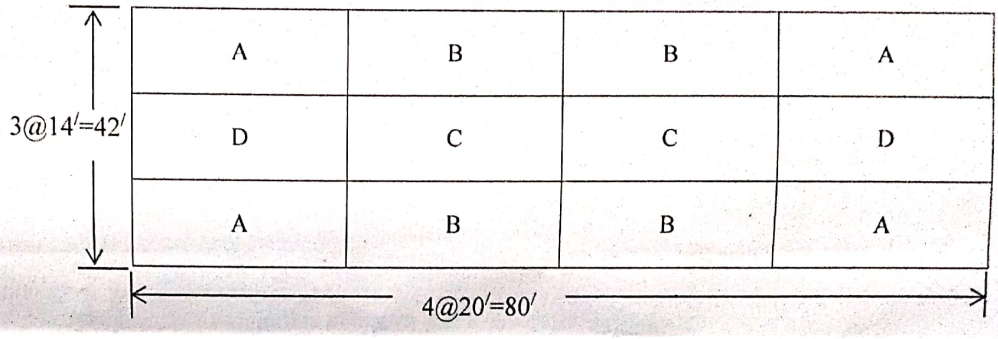
Full marks: 72 **Time: 3 Hours**

N.B:- (i) Answer any **SIX** questions, taking **THREE** from each section.
(ii) Figures in the margin indicate full marks.
(iii) Use separate answer script for each section.
(iv) Assume reasonable value for any data missing.

SECTION-A

Q.1(a) What is two-way slab? Mention the difference between one-way and two-way slabs. 3.00

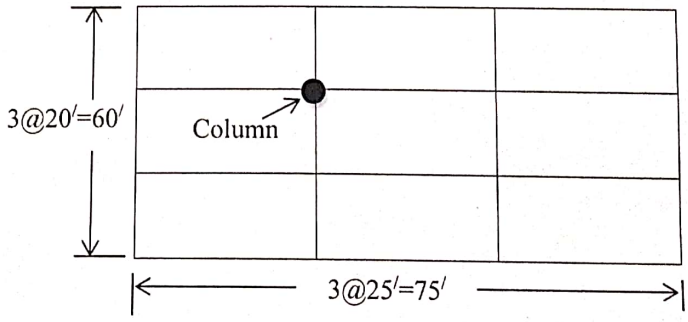
(b) Design slab panel B for the floor system shown in figure below. Assume floor finish = 30 psf, live load = 60 psf, $f_c' = 3$ ksi, $f_y = 60$ ksi and beam width = 12 in. 9.00



Q.2(a) Distinguish among tied, spiral and composite columns. 3.00

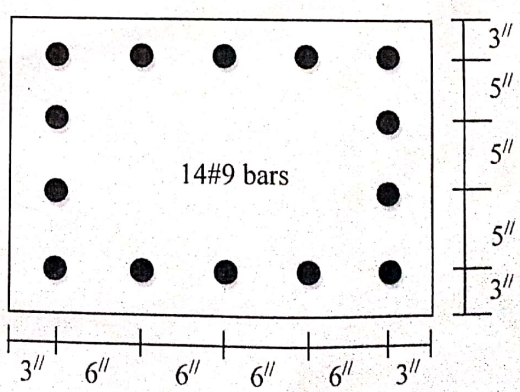
(b) Explain why transverse reinforcement are used in RC columns. 2.00

(c) Design a round spiral column for a six story building as shown in figure below. Assume (i) uniform live load on the floor = 125 psf, (ii) uniform dead load on the floor = 100 psf, the dead load includes weight of all members and floor finishing etc., (iii) $f_c' = 4$ ksi and $f_y = 60$ ksi. Draw the working diagram following code guidelines. Follow USD method. 7.00

