BANGLADESH UNIVERSITY OF ENGINEERING AND TECHNOLOGY, DHAKA

L-4/T-1   B. Sc. Engineering Examinations 2012-2013

Sub : **CE 425** (Structural Analysis and Design II)

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) Prove that a moment applied at one end of a prismatic beam, the other end being
     fixed, will cause a moment half as large and of opposite sign at the fixed end.   **(5)**

     (b) What is the distribution factor of the unbalanced moment to the members meeting at
     a joint.   **(5)**

     (c) Distribute moment and draw shear and moment diagrams for the continuous beam
     shown in Fig. 1. E is constant for all members.   **(25)**

2.   Determine the final member-end moments for the frame shown in Fig. 2. E is constant
     for all members.   **(35)**

3.   (a) Derive the displacement transformation matrix and force transformation matrix for a
     truss element. Prove that, member stiffness matrix in global co-ordinates for a truss
     element is $K = T^T kT$, where symbols have their usual meanings.   **(17)**
     Also, write **K** (member stiffness matrix in global co-ordinates) in the final matrix form.

     (b) Determine the structure stiffness matrix for the truss shown in Fig. 3. A & E is
     constant for all members and neglect flexural effect.   **(18)**

4.   (a) Determine the reactions at supports of the beam shown in Fig. 4 by stiffness method.
     Both members have equal E & I.   **(30)**

     (c) What is the difference between Force Method of analysis and Displacement Method
     of analysis for indeterminate structures?   **(5)**

CE 425/WRE

SECTION – B

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

5. (a) Analyze the truss in Fig. 5 by the consistent deformation method (EA = constant for all the bars). **(30)**

   (b) State the Müller Breslau Principle. **(5)**

6. (a) Draw qualitative influence lines for bending moment at A,B shear force at C and reaction at A of the continuous beam in Fig. 6. **(8)**

   (b) Compute the force in the tie rod (Fig. 7) considering the effect of both the axial force and bending (E is constant). **(27)**

7. (a) For the frame in Fig. 8, draw qualitative influence lines for (i) maximum negative bending moment at B of the beam BC (ii) maximum positive bending moment at P and (iii) maximum axial force in column BM. Show the corresponding uniformly distributed live load loading pattern for each of them. **(10)**

   (b) Find the reactions due to a vertical settlement of 7 mm at the support B of the beam in Fig. 9. $E = 220 \times 10^6$ kN/m^2 and $I = 160 \times 10^{-6}$ m^4 for the beam. **(25)**

8. (a) Show the two possible primary (released) structures and redundants for the structures in Fig. 10. **(6)**

   (b) Analyse the frame in Fig. 11 by the consistent deformation method and draw the bending moment diagram (EI is constant). **(29)**
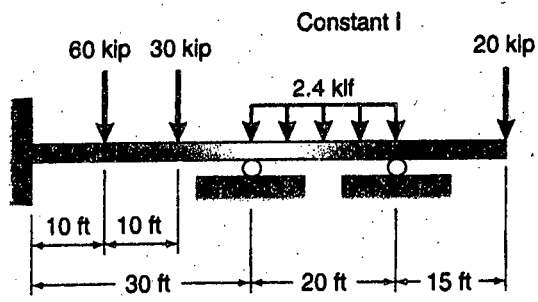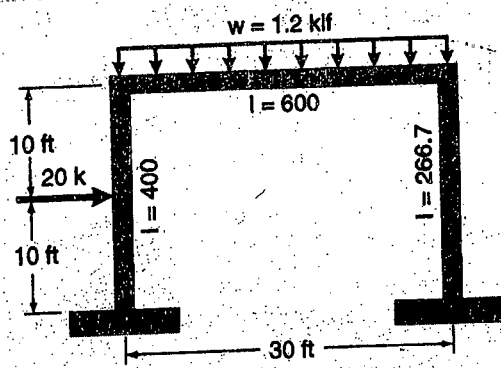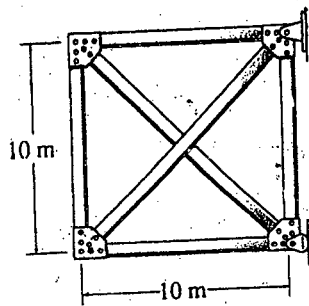
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60 kip **30 kip**   Constant I   **20 kip**

2.4 klf

| 10 ft | 10 ft |

|← 30 ft →|← 20 ft →|← 15 ft →|

Fig. 1

w = 1.2 klf

I = 600

10 ft

20 k

I = 400

I = 266.7

10 ft

|← 30 ft →|

Fig. 2

10 m

10 m

Fig. 3

M_0

1   2

|← L →|← L →|

Fig. 4

55K

G

M @ 16' = 48'

