L-4/T-1/WRE

Date : 29/10/2019

BANGLADESH UNIVERSITY OF ENGINEERING AND TECHNOLOGY, DHAKA

L-4/T-1 B. Sc. Engineering Examinations 2018-2019

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 Water Resources Development, Planning and Management. Briefly describe different types of planning based on time frame of the plan. (7)

   (b) Compare between Traditional and Modern approaches of Planning. (7)

   (c) State the salient features of 'Dublin Principles' for effective planning and management of water resources. (7)

   (d) Why does water resources planning and management need to be done in an integrated way? (7)

   (e) What are the targets of Goal 6 of Sustainable Development Goal? (7)

2. (a) Write down the general principles of economic analysis. (7)

   (b) List the task of a water resources project for irrigation in Bangladesh. (7)

   (c) Briefly describe the public sector planning system in Bangladesh. (7)

   (d) What are the benefits of SIA? Discuss the key environmental assessment processes for any water resources project. (14)

3. (a) Show the key steps in the Environmental Assessment process of water resources projects in a flow chart. (7)

   (b) Discuss the factors that contribute to effective public participation in water resources projects. (10)

   (c) What is project appraisal? List the criteria for a good plan. (7)

   (d) Discuss the outline of a comprehensive study report for a river basin. (11)

4. (a) Provide a checklist of important Engineering task of a water quality management project. (7)

   (b) List the socio-economic and environmental challenges in the water sector of Bangladesh. (7)

   (c) Briefly outline the major sources of flooding in different hydrological region of Bangladesh. (7)

   (d) A certain project has a fixed cost of $100,000 and an annual maintenance cost of $ 2500 each year over a 50-year life. Benefit realized increases linearly from $4000 in the second year to $8000 in the 10th year. The benefit for the rest of the time is $9000 per year. (14)

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Contd. ...Q.No. 4(c)

(i) What is the project cost-benefit ratio at 4% interest?

(ii) What is the internal rate of return if the benefit realized is constant at the rate of $7000 per year?

SECTION – B

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

5. (a) What are the objectives of construction management? **(10)**

(b) Briefly describe the functions of construction management. **(10)**

(c) The government of Bangladesh has decided to build a multipurpose bridge over the river Padma. The government has appointed AECOM to design the bridge and China Major Bridge Engineering Company has been selected to construct the bridge. Identify different parties for this construction project and state their responsibilities. **(10)**

(d) Explain the necessity of safety program in construction industry. **(5)**

6. (a) List down the levels of Work Breakdown Structure (WBS) and the guidelines for establishing WBS. Construct a WBS for a three span deck girder bridge to be constructed in Bandharia Upazilla of Pirojpur. **(12)**

(b) Explain QC, QA and TQM. **(8)**

(c) Explain the different fee structures of negotiated contracts. **(8)**

(d) List down the components of a contract document. **(7)**

7. (a) What aspects of the equipment suitability and constraints should be considered during selection of construction equipment? **(8)**

(b) 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 built up roofing. The ceiling is of suspended tile. The floor is a concrete slab with asphalt finish. Interior finish on walls is paint. The project has been broken down into 18 activities with estimated construction time shown below. Specify the predecessors of each activity. Note that the activities are not given in any order. **(10)**

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Contd. ... Q. No. 7(b)

Activity	Estimated duration (days)	Activity	Estimated duration (days)
Underground services (water and 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

(c) A subcontractor has to erect 8400 square meter of metal scaffolds. The contractor can use several crews (shown in table) 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. 95/day, carpenter Tk. 128/day, foreman Tk. 144/day, scaffolding Tk. 60/day. **(10)**

Estimated daily Production (m^2)	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) Write down the functional classifications of construction equipment's with examples. **(7)**

8. (a) Define the following terms: **(6)**

(i) Dummy activity

(ii) Optimistic time estimate

(iii) Critical activity

(b) Write down the advantages and disadvantages of lump sum contracts and unit price contracts. **(9)**

(c) For the following project draw the network diagram and calculate the duration to complete the project. Also **(20)**

(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 the Z table)

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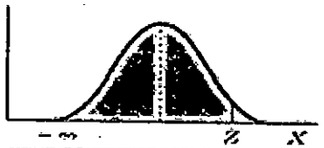
activity	description	Duration (days)			predecessor
		Optimistic	Most Likely	Pessimistic	
A	Purchase land	30	60	90	-
B	Hire staff	9	25	32	A
C	Obtain permits	2	10	18	A
D	Obtain business license	20	45	52	A
E	Site preparation	3	4	11	C,D
F	Construct office	21	25	41	E
G	Paving and landscaping	9	12	15	F
H	Stock soil testing equipment	25	30	41	B,G
I	Test equipment	11	12	16	H