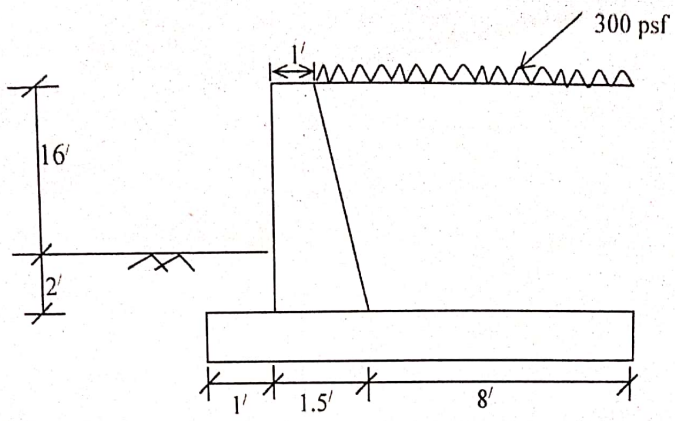


Q.3(a) Write short notes on (i) plastic centroid (ii) interaction diagram (iii) slender column. 3.00

(b) For the tied column section shown in figure below (i) draw the interaction diagram about x-axis (ii) verify if the section allowed to take P = 450 k, at an eccentricity e = 5″. Assume $f_c' = 4$ ksi and $f_y = 60$ ksi. 9.00



Q.4 Design the stem of the retaining wall shown in figure below with $\phi = 30^o$, $f = 0.5$, $\gamma = 120$ pcf, allowable soil pressure = 3.5 ksf, $f_c' = 3$ ksi and $f_y = 50$ ksi. 12.00



SECTION-B

Q.5 (a) Define drop panel. Write the functions of column capital. 2.00

(b) Design an interior panel of flat slab 20 ft by 20 ft for a total load 300 psf including self-weight of slab. Use $f_c' = 3500$ psi and $f_s = 24000$ psi. 10.00

Q.6(a) Describe the upper bound theory. 2.00

(b) Describe the guidelines for establishing axis of rotation and yield lines. 3.00

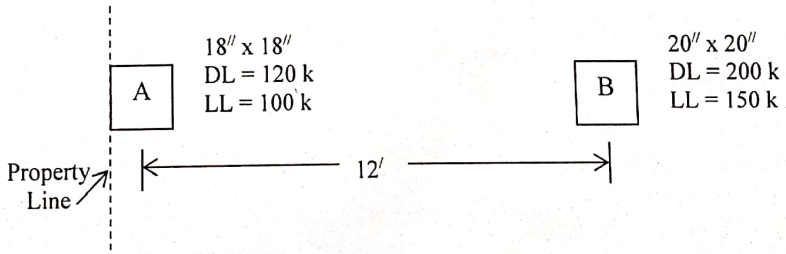
(c) A two-way slab 10 ft by 20 ft is simply supported on all four sides and isotropically reinforced. Determine the required moment resistance of slab to carry a uniformly distributed load w. 7.00

Q.7(a) Write the functions of foundation. 2.00

(b) A 18″ x 18″ column having a load of 300 kips is to be supported by a foundation bed having bearing capacity of 3 ksf. Design a rectangular footing to support this column. Assume $f_c' = 4000$ psi and $f_y = 60000$ psi 10.00

Q.8(a) Explain why the punching shear is considered in the design of column footings but not to wall footings. 2.00

(b) Design a rectangular combined footing for the two columns shown in figure below. Use, $q_a = 5$ ksf, $f_c' = 3000$ psi and $f_y = 60000$ psi. The bottom of the footing is to be 6 ft below the grade. 10.00