C

F

B

E

A   A

D

16'

Fig. ① 5

A   B   C

L   L

4/3 4/3 4/3

Fig. ② 6

X-A = 1 in²

12'

I = 300 in⁴
X-A = 10 in²

8'   26K   8'

Fig. ③ 7

A   P

C   B

D

M

Fig. ④ 8

A   B   C

6m   6m

Fig. ⑤ 9

(i)

(ii)

Fig. 6 / 10

60 KN

B   6m   4m   C

4m   6m

A   D

Fig. 7 / 11

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L-4/T-1   B. Sc. Engineering Examinations 2012-2013
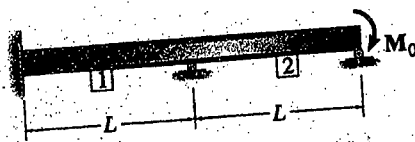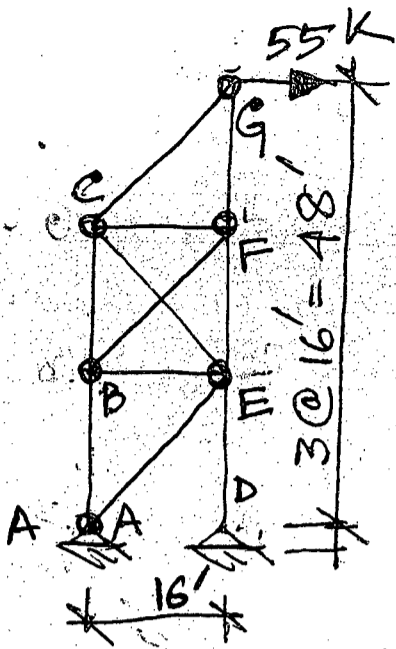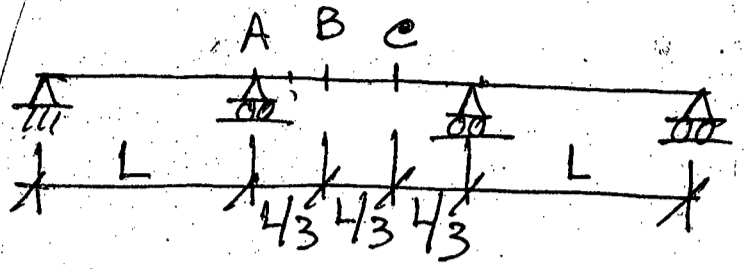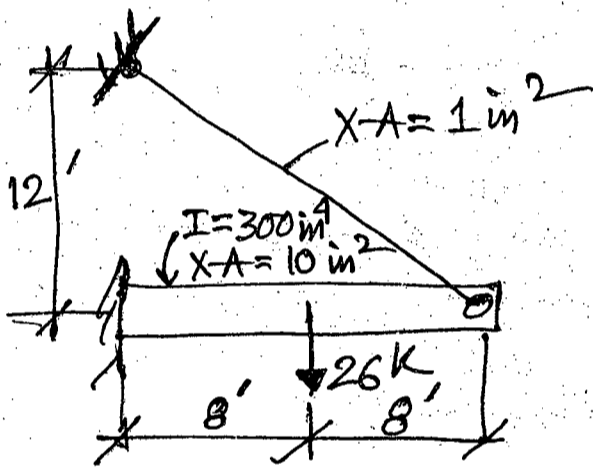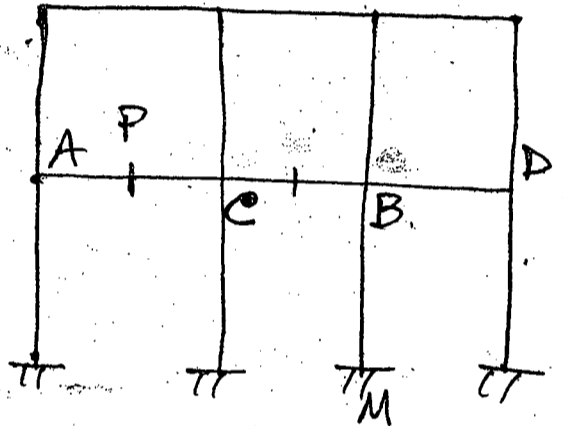
Sub : **WRE 415** (Water Resources Planning and Construction Management)

Full Marks: 210   Time : 3 Hours

USE SEPARATE SCRIPTS FOR EACH SECTION

The figures in the margin indicate full marks.

