L-4/T-1/WRE **Date : 31/01/2012**

BANGLADESH UNIVERSITY OF ENGINEERING AND TECHNOLOGY, DHAKA

L-4/T-1 B. Sc. Engineering Examinations 2010-2011

Sub : **CE 411** (Structural Analysis & Design-III)

Full Marks: 280 Time : 3 Hours

The figures in the margin indicate full marks.

USE SEPARATE SCRIPTS FOR EACH SECTION

SECTION – A

There are **FOUR** questions in this Section. Answer any **THREE**.

Assume reasonable values for missing data (if any). Symbols carry their usual meaning.

1. (a) Define the following terms: **(9)**

   (i) Stiffness

   (ii) Fixed end moments

   (iii) Carry over factors.

   (b) The prismatic beam AB shown in Figure 1 is subjected to end rotation, $\theta_A = 1$ at end A while $\theta_B = 0$ at end B (i) Calculate end moments. M_{AB} and M_{BA} from the basics. (ii) If B end of the member AB is also simply supported calculate M_{AB} for $\theta_A = 1$. **(18)**

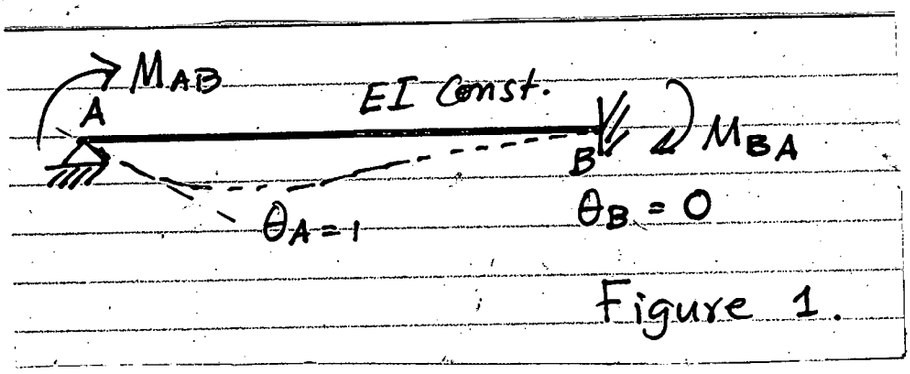

Figure 1.

(c) For the loaded frame shown in Figure 2, find the end moments at A and C. Draw the deflected shape. **(19⅔)**

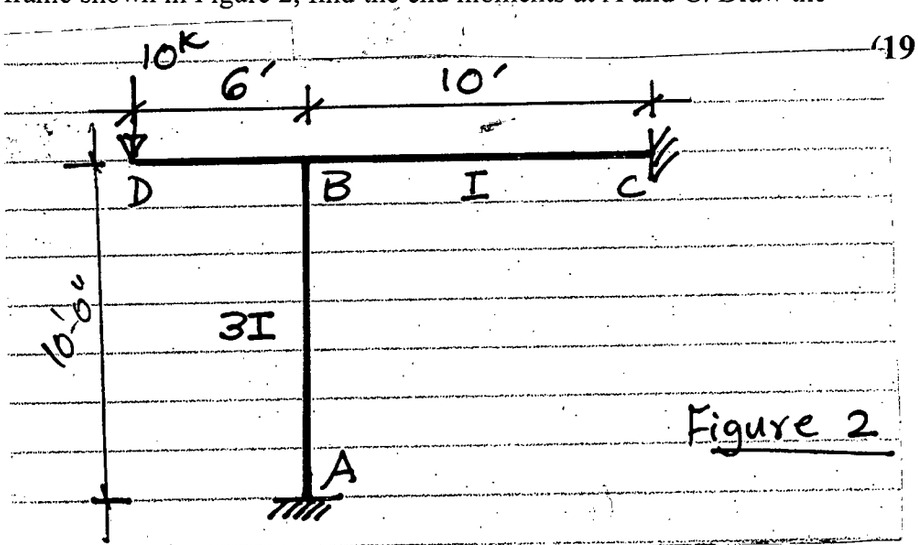

Figure 2

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2. Analyse the frame shown in Figure 3 by moment distribution method. Find all reaction components, draw the moment diagram and sketch the deflected structure. **(46⅔)**

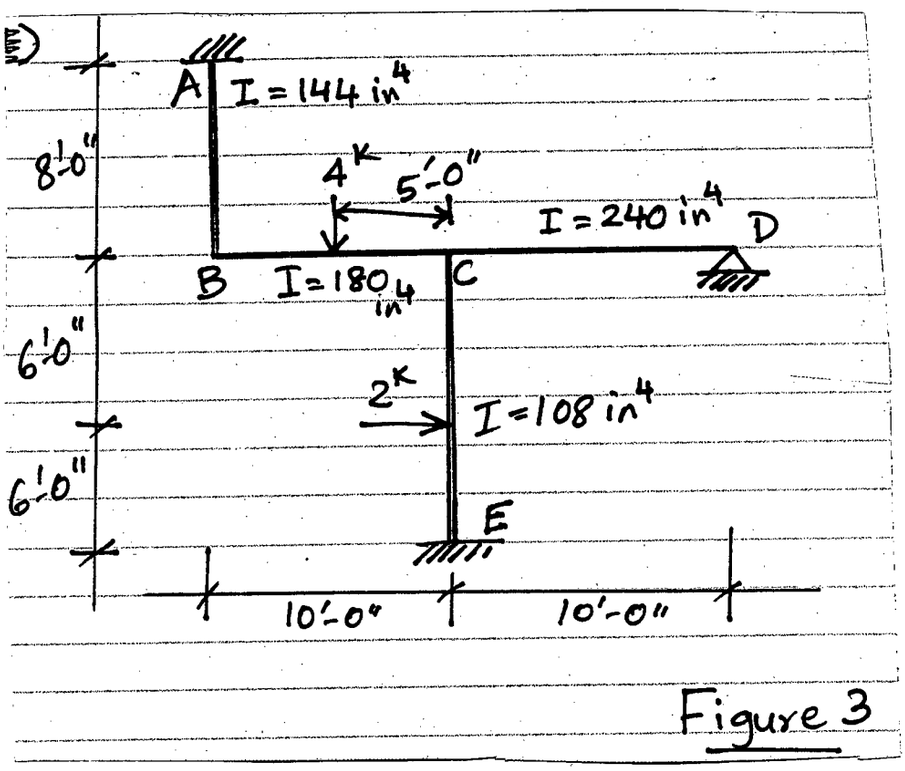

Figure 3

3. (a) Analyse the beam shown in Figure 4 using moment distribution method. Draw bending moment diagram. **(15)**