****

Heaven's Light is Our Guide

DEPARTMENT OF CIVIL ENGINEERING

RAJSHAHI UNIVERSITY OF ENGINEERING & TECHNOLOGY

B.Sc. Engineering **Third Year Even** Semester Examination, 2019

CE 3213

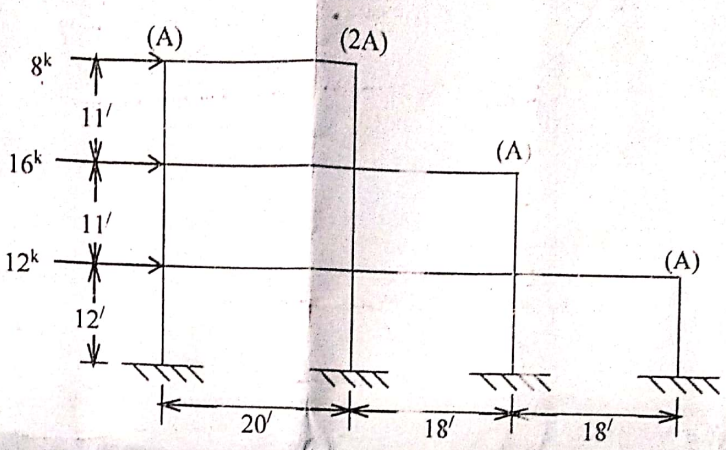
Structural Analysis & Design -II

Full marks: 72 **Time: 3 Hours**

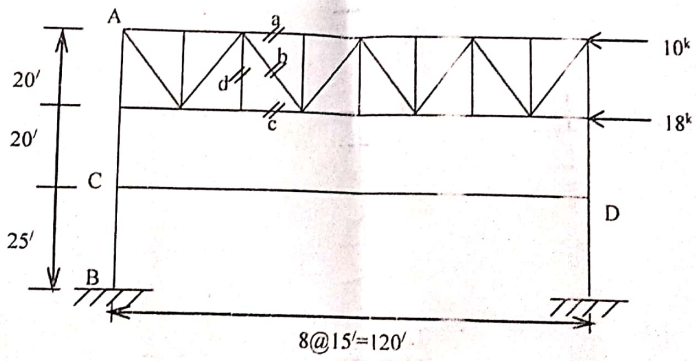
N.B:-
(i) Answer any **SIX** questions, taking **THREE** from each section.
(ii) Figures in the margin indicate full marks.
(iii) Use separate answer script for each section.
(iv) Assume reasonable value for any data missing.

SECTION-A

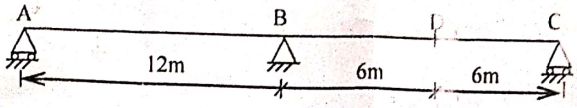
Q.1 Analyze the building frame shown in figure below using Cantilever method. Draw SFD and BMD of all the members. Cross sectional areas of all columns are shown at the top of each column. 12.00



Q.2 Determine the stresses in members a, b, c and d of the portal frame shown in figure below. Also draw SFD and BMD of the members AB and CD. 12.00

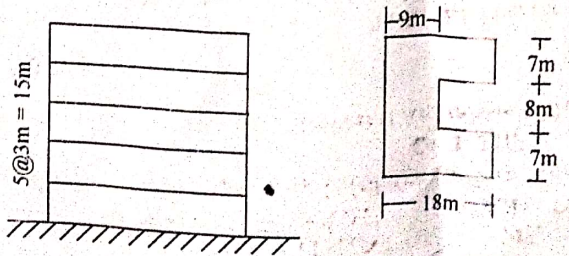


Q.3 Determine the influence line for the shear force and the bending moment at section D of a continuous beam ABDC as shown in figure below. 12.00



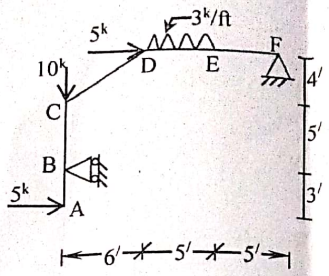
Q.4(a) State Muller – Breslau principle. 2.00

(b) Calculate the design wind force and earthquake force at each floor level for the following five storied building as shown in figure below. (Follow BNBC) 10.00

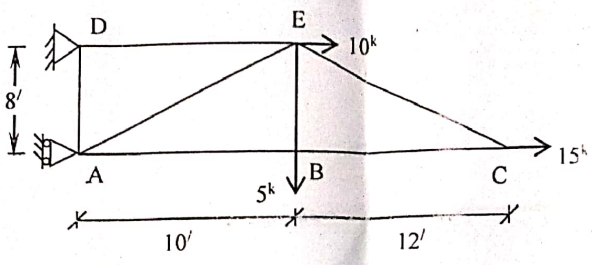


SECTION-B

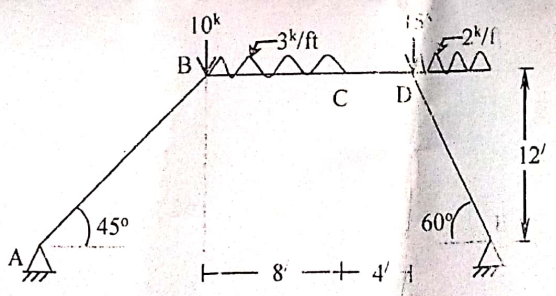
Q.5 Find vertical deflection and horizontal deflection at A for the frame below. 12.00
Use $E = 30 \times 10^3$ ksi, $I = 100$ in^4.