Contd. — P/5

Table for Question 8(c)

Z-TABLE EXPANDED

Table 8-4. Cumulative (Single Tail) Probabilities of the Normal Probability Distribution (Areas under the Normal Curve from $-\infty$ to Z)



Example: the area to the left of Z = 1.34 is found by following the left Z column down to 1.3 and moving right to the .04 column. At the intersection read .9099. The area to the right of Z = 1.34 is 1 − .9099 = .0901. The area between the mean (dashed line) and Z = 1.34 = .9099 − .5 = .4099.

z	00	.01	.02	.03	.04	.05	.06	.07	.08	.09
.0	.5000	.5040	.5080	.5120	.5160	.5199	.5239	.5279	.5319	.5359
.1	.5398	.5438	.5478	.5517	.5557	.5596	.5636	.5675	.5714	.5753
.2	.5793	.5832	.5871	.5910	.5948	.5987	.6026	.6064	.6103	.6141
.3	.6179	.6217	.6255	.6293	.6331	.6368	.6406	.6443	.6480	.6517
.4	.6554	.6591	.6628	.6664	.6700	.6736	.6772	.6808	.6844	.6879
.5	.6915	.6950	.6985	.7019	.7054	.7088	.7123	.7157	.7190	.7224
.6	.7257	.7291	.7324	.7357	.7389	.7422	.7454	.7486	.7517	.7549
.7	.7580	.7611	.7642	.7673	.7704	.7734	.7764	.7794	.7823	.7852
.8	.7881	.7910	.7939	.7967	.7995	.8023	.8051	.8078	.8106	.8133
.9	.8159	.8186	.8212	.8238	.8264	.8289	.8315	.8340	.8365	.8389
1.0	.8413	.8438	.8461	.8485	.8508	.8531	.8554	.8577	.8599	.8621
1.1	.8643	.8665	.8686	.8708	.8729	.8749	.8770	.8790	.8810	.8880
1.2	.8849	.8869	.8888	.8907	.8925	.8944	.8962	.8980	.8997	.9015
1.3	.9032	.9049	.9066	.9082	.9099	.9115	.9131	.9147	.9162	.9177
1.4	.9192	.9207	.9222	.9236	.9251	.9265	.9279	.9292	.9306	.9319
1.5	.9332	.9345	.9357	.9370	.9382	.9394	.9406	.9418	.9429	.9441
1.6	.9452	.9463	.9474	.9484	.9495	.9505	.9515	.9525	.9535	.9545
1.7	.9554	.9564	.9573	.9582	.9591	.9599	.9608	.9616	.9625	.9633
1.8	.9641	.9649	.9656	.9664	.9671	.9678	.9686	.9693	.9699	.9706
1.9	.9713	.9719	.9726	.9732	.9738	.9744	.9750	.9756	.9761	.9767
2.0	.9772	.9778	.9783	.9788	.9793	.9798	.9803	.9808	.9812	.9817
2.1	.9821	.9826	.9830	.9834	.9838	.9842	.9846	.9850	.9854	.9857
2.2	.9861	.9864	.9868	.9871	.9875	.9878	.9881	.9884	.9887	.9890
2.3	.9893	.9896	.9898	.9901	.9904	.9906	.9909	.9911	.9913	.9916
2.4	.9918	.9920	.9932	.9925	.9927	.9929	.9931	.9932	.9934	.9936
2.5	.9938	.9940	.9941	.9943	.9945	.9946	.9948	.9949	.9951	.9952
2.6	.9953	.9955	.9956	.9957	.9959	.9960	.9961	.9962	.9963	.9964
2.7	.9965	.9966	.9967	.9968	.9969	.9970	.9971	.9972	.9973	.9974
2.8	.9974	.9975	.9976	.9977	.9977	.9978	.9979	.9979	.9980	.9981
2.9	.9981	.9982	.9982	.9983	.9984	.9984	.9985	.9985	.9986	.9986
3.0	.9987	.9987	.9987	.9988	.9988	.9989	.9989	.9989	.9990	.9990
3.1	.9990	.9991	.9991	.9991	.9992	.9992	.9992	.9992	.9993	.9993
3.2	.9993	.9993	.9994	.9994	.9994	.9994	.9994	.9995	.9995	.9995
3.3	.9995	.9995	.9995	.9996	.9996	.9996	.9996	.9996	.9996	.9997
3.4	.9997	.9997	.9997	.9997	.9997	.9997	.9997	.9997	.9997	.9998