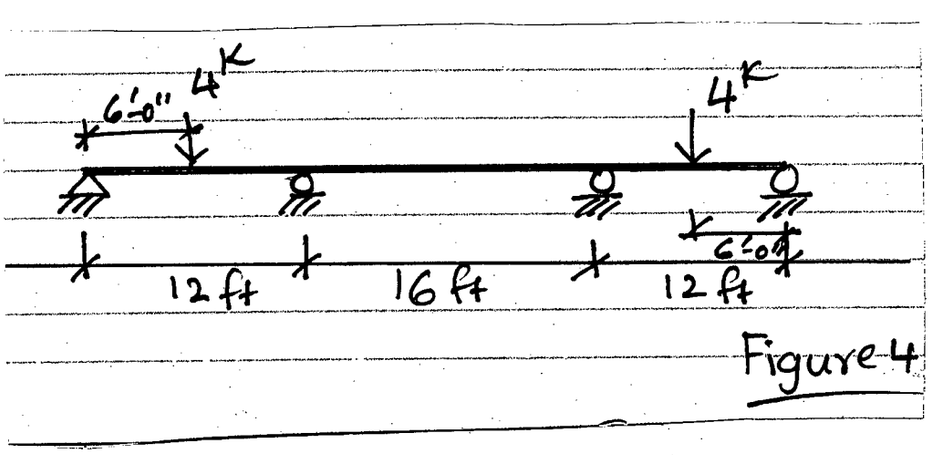

Figure 4

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CE 411

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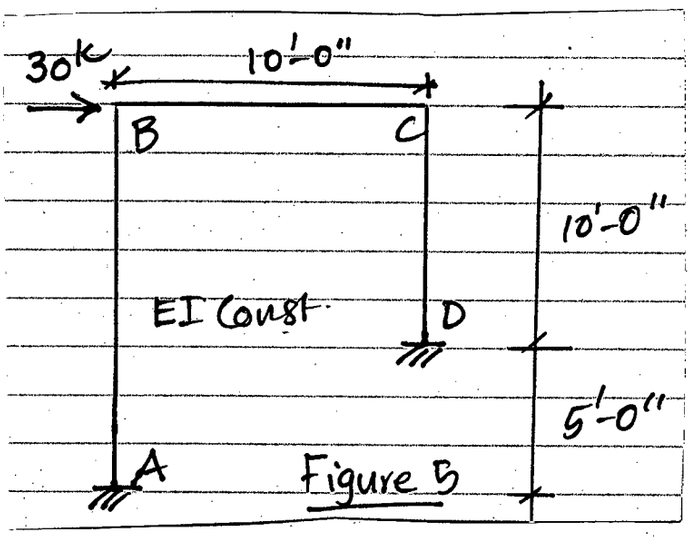
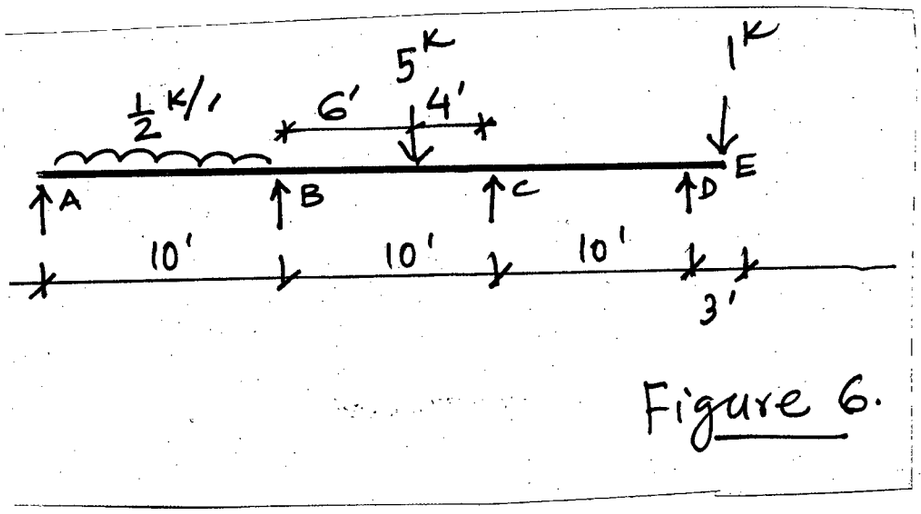
(b) Figure 5 shows a frame of uniform cross section and subjected to a transverse load of 30 kips to the right. Find out the end moments. **(16⅔)**



(c) Derive slope deflection equations. **(15)**

4. (a) In the process of analyzing the continuous beam shown in Figure 6 by slope deflection method write down the member equations for M_{AB}, M_{BC}, M_{CB} and M_{CD}. **(22⅔)**



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CE 411

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(b) Draw influence lines for shear and moment at midspan section of member ab of the rigid frame shown in Figure 7. **(24)**

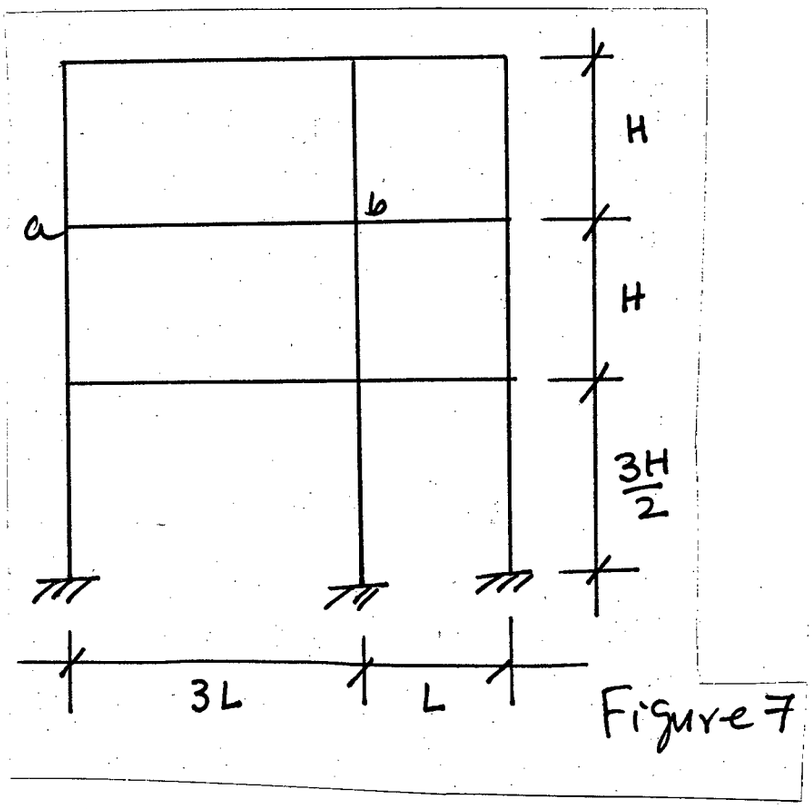

Figure 7

SECTION – B

There are **FOUR** questions in this Section. Answer any **THREE**.