SECTION – A

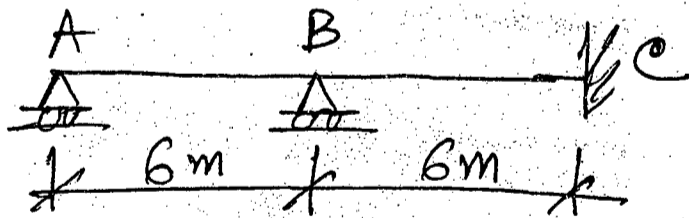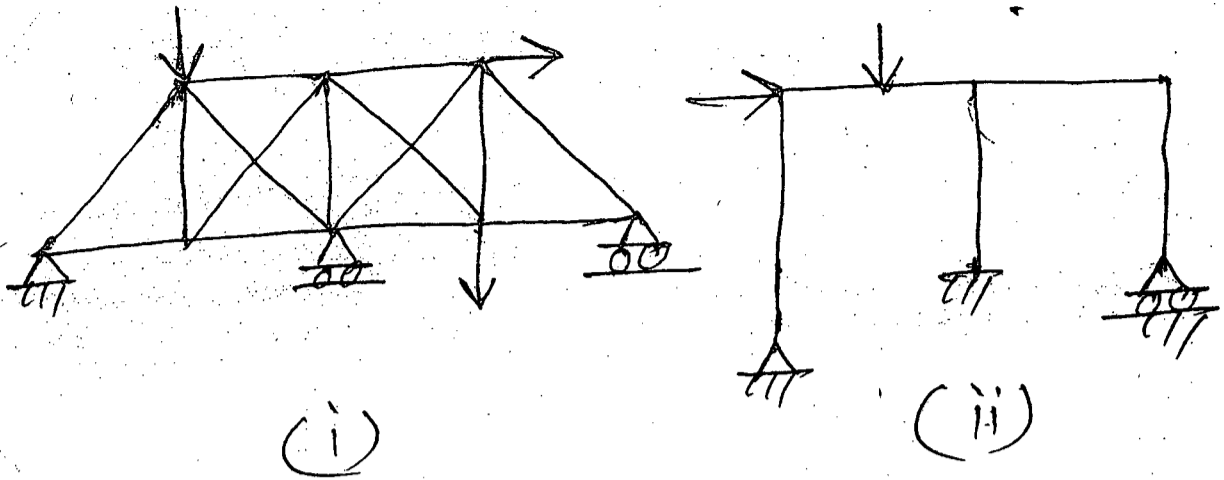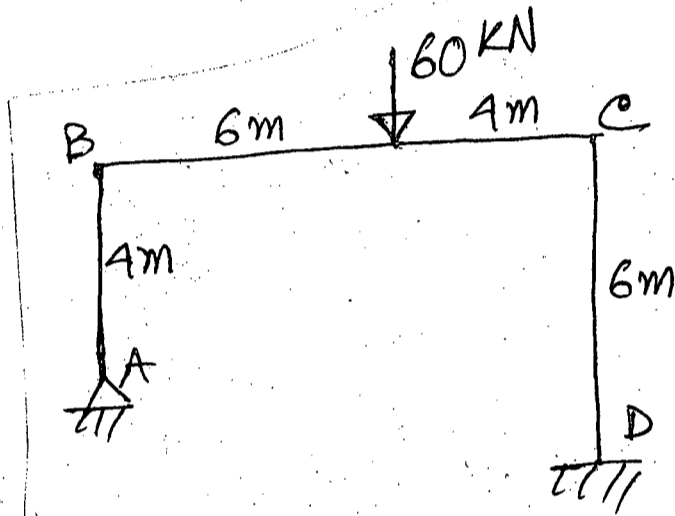There are **FOUR** questions in this section. Answer any **THREE**.

Abbreviations have their usual meanings.

1. (a) Briefly explain the functions of construction management.   **(12)**

(b) Who are in the construction team and what are their responsibilities?   **(8)**

(c) A small single story commercial building is to be constructed on the site of an existing old structure. The exterior and interior walls are of concrete blocks, the roof is erected from steel members covered with rigid insulation and build up roofing. The ceiling is of suspended tile. The floor is a concrete slab with asphalt finish. Interior finish on all walls is paint. The project has been broken down in to 18 activities with estimated construction time shown below. Specify the predecessors of each activity. Note that the activities are not given in any order.   **(8)**

| Activity	Estimated Duration (days)	Activity	Estimated Duration (days)
Underground services (water & sewage services)	1	Rough plumbing	3
Exterior walls	6	Rough electrical	3
Foundations	3	Rough carpentry	2
Demolition	2	Finish plumbing	4
Interior walls	3	Finish electrical	3
Floor slab	3	Finish carpentry	4
Floor finishing	2	Ceiling	3
Roof Steel	2	Windows	1
Roof Finishing	2	Paint	1