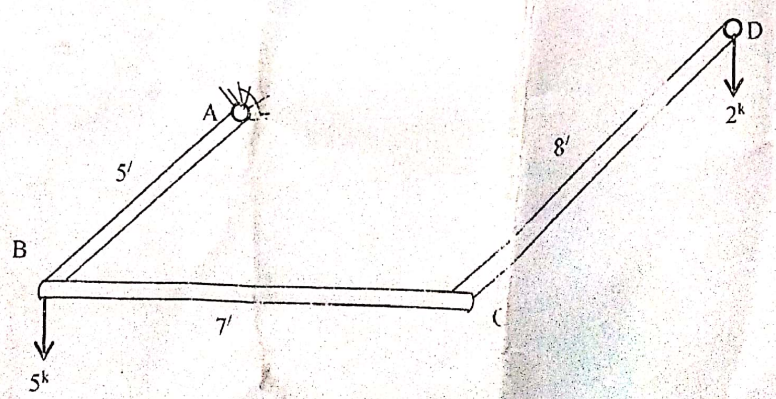
Q.6 Find vertical deflection at C and rotational deflection of member AB of the truss shown below. Cross-sectional area for each member is 3 in^2, $E = 30 \times 10^3$ ksi. 12.00



Q.7 Determine horizontal thrust developed and draw BMD of the two hinged arch shown below. 12.00
[Use $E = 30 \times 10^6$ psi, $I = 500$ in^4]



Q.8 Standard pipe bracket shown below having 90° angle at B and C and located in same plane. Find (i) vertical deflection of C (ii) rotational deflection of D about the axis of CD. 12.00
[$I = 10$ in^4, $G = 12000$ ksi, $E = 30 \times 10^3$ ksi].



Heaven's Light is Our Guide

DEPARTMET OF CIVIL ENGINEERING

RAJSHAHI UNIVERSITY OF ENGINEERING & TECHNOLOGY

B.Sc. Engineering **Third Year Even Semester** Examination, **2019**

CE 3221

Hydrology

Full Marks: 72 **Time: 3 Hours**

N.B.:-
(i) Answer any **SIX** questions, taking **THREE** from each section.
(ii) Figure in the margin indicate full marks.
(iii) Use separate answer script for each section.
(iv) Assume reasonable value for any data missing.

SECTION-A

Q.1 (a) Explain with the help of a neat sketch the hydrologic cycle in nature, indicating its various phases. 4.00

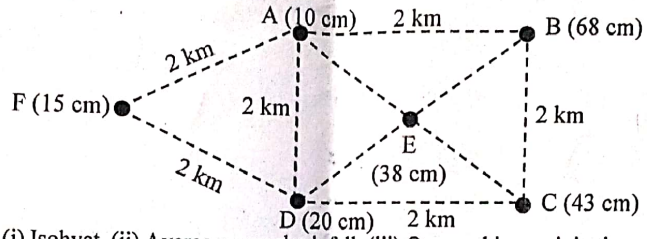
(b) What are the functions of hydrology in water resources development? 4.00

(c) Explain 'hydrologic equation'? What are the basic data required for hydrological studies? 4.00

Q.2 (a) Explain the methodology for rain-gauge installation. 4.00

(b) Write a short note on probable maximum precipitation (PMP). Describe the methods of estimating PMP. 3.00

(c) Find the mean precipitation for the area shown in figure below by Thiessen Polygon method. The area is compound of a square plus an equilateral triangular plot of side 2 km. Rainfall readings are in cm at the various station indicated. 5.00