5. (a) Draw bending moment diagram of the beam shown in Fig. 8. Use Flexibility method. Assume EI = constant for the whole beam. **(25)**

(b) Calculate deformation of the free degrees of freedom of the beam shown in Fig. 9. Use stiffness method. Assume EI constant for the whole beam. **(21⅔)**

6. (a) Derive the stiffness matrix for the frame shown in Fig. 10. Consider axial deformation. Take E = 3000 ksi, A = 10 m^2 for all members. **(27)**

(b) Calculate deformation of the free degree of freedom of the frame shown in Fig. 11. Assume EI to be constant for all the members. Ignore axial deformation. **(19⅔)**

Contd P/5

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7. (a) Draw bending moment diagram and the deflection shape of the plane grid shown in Fig. 12. Assume EI = constant. **(25)**

   (b) Derive the stiffness matrix for he frame shown in Fig. 13. Assume A, E, I, G and J to be constant for all members. Consider torsion. **(21⅔)**

8. (a) For the truss shown in Fig. 14, write down the coordinate matrix, connectivity matrix, member property matrix, stiffness matrix of each member and the global stiffness matrix. **(34⅔)**

   (b) Find D.O.K.J. for the structures shown in Fig. 15. Show their directions. Neglect axial and torsional deformation. **(12)**

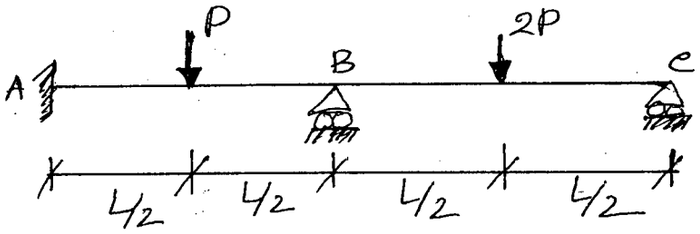

Fig. 8.

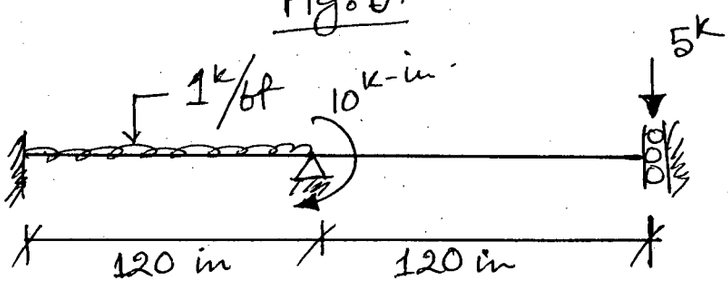

Fig 9

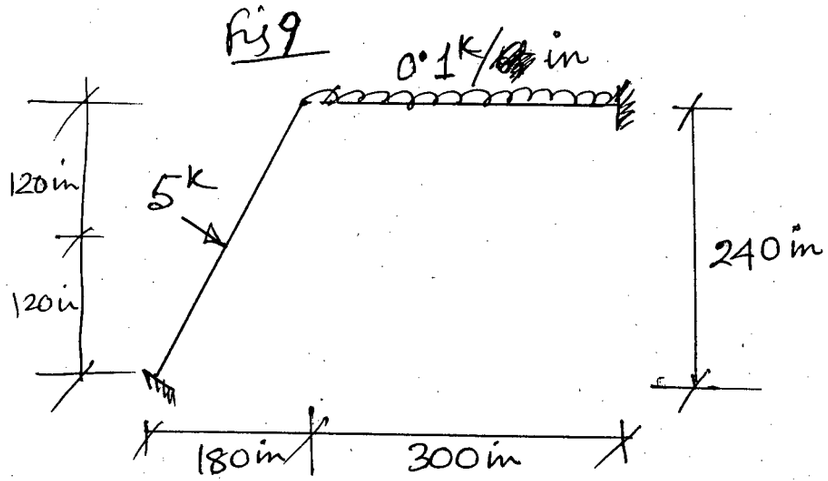

Fig. 10.

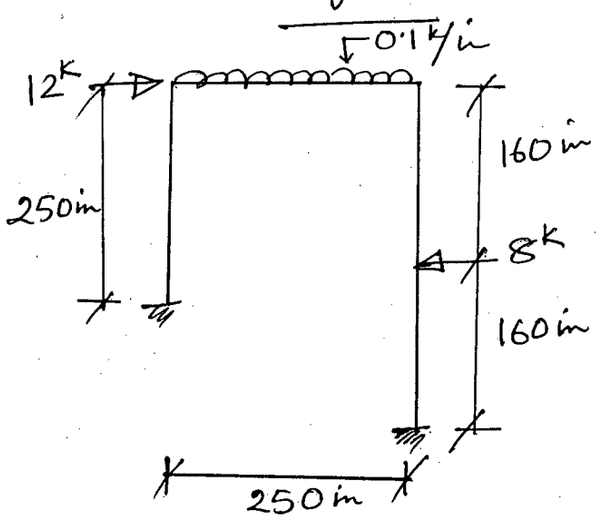

Fig. 11.