(d) What are the guidelines for establishing Work Breakdown Structure (WBS). Construct a WBS for a 3 span deck girder bridge to be constructed in Sonagazi Upazila of Feni.   **(2+5=7)**

2. (a) Write down the specific steps in the PDCA cycle. **(8)**

   (b) What are the most commonly used statistical tools in the Total Quality Management (TQM) process. Briefly explain each tool with figure. **(12)**

   (c) Provide an earned Value analysis to evaluate the progress of the sewerage construction project which is scheduled to be completed within 94 working days. The original budget of the project is £147,500. A status report after 10 and 20 working days into the project has been given below: **(15)**

Status Report After 10 working days	Status Report After 20 working days
Activity A, 100% completed as scheduled, actual cost = £1,500	Activity D, 100% complete, two days delayed, actual cost = £8,000
Activity B, 100% completed as scheduled, actual cost = £2,200	Activity E, 60% complete two days delayed, actual cost = £3,200
Activity C, 100% completed as scheduled, actual cost = £4,000	Activity F, 50% complete two days delayed, actual cost = £6,300
BCWP = £7,600	BCWP = £22,720
ACWP = £7,700	ACWP = £25,200
BCWS = £7,600	BCWS = £22,400
BAC = £147,500	BAC = £147,500

3. (a) Define AoA and AoN. What are the differences between the two network diagrams? **(5)**

   (b) Define successor/predecessor activity. How many types of successor/predecessor relationships are possible? Explain with examples. **(7)**

   (c) For the following PDM network diagram calculate the project duration, critical path, critical activities. **(18)**
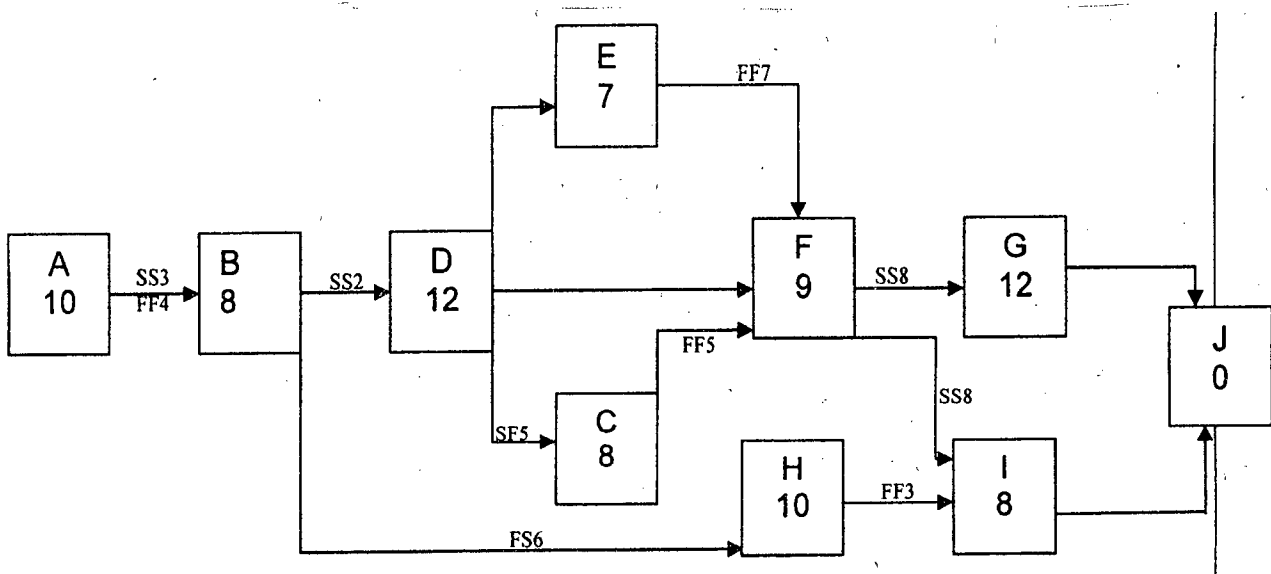
(d) The construction of a RC wall involves placing 660 m³ of concrete, 50 tons of steel and 790 m² of formwork. Calculate the duration of the activity using a balanced mix of resources if **(5)**

- A 6 man concrete gang can place 16 m³ of concrete per day.
- One steel fixer and one assistant can fix 0.5 t of steel per day
- One carpenter and one assistant can fix and remove 16 m² shuttering per day

4. (a) Define Cost Performance Index (CPI) and Schedule Performance Index (SPI). What are the interpretations of these indices being grater than and less than unity. **(4+4)**