Q.3 (a) Write short notes on (i) Isohyet, (ii) Average annual rainfall, (iii) Orographic precipitation, and (iv) Rain-gauge density. 4.00

(b) Explain normal ratio method of estimating the missing rainfall data. 4.00

(c) Determine the optimum number of rain gauge station required to install in the watershed if the normal annual rainfall recorded at different stations are 800, 1020, 850, 470, 710 and 390 mm. Assume the allowable error in the mean value is 10%. 4.00

Q.4 (a) Define Unit hydrograph. What are the properties of unit hydrograph? 4.00

(b) Discuss the assumptions and limitations of the unit hydrograph. 4.00

(c) The ordinate of 3-hr unit hydrograph are given as under. Find the ordinates of 9-hr unit hydrograph. 4.00

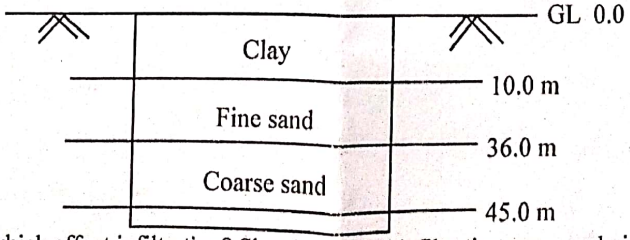
Time (hr)	0	3	6	9	12	15	18	21
3-hr OUH (m^3/s)	0	50	75	150	80	50	30	0

SECTION B

Q.5 (a) Distinguish between (i) Specific yield and specific retention, (ii) Water table aquifer and artesian aquifer, and (iii) Zone of aeration and zone of saturation. 6.00

(b) How will you select the screen length in tube-well construction? 3.00

(c) A bore well log is shown in figure below, and an yield of around 900 lpm is expected. Design location and length of screen (for artesian condition) of the water well with piezometric head 6 m below ground level. 3.00



Q.6 (a) What are the factors which affect infiltration? Sketch a typical infiltration curve and give its equation. 4.00

(b) Explain the method of determining infiltration by Double-ring infiltrometer. 4.00

(c) The total observed runoff volume during a 6-hr storm with a uniform intensity of 1.5 cm/h is 21.6×10^6 m^3. If the area of the basin is 300 km^2, find the average infiltration rate for the basin. 4.00

Q.7 (a) What are the advantages of ground water compared to surface water? 4.00

(b) Derive an expression for steady state discharge of well fully penetrating into unconfined aquifer. 4.00

(c) An artesian aquifer 30 m thick has a porosity of 25% and bulk modulus of compression 2000 kg/cm^2. Estimate the storage coefficient of the aquifer. What fraction of this is attributable to the expansibility of water? 2.1×10^9 kg/m^2 4.00

Q.8 (a) What is ground water recharge? Why artificial recharge is done? Discuss the selection of artificial recharging area. 4.00

(b) Mention various methods of artificial ground water recharge. Discuss the most popular method with advantages. 4.00

(c) Discuss the parameters for water well design. 4.00

Heaven's Light is Our Guide

DEPARTMET OF CIVIL ENGINEERING
RAJSHAHI UNIVERSITY OF ENGINEERING & TECHNOLOGY
B.Sc. Engineering Third Year Even Semester Examination, 2019

CE 3233

Geotechnical Engineering - II

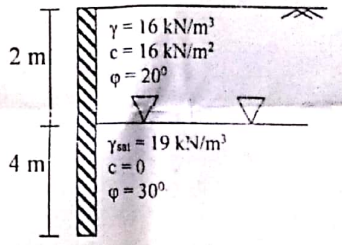
Full Marks: 72 **Time: 3 Hours**

N.B.:-
(i) Answer any **SIX** questions, taking **THREE** from each section.
(ii) Figure in the margin indicate full marks.
(iii) Use separate answer script for each section.
(iv) Assume reasonable value for any data missing.