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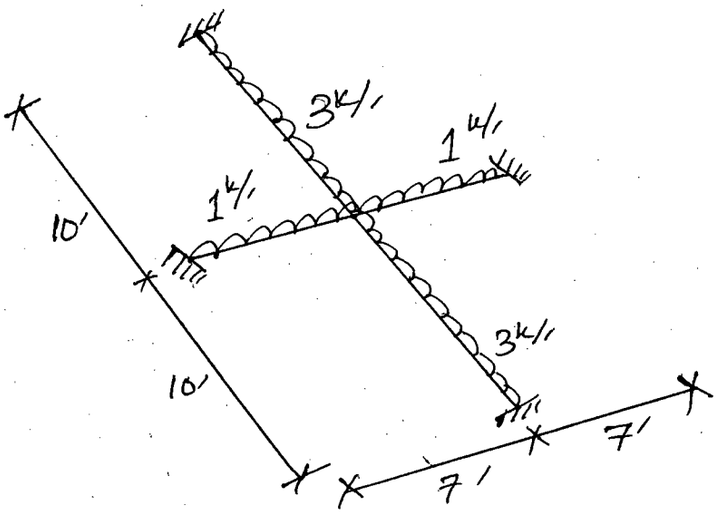


Fig. 12

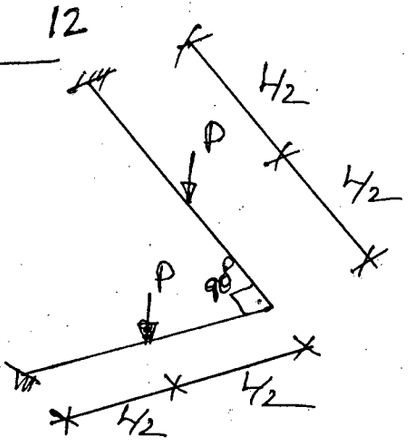
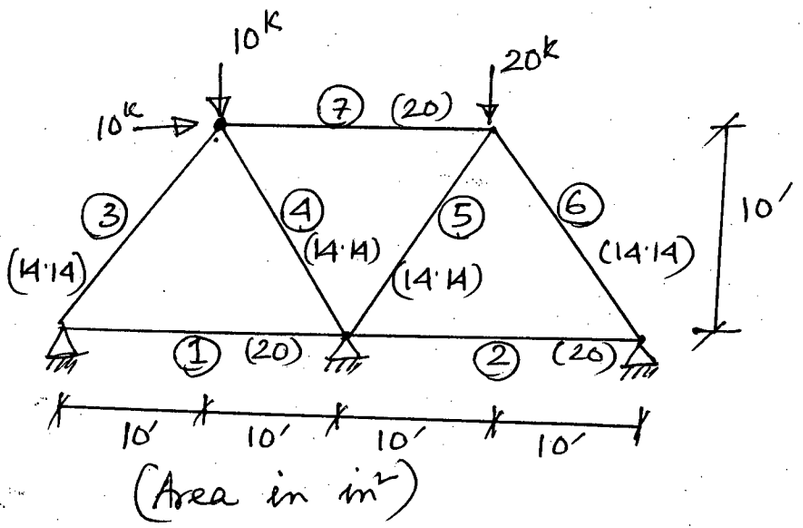
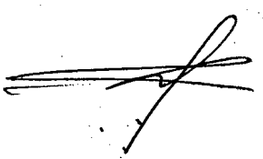


Fig 13.



(Area in in²)

Fig. 14



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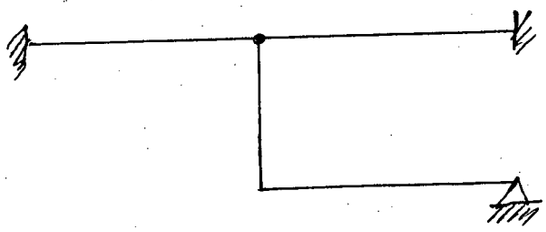
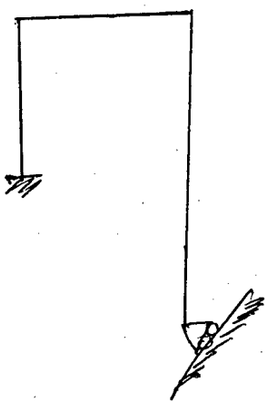
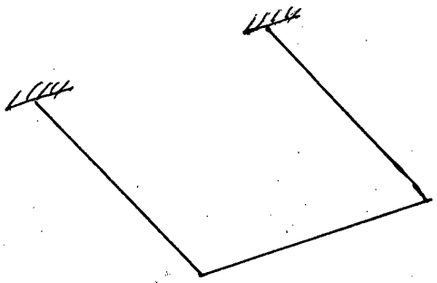


(a)



(b)



(c)

Fig. 15

L-4/T-1/WRE **Date : 18/02/2012**

BANGLADESH UNIVERSITY OF ENGINEERING AND TECHNOLOGY, DHAKA

L-4/T-1 B. Sc. Engineering Examinations 2010-2011

Sub : **WRE 415** (Water Resources Planning and Construction Management)

Full Marks : 210 Time : 3 Hours

The figures in the margin indicate full marks.

USE SEPARATE SCRIPTS FOR EACH SECTION

SECTION – A

There are **FOUR** questions in this section. Answer any **THREE**.

1. (a) Define construction management. Briefly describe the functions of construction management. **(3+8=11)**

   (b) What do you mean by technical specification? Write down a typical index of technical specification for the construction of a large bridge project. **(2+7=9)**

   (c) Write short notes on: **(3×5=15)**

   (i) Prequalification of tenderer

   (ii) Competitively bid contracts

   (iii) Human factor in construction industry

2. (a) What do you mean by planning of manpower in construction industry? Explain briefly. **(9)**

   (b) State the importance of critical path in construction scheduling. Find the critical path from the analysis of the following network diagram (Figure 1). Show the calculations in a table. The numbers shown in brackets indicate activity durations in week. **(2+18=20)**

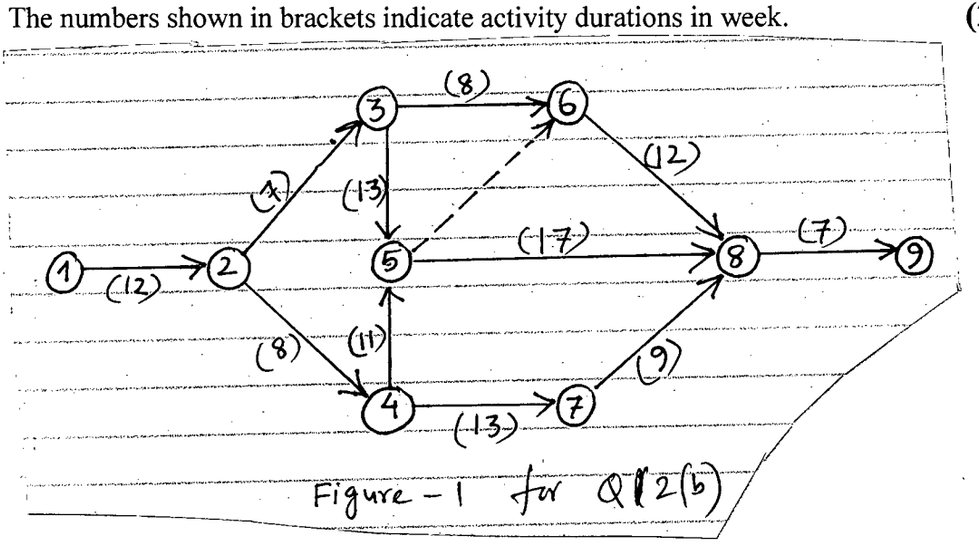


Figure – 1 for Q 2(b)