(b) Explain the analysis tree for total float and SPI. **(7)**

(c) A subcontractor has to erect 8400 square meter of metal scaffolds. The contractor can use several crews with various costs. it is expected that the production will vary with the crew size given in the table below. Determine the direct cost of this activity considering different combination of crew formation. Consider the following cost rates: Labor Tk. 96/day, carpenter Tk. 128/day, foreman Tk. 144/day, scaffolding Tk. 60/day. **(5)**

Estimated daily Production (m²)	Crew Size (Men)	Crew Formation
166	5	1 scaffold set, 2 labors, 2 carpenters, 1 foreman
204	6	2 scaffold set, 3 labors, 2 carpenters, 1 foreman
230	7	2 scaffold set, 3 labors, 3 carpenters, 1 foreman

(d) For the following project draw the network diagram and calculate the expected duration to complete the full project. Also **(15)**
   (i) Determine the critical path and critical activities for the project
   (ii) Determine the probability to complete the project within 180 days
   (iii) Determine the project completion time assuming a probability of 98% (use table 1)

Activity	Description	Optimistic (a)	Most Likely (m)	Pessimistic (b)	Predecessor
A	Purchase land	30	60	90	–
B	Hire staff	9	25	32	A
C	Obtain permits	2	10	18	A
D	Obtain business license	20	45	52	A
E	Site preparation	3	4	11	C, D
F	Construct office	21	25	41	E
G	Paving & landscaping	9	12	15	F
H	Stock soil testing equipment	25	30	41	B, G
I	Test equipment	11	12	16	H

WRE 415/WRE

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

Assume reasonable value if data is not given.

5. (a) What do you mean by Water Resources Planning? What do plans consider and who has a stake in Water Resources Planning? **(10)**

    (b) List the key factors affecting project planning and management. **(10)**

    (c) Write down the different steps of analysis for formulating and evaluating alternative strategies for IWRM. **(15)**

6. (a) With the help of flow diagram, write down various scheme of the decision in water resources management. **(10)**

    (b) Discuss briefly the various stages of implementation program for the assessment of water Resources. **(10)**

    (c) Define a water resources system. Give an example with sketches of a good river basin system with its various interdependent components. **(15)**

7. (a) Write down the main components of the long term water management modeling by means of simulation technique. **(10)**

    (b) How the performance of a project related to a water resources system can be evaluated? List the criteria of overall measures of system performance. **(10)**

    (c) Name the types of model used ins Water Resources Assessment (WRA)? Discuss briefly about the each type. **(15)**

8. (a) What are the methods and tools available for evaluation of a water project? Write down the steps of Stakeholder Analysis method. **(10)**

    (b) Write down the procedure of logical frame Analysis (LFA). Prepare a log Frame matrix with possible contents. **(15)**

    (c) Distinguish between Financial and Economic Analysis. Write down the various components of budgetary cost for a typical water related project. **(10)**

Table 1 for question 4(d)

Value of deviation z	Probability of completion
-3.0	0.00
-2.5	0.01
-2.0	0.03
-1.5	0.07
-1.4	0.08
-1.3	0.09
-1.2	0.11
-1.1	0.14
-1.0	0.16
-0.9	0.18
-0.8	0.21
-0.7	0.24
-0.6	0.27
-0.5	0.31
-0.4	0.35
-0.3	0.38
-0.2	0.42
-0.1	0.46
-0.0	0.50
0.1	0.54
0.2	0.58
0.3	0.62
0.4	0.66
0.5	0.69
0.6	0.73
0.7	0.76
0.8	0.79
0.9	0.82
1.0	0.84
1.1	0.86
1.2	0.88
1.3	0.90
1.4	0.92
1.5	0.93
2.0	0.98
2.5	0.99
3.0	1.00

BANGLADESH UNIVERSITY OF ENGINEERING AND TECHNOLOGY, DHAKA

L-4/T-1   B. Sc. Engineering Examinations 2012-2013

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

Full Marks: 140   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) Explain the terms (i) residual drawdown (ii) well loss (iii) well efficiency.   **(6)**

    (b) Derive the equation for steady unidirectional flow in an unconfined aquifer and state the assumptions made in the derivation. Also discuss the discrepancies.   **(10⅓)**

    (c) The drawdown caused by a pumping well in a confined aquifer is 0.5 m at an observation well located 40 m from the pumping well after 2 hours of pumping. When will the same drawdown occur at an observation well located 100 m from the pumping well?   **(7)**

2. (a) Write notes on (i) partial penetration of a well in a confined aquifer (ii) recovery test.   **(6)**

    (b) Briefly describe Theis method of determining aquifer constants S and T from pumping test data.   **(7⅓)**

    (c) A well pumping at a rate of 2500 m³/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) Give a comparison between direct circulation rotary method and reverse circulation rotary method of well drilling.   **(5)**

    (b) What do you mean by well development? State its objectives.   **(4⅓)**

    (c) Briefly discuss about placement of well screen.   **(4)**

    (d) Preliminary test shows that a well can yield 3000 lpm from a confined aquifer of thickness 20 m. The aquifer sand has $D_{10} = 0.12$ mm, $D_{50} = 0.30$ mm and $D_{60} = 0.36$ mm.   **(10)**

    (i)   Determine the length of the well screen if its diameter and effective open area are 20 cm and 15% respectively.