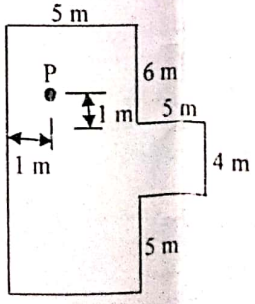
SECTION-A

Q.1 (a) Explain active and passive states with necessary figures. 3.00
(b) Discuss Rankine's theory for passive earth pressure. Derive expression for critical height of an unsupported vertical cut in cohesive soil. 5.00
(c) A counterfort retaining wall of 8 m height retains non-cohesive backfill. The void ratio and angle of internal friction of the backfill respectively are 0.8 and 26^0 in loose state and they are 0.45 and 35^0 in dense state. Calculate and compare active and passive earth pressures in both cases, taking G = 2.67. Give your comments on the results. 4.00

Q.2 (a) Enumerate the assumptions that are made in Rankine's theory. 3.00
(b) Derive the condition for maximum pressure from a sliding wedge by Coulomb's wedge theory. 4.00
(c) A retaining wall with the soil profile is depicted in the figure below. Compute the active earth pressure, draw the active earth pressure diagram, and find the location of active force on the wall. 5.00



Q.3 (a) Describe various approximate methods for the determination of the vertical stress at a point. State the limitations. 6.00
(b) Determine the vertical stress increase at point P of the figure given below at a depth of 4 m. Given, q = 100 kN/m², use equivalent point load method. 6.00



Q.4 (a) Discuss the basis of the construction of Newmark's influence chart. Also state its uses. 5.00
(b) "In actual design, the contact pressure distribution below a foundation is generally taken as uniform"- explain the statement. 3.00
(c) A square foundation (4 m x 4 m) is to carry a load of 35000 kN. Calculate the vertical stress at a depth of 5 m below the centre of the foundation. Also, determine the vertical stress using 1:2 distribution. 4.00

SECTION B

Q.5 (a) What is sub-soil exploration? Discuss the procedure suggested by ASCE to decide the depth of exploration. 3.50

(b) What is N-value? Discuss the importance of N-value in Geotechnical Engineering. 3.50

(c) Calculate the corrected SPT number for the data given below. The GWT is located at a depth of 5.5 m below the EGL. Given that the dry unit weight of sand from 0 to a depth of 5.5 m is 18 kN/m^3, and the saturated unit weight of sand for depth 5.5 m to 10.5 m is 19.5 kN/m^3. The sand is over consolidated coarse sand. Use Skempton's relationship. 5.00

Depth (m)	1.5	3.0	4.5	6.0	7.5	9.0	10.5
N_{60}	5	7	9	8	13	12	14

Q.6 (a) What do you understand by disturbed and undisturbed soil samples? How would you collect undisturbed soil sample from field? 3.00

(b) Discuss with neat sketches the nature of bearing capacity failure of soil. 3.00

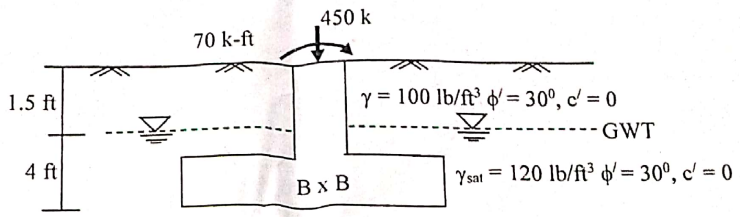
(c) What do you mean by 'Boring log'? What are the information should be presented in a boring log? 3.00

(d) What are the different types of settlement occur below a foundation? Explain each of them. 3.00

Q.7 (a) Write short notes on: (i) CPT, (ii) PMT, and (iii) VST. 3.00

(b) Discuss Meyerhof's bearing capacity theory. How does it differ from Terzaghi's bearing capacity theory? 3.00

(c) A square footing is shown in figure below. Use an FS of 3 and determine the size of the footing. 6.00