   (c) Define the following terms: **(3×2=6)**

   (i) Dummy activity

   (ii) Optimistic time estimate

   (iii) Modal time

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3. (a) Explain the necessity of a safety program in construction industry. **(6)**

(b) List the site constraints that influence the selection of construction equipment. **(6)**

(c) Write down the different components of a contract document. **(7)**

(d) A small project consists of activities A through H whose precedence relationship is given below: **(16)**

(i) A, B and C can be started at the same time

(ii) D follows A

(iii) E follows B

(iv) G follows C

(v) Both D and E precede F

(vi) The last activity H is successor to both F and G

The time estimates (duration in weeks) are given below:

Activity	Duration in weeks		
	Optimistic time	Most likely time	Pessimistic time
A	1	1	7
B	1	4	7
C	2	2	8
D	1	1	1
E	2	5	14
F	3	6	15
G	2	5	8
H	3	5	9

Draw the network diagram. Also find the expected duration and variance for each activity. Show the calculations in a table.

4. (a) Suppose two types of crops can be grown in an irrigation project. Relevant data is given below: **(20)**

Item	Crop 1	Crop 2
Water requirement (acre-ft/acre	5	3
Fertilizer requirement (kg/acre)	2	3
Profit (10^3 Tk/acre)	10	8

Note that 16 acre-ft of water and 20 kg of fertilizer are available for the project.

(i) Formulate a linear programming model to determine the acres of land under each crop so that profit is maximized. Solve the LP model by Simplex method.

(ii) Formulate the dual model and hence obtain the dual solution.

Contd P/3

WRE 415

Contd ... Q. No. 4

(b) Given 3 million cubic meter (mcm) of water to be delivered in 1 mcm unit to each of three irrigation projects. Determine the optimal distribution(s) of water if all of the water is to be used. Table below shows the net benefits. **(15)**

Water delivered (mcm)	Net benefit from irrigation (10^6 Tk)		
	Project 1	Project 2	Project 3
0	0	0	0
1	2	3	5
2	5	3	7
3	4	8	5

SECTION – B

There are **FOUR** questions in this section. Answer any **THREE**.

5. (a) Describe the concept of water resources system and state its functions. **(10)**

   (b) Define integrated water resources management and state the different viewpoints and stakeholders of water management that need to be balanced, coordinated and integrated. **(15)**

   (c) Discuss the concept of sustainable development in context of water resources management. **(10)**

6. (a) Each project proposal must pass five feasibility tests, such as engineering feasibility, economic feasibility, financial feasibility, political feasibility and social acceptability. State how each of these feasibilities is ascertained or determined. **(15)**

   (b) Suppose you are conducting a regional navigation implementation plan with two alternatives. *Alternative one* is to construct a ship channel bypassing an unnavigable portion of the river. *Alternative two* is to dredge the river channel, an operation that would have to be repeated annually. Prepare the environmental impact matrices for the two alternatives using each column of the tables to represent a proposed action, and each row to represent potential environmental parameters that are likely to be affected. **(20)**

7. Briefly answer the following

   (a) State the purposes of water resources development and management. **(10)**

   (b) Who are the possible sponsors of a water resources project? Distinguish between the aims and approaches followed by a government sponsor and private venturer in determining the attractiveness of a project. **(10)**

   (c) What professional specialists are needed for water resources planning? **(10)**

   (d) State the advantages of having uniform procedures of project formulation. **(5)**

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8. Two Water Supply Projects A and B are to be compared in terms of their benefit-cost ratios and net benefits (benefits minus costs) on a present worth basis and on an annual basis over a 40 year period of analysis. The applicable discount rate is 5%. Project A provides an initial investment of Tk. 40,000,000 to meet the demands for water for 40 years, and to meet the same demand Project B uses investments in two stages, i.e. invests Tk. 25,000,000 at the beginning of the project and Tk. 30,000,000 at the beginning of the second 20-year period. The following table shows the benefits and costs for Projects A and B. Each amount is an end-of-year value. Which is the more economic project? **(35)**

Data for Question 8

Item	Project A	Project B
Construction cost	Tk 40,000,000	Tk 25,000,000 (1st stage)
		Tk 30,000,000 (2nd stage)
Operations and maintenance	Tk 160,000 per year for 40 years	Tk 100,000 per year for first 20 years
		Tk 220,000 per year for 2nd 20 years
Annual benefits	Tk 2,500,000	Tk 2,500,000
Discount rate	5 percent	5 percent
Economic life	40 years	40 years for each stage
Period of analysis	40 years	40 years

L-4/T-1/WRE **Date : 25/02/2012**

BANGLADESH UNIVERSITY OF ENGINEERING AND TECHNOLOGY, DHAKA

L-4/T-1 B. Sc. Engineering Examinations 2010-2011

Sub : **WRE 417** (Groundwater Engineering)

Full Marks: 140 Time : 3 Hours

The figures in the margin indicate full marks.

USE SEPARATE SCRIPTS FOR EACH SECTION

SECTION – A

There are **FOUR** questions in this Section. Answer any **THREE**.

1. (a) Show that for steady unidirectional flow in a confined aquifer, the head decreases linearly with distance. **(6)**

   (b) Derive the equation for steady state discharge from a well in an unconfined aquifer. State the assumptions made in the derivation. **(8 1/3)**

   (c) A 45-cm well fully penetrates an unconfined aquifer of saturated thickness of 30 m. Under a steady pumping rate for a long time the drawdowns at two observation wells 15 m and 30 m from the well are 5.0 m and 4.2 m respectively. If the hydraulic conductivity of the aquifer is 25 m/day, determine the discharge and drawdown at the pumping well. **(9)**

2. (a) Give a comparison among a hand tubewell, a shallow tubewell and a deep-tubewell. **(6)**

   (b) Discuss the cooper-Jacob method of determining aquifer constant T and S from pumping test data. **(7 1/3)**

   (c) A well pumping at a rate of 2300 m^3/day was shut down after 240 min. There after the residual drawdown was measured with time in an observation well as given below. Calculate the transmissivity of the aquifer. **(10)**