    (ii) Design the gravel pack.

4. (a) What are sources of saline water in aquifer? Briefly outline the various methods of controlling saline water intrusion in aquifer. **(8)**

(b) What are the salient points of difference between a shallow tubewell and a deep tubewell? **(4)**

(c) What do you mean by well rehabilitation? Discuss the common methods of well rehabilitation. **(6⅓)**

(d) Derive the Ghyben-Herzberg relation for sea water intrusion. **(5)**

SECTION – B

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

5. (a) Define: confined aquifer, specific storage, storage coefficient and porosity. **(6)**

(b) Draw a neat sketch showing subsurface water distribution in a vertical soil profile. **(7⅓)**

(c) What are the various methods of artificial recharge of groundwater? Describe. **(10)**

6. (a) What are the municipal sources and causes of groundwater pollution? **(8)**

(b) Discuss the various techniques of surface investigation of groundwater.

(c) An anisotropic aquifer has three different layers. The thickness of the top, middle and bottom layers is 10 m, 12 m and 8 m 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. **(6)**

7. (a) State and explain Darcy's law of groundwater movement. Write down the conditions for validity of Darcy's law. **(8)**

(b) Illustrate the interrelations of groundwater table levels, recharge and evapotranspiration fluctuations with a neat sketch. **(8)**

(c) What are the purposes of artificial recharge of groundwater? **(7⅓)**

8. (a) What are isotropic and anisotropic aquifers? Derive equivalent horizontal and vertical hydraulic conductivities. **(9⅓)**

(b) Explain the concept of 'safe yield' and 'optimal yield' of a groundwater basin with examples. **(8)**

(c) Describe the sub-surface geophysical methods for groundwater exploration. **(6)**

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L-4/T-1   B. Sc. Engineering Examinations 2012-2013

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

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

(b) Explain the terms "field capacity" and "permanent wilting point" and describe how these parameters can be determined in the field. **(8)**

(c) Briefly describe and give advantages and disadvantages of neutron method of measuring soil moisture. **(7)**

(d) Explain why the infiltration rate is high at the beginning and approaches to a constant value after several hours of wetting. **(5)**

(e) The field capacity and permanent wilting point of soil of a 0.5 ha wheat field are 27% and 12% respectively. The bulk density of the soil is 1.35 g/cc and effective roof zone depth is 80 cm. Determine the net depth of irrigation if the allowable depletion is 50%. Also determine the time required to irrigate the field with stream of 28 l/s assuming application losses of 30%. **(9)**

2. (a) Distinguish between (i) consumptive use and evapotranspiration (ii) consumptive irrigation requirement and net irrigation requirement (iii) field irrigation requirement and gross irrigation requirement. **(9)**

(b) Briefly describe the soil moisture depletion method to determine consumptive use of water of a field crop. **(6)**

(c) Explain why irrigation efficiencies of 100 percent are not always desirable. **(5)**

(d) Wheat is to be grown at a particular place between 1 November to 15 March. The mean par evaportation and effective rainfall in the respective month are given below. **(15)**

Month	November	December	January	February	March (1 – 15)
Pan evaportation, cm	15.2	13.1	9.6	10.5	9.8
Effective rainfall, cm	0.5	1.7	3.6	2.7	Nil

The values of consumptive use coefficient (K) at various growth stages are as follows:

Percentage of growing season	10	20	30	40	50	60	70	80	90	100
K	0.15	0.27	0.40	0.52	0.65	0.77	0.88	0.90	0.70	0.60

Determine (i) monthly consumptive use (ii) field irrigation requirement assuming that water application efficiency is 70%.