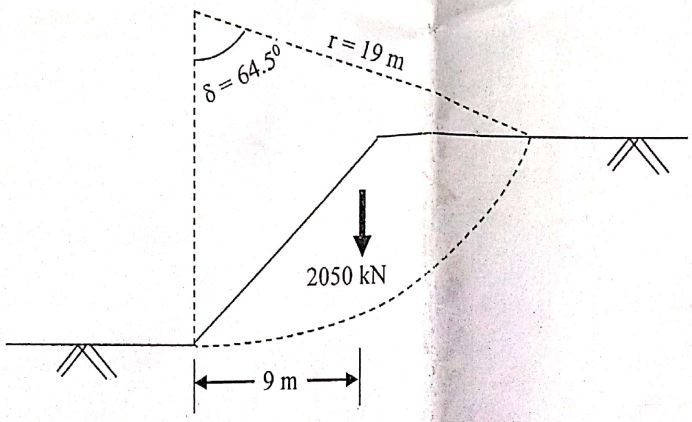


Q.8 (a) Differentiate between rigid footing and flexible footing. 2.50

(b) What are the different types of slope failures? Discuss with neat sketches. 3.00

(c) How will you modify the bearing capacity equation for various locations of ground water table? 2.00

(d) An earth slope of clayey soil is shown in figure below. Determine the factor of safety against sliding along the slip surface. 4.50



Heaven's Light is Our Guide

DEPARTMENT OF CIVIL ENGINEERING

RAJSHAHI UNIVERSITY OF ENGINEERING & TECHNOLOGY

B.Sc. Engineering **Third Year Even Semester** Examination, 2019

CE 3205

Transportation Engineering - I

Full marks: 72 **Time: 3 Hours**

N.B:-
(i) Answer any **SIX** questions, taking **THREE** from each section.
(ii) Figures in the margin indicate full marks.
(iii) Use separate answer script for each section.
(iv) Assume reasonable value for any data missing.

SECTION-A

Q.1 (a)	Write short notes on (i) Traffic (ii) Road user (iii) PCU (iv) Road safety	4.00
(b)	Discuss briefly the road user characteristics and their influence in traffic performance.	4.00
(c)	Explain the terms: (1) DHV and (ii) LOS. Write the objectives of origin and destination study.	4.00
Q.2 (a)	Draw a collision diagram. Discuss the various measures generally adopted to reduce the rate of accident.	6.00
(b)	Write short notes on: (i) Conflicts point (ii) Over-pass (iii) By-pass and (iv) Fly-over.	4.00
(c)	Write the design factors generally considered in highway lighting.	2.00
Q.3 (a)	Briefly discuss the functions of (i) Traffic signs (ii) Traffic signals (iii) Traffic islands (iv) Road marking	4.00
(b)	Draw a full clover leaf grade separated intersection and, write its advantages and disadvantages.	4.00
(c)	Discuss the parking problems in Rajshahi city and suggest some remedial measures.	4.00
Q.4 (a)	Discuss the various measures adopted for the safety of pedestrians.	4.00
(b)	Discuss the well-known traffic management measures.	3.50
(c)	Distinguish between: (i) Hardness and Toughness (ii) Skid and Slip (iii) Cutback and Emulsion	4.50

SECTION-B

Q.5 (a)	Write down the advantages and disadvantages of road transport.	4.00
(b)	Discuss the role of transportation for the development of a country.	4.00
(c)	Discuss the common elements of every transport system.	4.00
Q.6 (a)	What are the objects of highway geometric design? List the various geometric elements to be considered in highway design.	4.00
(b)	Discuss various surveys that are carried out before planning a highway system for a given area.	4.00
(c)	An ascending gradient of 1 in 100 meets a descending gradient of 1 in 120. Design a summit curve for a speed of 100 kmph so as to have an OSD of 470 m.	4.00
Q.7 (a)	Write short notes on: (i) Camber, (ii) Frontage road, (iii) Right of way, and (iv) Off tracking.	4.00
(b)	Derive an expression for finding the SSD at level and at grades.	4.00
(c)	Calculate the safe stopping sight distance for a design speed of 50 kmph for (i) two-way traffic on a two lane road, and (ii) two-way traffic on a single lane road. Assume coefficient of friction as 0.37 and reaction time of driver as 2.5 seconds.	4.00
Q.8 (a)	What do you mean by 'Superelevation'? Write down the steps for practical design of superelevation.	4.00
(b)	Derive an expression for OSD on a highway.	4.00
(c)	Explain with sketches, how obligatory points control the highway alignment.	4.00

The End