Time since pump shut down, min	1.0	2.0	5	10	20	30	60	100	140	180
Residual drawdown, m	0.9	0.8	0.7	0.56	0.55	0.38	0.28	0.21	0.17	0.14

3. (a) Write short notes on: **(3×4=12)**

   (i) Cable tool method of well drilling

   (ii) Well development

   (iii) Well rehabilitation

   (b) Preliminary test shows that a well can yield 300 lpm from a contained aquifer situated between 90-110 m below GL. The aquifer sand has D_{10} = 0.12 mm, D_{50} = 0.32 mm and D_{60} = 0.36 mm. (i) Determine the length of the well screen if the diameter and effective open area are 20 cm and 15% respectively, (ii) Design the gravel pack and determine the slot size of the screen. **(11 1/3)**

Contd P/2

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4. (a) What are the sources of saline water in aquifers? Show that in an unconfined coastal aquifer, salt water occurs at a depth below sea level of about 40 times the height of the fresh water above sea level. **(11)**

   (b) Enlist the sequence of activities preceding start of a groundwater management investigation. **(6)**

   (c) Briefly discuss the feasibility study for groundwater management. **(6 1/3)**

SECTION – B

There are **FOUR** questions in this Section. Answer any **THREE**.

5. (a) Briefly describe the vertical distribution of subsurface water **(8)**

   (b) Define aquifer. Classify aquifers. **(5 1/3)**

   (c) Define: (i) Storage coefficient (ii) Specific retention (iii) field capacity (iv) Spring (v) Intrinsic permeability. **(10)**

6. (a) What is ground water tracer? Write down the properties of ideal tracer. **(6)**

   (b) An anisotropic aquifer has three different layers. The thickness of the top, middle and bottom layers are 12 m, 15 m and 5m, respectively. The hydraulic conductivities of the top middle and bottom layers are 5 m/d, 0.05 cm/s and 2 m/d, respectively. Determine the equivalent horizontal and vertical hydraulic conductivities. **(5 1/3)**

   (c) Briefly describe water quality criteria. **(6)**

   (d) Write short note on physical analysis and biological analysis of groundwater. **(6)**

7. (a) What are the purposes of artificial ground water recharge? **(5 1/3)**

   (b) What do you understand by recharge mounds? If water is spread in a square basin 500 ft on a side at a uniform rate of 0.052 cm/s, what will be the height of the ground water mound at the edge of the basin after 1 month? Given, hydraulic conductivity = 3×10^{-5} m/s, depth of the aquifer = 700 ft, Storage coefficient = 0.20. Relevant chart is provided in Figure 1. **(10)**

   (c) Write short note on fluctuations of ground water due to evapotranspiration. **(8)**

8. (a) Briefly describe the time variations of ground water levels. **(6)**

   (b) What do you understand by hardness of water? A sample of water contains 0.01 gm/l and 0.023 gm/l of Calcium and Magnesium, respectively. Classify the water. **(6)**

   (c) Mention the importance of unsaturated flow in groundwater hydrology **(4 1/3)**

   (d) What are the artificial methods of ground water recharge? Describe any three of them. **(7)**

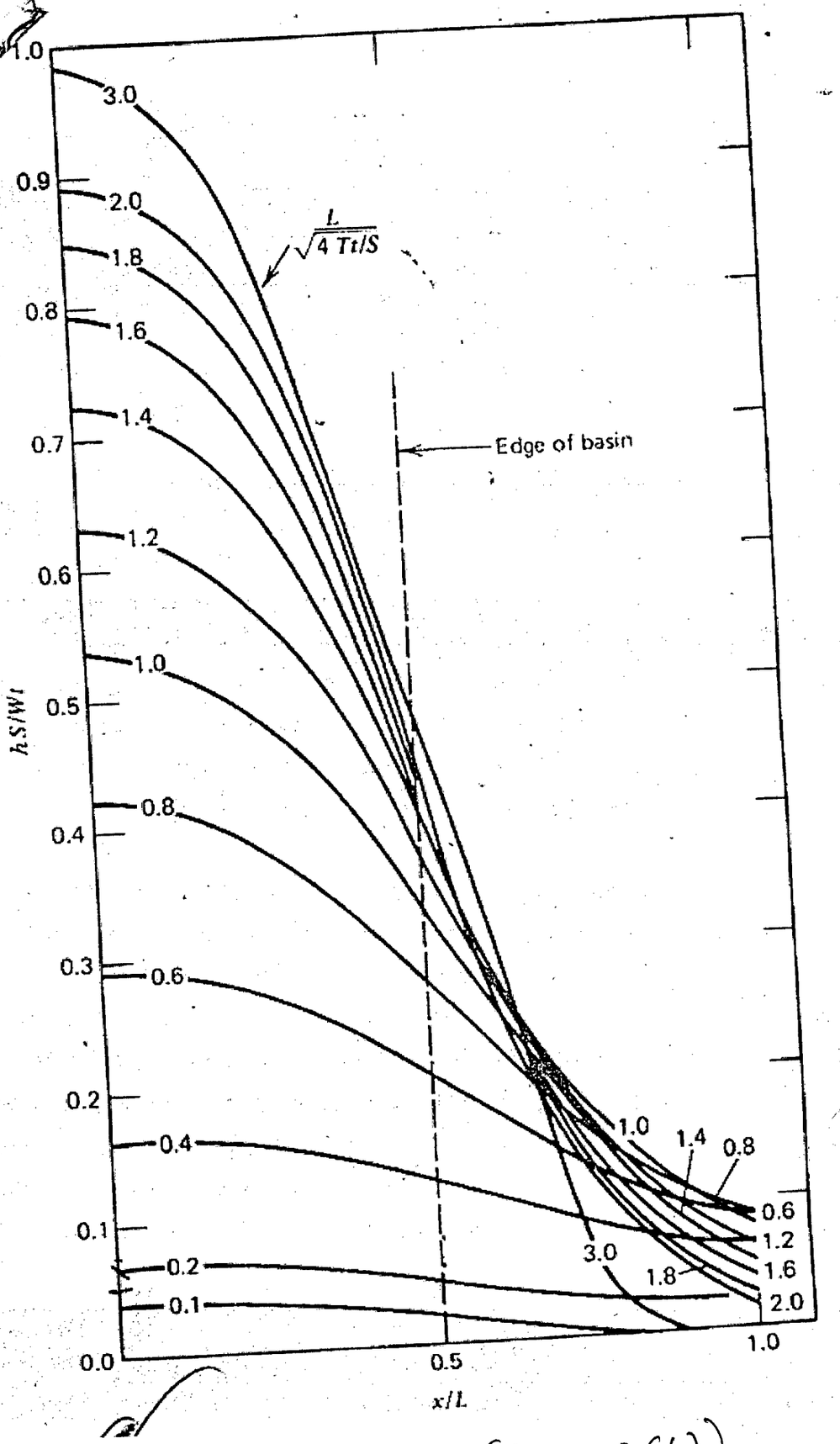

Figure-1 (for Q-3(b))

L-4/T-1/WRE **Date : 11/03/2012**

BANGLADESH UNIVERSITY OF ENGINEERING AND TECHNOLOGY, DHAKA

L-4/T-1 B. Sc. Engineering Examinations 20010-2011

Sub : **WRE 419** (Irrigation and Drainage Engineering)

Full Marks : 210 Time : 3 Hours

USE SEPARATE SCRIPTS FOR EACH SECTION

The figures in the margin indicate full marks.