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3. (a) What are the salient points of difference between (i) border-strip flooding and furrow irrigation (ii) check flooding and basin flooding? **(8)**

(b) What conditions favour sprinkler irrigation? Explain why this method is not widely used in our country. **(9)**

(c) Briefly describe with a figure the working principle of a centrifugal pump. **(6)**

(d) A stream of 105 l/s was delivered to a field of 2.0 ha for 6 hours. The depth of roof zone was 1.2 m and the runoff loss was measured as 600 m^3. The depth of water penetration varied linearly from 1.2 m at the head to 0.8 m at the tail end of the field. Available water-holding capacity of the soil is 16 cm/m. Irrigation started when 50% of available water was depleted. Calculate the water-application, water-storage and water-distribution efficiencies. **(12)**

4. (a) Show in a neat diagram the layout of diversion head works and state the functions of the three main components. **(10)**

(b) Explain the terms "flexibility" and "sensitivity" as applied to a module. Derive a relationship between them. **(8)**

(c) What are the purposes of measuring irrigation water? Give a comparison between a Parshall flume and a Cut-throat flume. **(8)**

(d) A pump is to be installed on a well to irrigate rice grown over 12 ha of land. If the peak irrigation requirement is 9 mm/day and the total pumping head is 8 m, determine (i) the power requirement in KW (ii) the cost of electricity in a month (30 days) if the pump is operated for 16 hours a day and electric cost is Tk. 5.0 per unit. Assume that the efficiencies of pump and motor are 70% and 90% respectively. **(9)**

SECTION – B
There are **FOUR** questions in this section. Answer any **THREE**.
Symbols have their usual meaning.

5. (a) Define irrigation. Write down the advantages and disadvantages of irrigation. **(2+5=7)**

(b) Describe the three natural sources of irrigation water. **(8)**

(c) What do you understand by conjunctive use of surface and ground water? **(6)**

(d) Describe different impurities in irrigation water? **(8)**

(e) Why good quality of irrigation water is needed for high production of crop? **(6)**

6. (a) Define different types of irrigation water based on electric conductivity? **(4)**

(b) What do you understand by exchangeable sodium percentage (ESP)? **(4)**

(c) Describe the precautions to use saline water for irrigation. **(7)**

(d) What is leaching? Derive the equation for leaching requirement? Also elaborate the leaching method. **(2+4+2)**

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Contd ... Q. No. 6

(e) What is the classification of irrigation water having the following characteristics: concentration of Na, Ca and Mg are 25, 3.8 and 2.5 milli-equivalent per liter respectively and the electrical conductivity is 250 μmhos/cm at 25°C? What problem might arise in using this water in fine textured soil? What remedies do you suggest to overcome this problem?   **(6+3+3)**

7. (a) How can you select the suitable type of canal lining?   **(5)**

(b) An unlined canal giving a seepage loss of 4.5 cumec per million square meters of wetted area is proposed to be lined with 12 cm thick cement concrete lining, which costs Tk. 175 per 10 square meters. Given the following data, workout the economics of lining and benefit cost ratio.   **(10)**

Annual revenue per cumec of water from all crops	Tk. 3.5 lakhs
Discharge in the channel	83.5 cumecs
Area of the channel	40.8 m^2
Wetted perimeter of the channel	18.8 m
Wetted perimeter of the lining	18.5 m
Annual maintenance cost of unlined channel per 10 square meter	Tk. 2.0

(c) Draw a neat sketch of the cross section of an irrigation canal and identify all the salient features.   **(5)**

(d) What are the merits and demerits of watershed canal, contour canals and side slope canals?   **(4+4+3)**

(e) Why coefficient of rugosity is an important parameter in channel design.   **(4)**

8. (a) Write down the factors responsible for water logging?   **(5)**

(b) Design an irrigation channel with the following data: **(12)**

Discharge of the canal = 24 cumec

Permissible mean velocity = 0.80 m/sec

Bed slope = 1 in 2000

Side slope = 1 : 1

Chezy's constant, C = 48

(c) What are the design considerations for sub-surface drains?   **(6)**

(d) Discuss different types of water rate that are used in the irrigation system.   **(6)**

(e) Why the spacing of tile drainage is important? Find the equation for the optimal spacing?   **(4+2)**

BANGLADESH UNIVERSITY OF ENGINEERING AND TECHNOLOGY, DHAKA

L-4/T-1   B. Sc. Engineering Examinations 2012-2013

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**.

Symbols denote their usual meanings.

Assume reasonable values of any data is missing.

1. (a) What are the primary components of remote sensing? Write a short note on the regions of electromagnetic spectrum.   **(6⅓)**

   (b) What is atmospheric absorption? Explain different atmospheric scattering processes.   **(6)**

   (c) Define spectral response curve and critical spectral regions. Draw the qualitative spectral signatures of vegetation, soil and water and explain.   **(2+5)**

   (d) Derive Wien's Displacement law from Planck's radiation law.   **(4)**

2. (a) What type of geometric image distortions exist in radar imagery? Explain.   **(6)**

   (b) What is speckle filtering? Outline the basic steps necessary to perform on radar imagery before carrying out any visual interpretation/analysis?   **(6)**

   (c) (i) What is azimuthal/along track resolution of a 10 foot Side Looking Airborne Radar (SLAR) array operating at a frequency of 10 GHz and at a distance 300,000 feet.   **(3+3)**

   (ii) What is the range resolution of a real aperture radar if the depression angle is 30° and pulse length is 0.1 microsecond? What should be the minimum distance between two distinct features on the surface if they are to be resolved as separate object in the image?