SECTION – A

There are **FOUR** questions in this Section. Answer any **THREE**.

1. (a) Distinguish between mass water content and volumetric water content and derive a relationship between them. **(6)**

   (b) Define and show in a diagram the different classes of soil water. Also indicate their availability their availability to plants and drainage characteristics. **(8)**

   (c) Give a comparison between Time Domain Reflectrometry and Neutron method of soil moisture measurement. **(6)**

   (d) Consider a vertical soil column of 0.25-square meter cross-sectional area and 1 m long. If 0.4 m^3 of water percolate through the column in 36 h from a supply pipe which permits the water to flow onto the soil just fast enough to keep the soil surface covered, what is the hydraulic conductivity in m per day? **(7)**

   (e) The field capacity and permanent wilting point of a soil are 27% and 12% respectively. The dry density of the soil is 1.35 g/cc and effective root zone depth is 80 cm. Determine the net depth of irrigation and sizes of flow to irrigate 5 ha in 8 h, if the depletion of available water prior to irrigation was 50%. Assume that the water application loss is 30%. **(8)**

2. (a) What are the factors affecting consumptive use? Briefly describe with sketches the different types of lysimeter used to determine consumptive use of a crop. **(12)**

   (b) Define water-application, water-storage and water-distribution efficiencies. Explain why all these three efficiencies are used to evaluate the field irrigation practices. **(11)**

   (c) Wheat is to be grown at certain place, the useful data of which are given below. Determine the seasonal consumptive use and field irrigation requirement if the water-application loss is 30%. Make use of Blaney-Criddle equation and assume that the crop factor is 0.85. **(12)**

Month	Mean temperature °C	Percent day time, hr	Effective rainfall, cm
November	17.5	7.3	1.8
December	16.0	7.2	1.4
January	14.2	7.4	3.0
February	14.5	7.3	2.5

3. (a) What are the salient points of difference between (i) Cheek flooding and basin flooding (ii) furrow irrigation and subirrigation? **(8)**

(9)

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(b) "Sprinkler irrigation is an excellent method but not widely used in our country" Explain".

(c) Write notes on (i) on-farm water distribution (iii) irrigation scheduling. **(10)**

(d) An area of 0.8 has was irrigated with a flow of 30 l/s in 8 hours. Depth of root zone was 1 m and available water holding capacity of the soil was 15 cm/m. Irrigation water was applied when 50% of available water was depleted. Determine the water-storage efficiency if the water application efficiency was 60%. **(8)**

4. (a) Give a layout of diversion head works and write down the functions of each component. **(10)**

(b) Define "flexibility" and "sensitivity" as applied to modules and derive a relationship between them. **(8)**

(c) What are the purposes of measuring irrigation water? State the rules for setting and operating weirs to measure irrigation water. **(9)**

(d) A pump lifts 250 m^3 of water per hour against a total head of 12 m. Compute the cost of energy in a month if the pump is operated 15 hours a day and electric cost is Tk. 3.5 per unit. Assume that the efficiencies of pump and motor are 70% and 90% respectively. **(8)**

SECTION – B

There are **FOUR** questions in this Section. Answer any **THREE**.

5. (a) Discuss the importance of irrigation. **(5)**

(b) Write short notes on (i) Leaching, (ii) Disadvantages of irrigation, (iii) Intensity of irrigation. **(15)**

(c) Discuss the quality of irrigation water based on its salt concentration. **(5)**

(d) The cultureable command area for a distributary is 15000 ha. The intensity of irrigation for wheat is 40% and for rice is 15%. If the total water requirement of the two crops are 37.5 cm and 120 cm and their periods of growth are 160 days and 140 days respectively, determine the outlet discharge from average demand consideration. **(10)**

6. (a) Mention the major causes of flood in Bangladesh. **(5)**

(b) What are the advantages you expect if the irrigation canal is to be lined? **(10)**

(c) Design a concrete lined irrigation canal to carry a discharge of 200 cumec at a slope of 1 in 5000. The side slope of the channel 1: 1 and Manning's coefficient may be taken as 0.014. Assume, the limiting velocity in the channel as 2 m/sec. **(15)**

(d) Compare briefly the silt theories of Kennedy and Lacey. **(5)**

7. (a) With neat sketch, show the layout of canal system. **(5)**

(b) What is waterlogging? Write down the basic causes of waterlogging. **(5+5)**

(c) Write short notes on (i) Ill effects of waterlogging, and (ii) Leaching requirement. **(10)**

Contd P/3

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Contd ... Q. No. 7

(d) In a tile drainage system, the drains are laid with their centres 1.5 m below the ground level. The impervious layer is 9.0 m below the ground level and the average annual rainfall in the area dis 80 cm. If it is desired to keep the highest position of the water table to 1 m below ground level, determine the spacing of the drain pipes. Coefficient of permeability may be taken as 0.001 cm/sec. **(10)**

8. (a) What is meant by C2 - S2 water? Discuss its usefulness for irrigating fine textured soil. **(3+3)**

(b) Design an earth canal section using Kennedy's theory for the data given below **(15)**

Canal discharge = 40 m^3/s

Canal bed slope = 1 in 5250

Critical velocity ratio = 1.085

Manning's n = 0.021.

(c) How can the irrigation water be scientifically managed and help in improving water logging problem? **(6)**

(d) Explain various types of canal seepage losses. **(8)**

L-4/T-1/WRE **Date : 03/03/2012**

BANGLADESH UNIVERSITY OF ENGINEERING AND TECHNOLOGY, DHAKA

L-4/T-1 B. Sc. Engineering Examinations 2010-2011

Sub : **WRE 427** (GIS and Remote sensing)

Full Marks: 140 Time : 3 Hours

The figures in the margin indicate full marks.

USE SEPARATE SCRIPTS FOR EACH SECTION

SECTION – A

There are **FOUR** questions in this Section. Answer any **THREE**.

1. (a) Define Geographic Information system and hence explain --- "GIS is a multidisciplinary science." **(5 1/3)**

   (b) Describe different types of GIS data with proper example. **(9)**

   (c) Briefly explain Military grid coordinate system. Show the location '30 PRG 4620' diagrammatically using this system. **(9)**

2. (a) What is map projection? Classify map projection based on orientation. **(6 1/3)**

   (b) Write down the advantages and disadvantage of raster data structure. A raster chain coded data structure for a lake have been found as follows- **(8)**

   3, 8 1
   0, 2 1, 2 0, 6 1, 3 2, 1 1, 2 2, 1
   3, 1 2, 3 1, 1 2, 1 1, 2 2, 1 3, 9

   1, 12 2
   0, 2 1, 1 2, 1 3, 1

   Prepare the entity model for the lake using 12 × 12 grid cell.

   (c) Discuss a vector GIS data model to represent surface. Prepare a topologically coded network and polygon file for the data structure shown in Figure 1. **(9)**

3. (a) How control points are selected in digitizing process? **(5 1/3)**

   (b) Describe the area measurement technique in raster data structure. Two raster maps – a land map and a flood map of the same area are given in Figure 2. Prepare a new map showing the low lands affected by severe flood. **(6)**

   (c) Discuss the attribute errors in raster data. Figure 3 shows some examples of spatial errors present in a vector data. Identify and enlist the errors and discuss the possible reasons of such errors. How you can detect and edit such errors? **(12)**

Contd P/2

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4. (a) Explain the processes involved in transformation of GIS data. **(5 1/3)**

(b) What is meant by aspatial queries? The forest map and water body map of the same area given in Figure 4. Using queries operation, prepare and explain – **(8)**

(i) An overlay map showing all the areas of both input map

(ii) An overlay map of forest and non-forest areas within water body

(iii) An overlay map showing the water body in the forest area.

(c) What are the common raster compaction models in GIS? For the raster data structure shown in Figure 5, prepare compaction codes using Block coding and Quad trees. Black cells represent water bodies. **(10)**

SECTION – B

There are **FOUR** questions in this Section. Answer any **THREE**.

5. (a) Explain the process of remote sensing technique with a suitable sketch. **(6 1/3)**

(b) Compare ideal remote sensing with real remote sensing **(5)**

(c) Define (i) Plan of polarization (ii) Spectral radiance (iii) Radiometry (iv) Thermal Infrared (v) Mie scattering **(8)**

(d) Discuss the interaction of electromagnetic energy in the atmosphere with neat sketch. **(4)**

6. (a) Discuss (i) Blackbody radiation by Plank's law (ii) the sun and earth as black bodies **(3+4=7)**

(b) Emissivity depends on which factor? show spectral emissivity for a black body, grey body and selective radiator with neat sketch. **(4)**

(c) Show spectral reflectance curves for vegetation, soil and water. Discuss the salient features of the curves. **(6 1/3)**

(d) What is Atmospheric window? Write down the energy balance equation and note the two concerning points. **(2+4=6)**

7. (a) What are orbital elements? Write the typical attitude measurement sensors. **(3 1/3)**

(b) Define (i) Platform (ii) GPS control station **(3)**

(c) Write short notes on (i) Landsat satellite (ii) Geosynchronous orbit. **(6+3=9)**

(d) What are the various steps of digital image processing in Remote Sensing? Discuss briefly. **(8)**

8. (a) Explain the following terms with sketches where necessary: **(6)**

(i) Ground Swath (ii) IFOV (iii) Optical sensor (iv) Spatial resolution

(b) Compare the dwell time for a cross-track and along-track scanner with typical example. **(6)**

(c) Write the spectral and radiometric characteristics of an optical sensor. **(5 1/3)**

(d) Show different types of scanning systems with neat sketch. **(6)**

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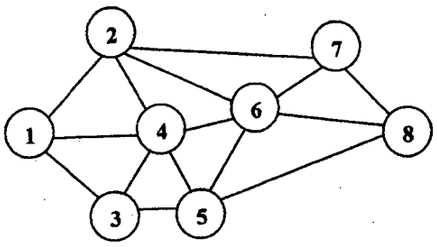

Figure 1 for Ques. No. 2(c)

1	1	1	1	1	1	3	3
1	1	1	1	3	3	3	3
1	1	3	3	3	3	3	3
1	3	3	3	3	3	3	3
1	1	3	3	3	3	3	3
2	2	2	2	2	3	3	3
2	2	2	2	2	2	3	3
2	2	2	2	2	2	2	3

1 = High land
2 = Medium land
3 = Low land

9	9	9	9	9	9	9	9
9	9	9	9	9	9	9	9
9	9	9	9	9	9	9	8
9	9	9	9	9	9	8	8
9	9	9	9	9	8	8	8
9	9	8	8	8	8	8	8
8	8	8	8	8	8	8	8
8	8	8	8	8	8	8	8

8 = Normal flood
9 = Severe flood

Figure 2 for Ques. No. 3(b)

Figure 3 for Ques. No. 3(c)

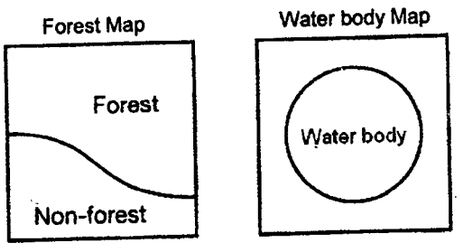

Figure 4 for Ques. No. 4(b)

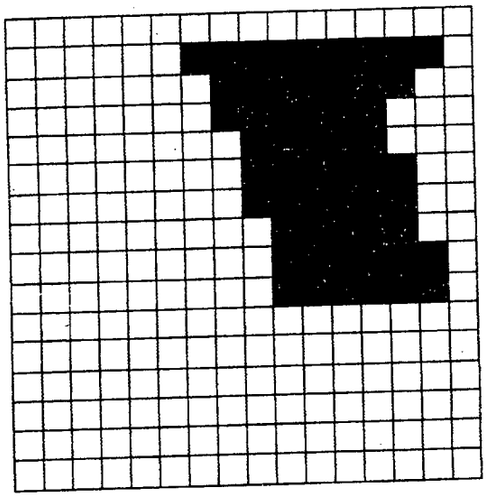

Figure 5 for Ques. No. 4(c)