   (d) What is SAR? Write down the operating principle of SAR.   **(5⅓)**

3. (a) What are the steps of image classification process? Write down the advantages and disadvantages of three image classification algorithms.   **(3+6)**

   (b) Write short notes on the following satellites.   **(5)**

       (i) GOES   (ii) NOAA-AVHRR

   (c) What are the advantages of enhanced vegetation index over normalized difference vegetation index?   **(3)**

   (d) Calculate (i) the land surface temperature (ii) the vegetation condition index (VCI) from the following Landsat data. Also determine the drought category based on VCI.   **(6⅓)**

   Thermal infrared band:

   Digital Number (DN) = 180, L_{max} = 15.3 [W/(m^2.sr.μm)], L_{min} = 1.238 [W/(m^2.sr.μm)], K2 = 1260.56 K, K1 = 607.76 [W/(m^2.sr.μm)]

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Contd ... Q. No. 3(d)

Near-infrared Band:

Reflectance = 0.51

Red Band:

Reflectance = 0.19

$NDVI_{max}$ = 0.83, $NDVI_{min}$ = 0.2; atmospheric vapor content = 1.2 g/cm^2, Upwelling atmospheric radiance 0.5 [$W/(m^2.sr.\mu m)$], and downwelling atmospheric radiance 0.84 [$W/(m^2.sr.\mu m)$]. Assume reasonable value if any data is missing.

4. (a) How remote sensing can be applied in (i) water quality monitoring and (ii) drought monitoring? **(2+2)**

(b) Calculate (i) incoming shortwave solar radiation, (ii) incoming and outgoing longwave radiation, (iii) net radiation from the following remotely sensed data **(7)**

Solar constant, G_{sc} = 1367 W/m^2, solar inclination = 0.79 radian, d = 1.01225 [astronomical units], elevation above mean sea level = 518 m, Stefan-Boltzmann constant = 5.67 × 10^{-8} W m^{-2} K^{-4}, near surface temperature = 20° C, surface temperature = 22° C, NDVI = 0.65, surface albedo = 0.3, atmospheric emissivity = 0.65

(c) Derive the expression of the emission temperature of the earth. **(4)**

(d) Write short note on (i) radiometric resolution (ii) spectral resolution. **(4)**

(e) Write down the environmental and metrological applications of remotely sensed Red, Green and NIR radiation. **(4 ⅓)**

## SECTION – B

There are **FOUR** questions in this section. **Q. No. 5** is compulsory and answer any **TWO** from the rest.

5. (a) Write short note on **(3+3+4)**

(i) Polygon overlay (ii) IDW interpolation

(iii) Optimization technique of spatial analysis

(b) List down the Boolean operators available to test the spatial relationship of geometries. **(5)**

(c) Briefly explain with schematic diagram the functions of **(2+3)**

(i) ConvexHull (ii) Symdifference

(d) Write down the capabilities of DBMS. **(7)**

(e) What are the types of spatial analysis? **(3)**

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6. (a) Write short description on different types of GPS errors. **(6)**

   (b) What is GPS constellation? Write down the functions of control segment of GPS? **(1+3)**

   (c) What do you mean by Conceptual model in GIS data modeling? Describe with example. **(6)**

   (d) Write short description on conflation. **(4)**

7. (a) Write down the name of different types of data models and their applications. **(6)**

   (b) What are the limitations of TIN. Draw a schematic diagram showing the topology of a TIN. **(2+2)**

   (c) Write short note on (i) UTM (ii) Classification of conic projection. **(2+2)**

   (d) Use raster compression technique Quadtrees to represent the following raster. **(6)**
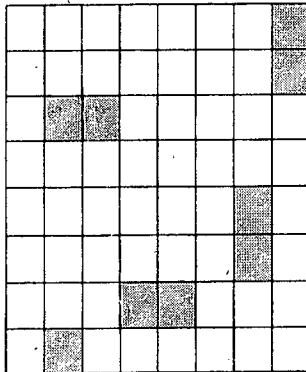
8. (a) Write down the types of generalization rules. Briefly describe one of those generalization rule. **(4+3)**

   (b) Show with schematic diagram different types of transformation methods used while georeferencing. **(3)**

   (c) Write down the locations of control segment stations for GPS. **(4)**

   (d) What do you mean by weird polygon and silver polygon? Briefly describe their reasons and correction methods. **(3+3)**