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L-4/T-1/WRE Date : 02/11/2019

BANGLADESH UNIVERSITY OF ENGINEERING AND TECHNOLOGY, DHAKA

L-4/T-1 B. Sc. Engineering Examinations 2018-2019

Sub : **WRE 417** (Ground Water 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**.
Assume reasonable value if data is not given.

1. (a) List the phases of ground water studies for the evaluation of ground water potentials in an area. Sketch a layered aquifer system and show its various features. **(9)**

   (b) Write briefly about the following: **(6⅓)**
   (i) Hydraulic heads in ground water
   (ii) Natural and artificial recharge

   (c) A confined aquifer has a source of recharge. K for the aquifer is 55 m/day, and porosity n is 0.25. The piezometric head in two wells 1000 m apart is 45 m and 40 m respectively, from a common datum. The average thickness of the aquifer is 20 m, and the average width of the aquifer is 5 km.
   Compute (i) the rate of flow through the aquifer (ii) the average time of travel from the head of the aquifer to a point 4 km downstream. **(8)**

2. (a) What are the Dupits assumptions? Derive the Dupit's equation for ground water table of an unconfined aquifer. **(9)**

   (b) Define (i) Standard coefficient of permeability (ii) Intrinsic permeability. **(6⅓)**

   (c) Two rivers are 1000 m apart, average rainfall is 15 cm/yr. evaporation is 10 cm/yr, water elevation in river-1 is 20 m, water elevation in river-2 is 18 m. Determine the daily discharge per meter width into each River. Take K = 0.5 m/day. **(8)**

3. (a) Derive the expression of flow rate for steady state radial flow in an unconfined aquifer. Consider symbols those are of usual meanings. **(9)**

   (b) The drawdown caused by pumping well in confined aquifer is 0.65 m at an observation well located at 40 m from the pumping well after 2 hours of pumping. When the same drawdown will occur at an observation well located 100 m from the pumping well? **(6⅓)**

   (c) How the yield of an aquifer can be measured? In a field test, a time of 5 hours was required for a tracer to travel through an aquifer from one well to another. The observation wells are 40 m apart and the difference in their water level was found to be 0.40 m. Compute the discharge velocity and coefficient of permeability. Given that the porosity of soil is 20%. **(8)**

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4. (a) Discuss the cavity type and screen type tube wells. Answer with sketch. **(9)**

   (b) List the ranges of hydraulic data used for design of Hand, Shallow and Deep Tube wells. **(6 ⅓)**

   (c) Discuss with sketches (i) the criteria for gravel pack design (ii) Well strainer. **(8)**

SECTION – B

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

5. (a) What are the advantages and disadvantages of sub-surface reservoirs over surface reservoirs? **(6 ⅓)**

   (b) Describe different environmental factors that affect ground water level? **(8)**

   (c) What are the different sources of ground water pollution? Describe different remedial measures for different types of ground water pollution. **(9)**

6. (a) What are the advantages and disadvantages of conjunctive use of ground water and surface water? **(6 ⅓)**

   (b) Describe general procedures for analyzing ground water management issues. **(8)**

   (c) Describe different ground water related issues and possible remedial measures for ground water of Bangladesh. **(9)**

7. (a) What are the main purposes of Artificial ground water recharge? **(6 ⅓)**

   (b) Distinguish between the following artificial recharge methods: (i) Basin Method vs Stream-Channel method (ii) Ditch and Furrow method vs Pit method. **(8)**

   (c) A recharge basin 400 m × 3000 m is proposed for a new area. The recharge rate is 175,000 m^3/day. The depth to natural groundwater in the area is 46 m and the aquifer has a saturated thickness of 20 m. The transmissivity of the aquifer is 2,500 m^2/day. If the maximum allowable rise of the recharge mound is 35 m, how far should the control area be established from the centerline of the recharge basin? Assume any reasonable value for any missing data. **(9)**

8. (a) Describe different controlling methods for salinity intrusion. **(6 ⅓)**

   (b) Describe different mechanisms of sub-soil investigation. **(8)**

   (c) The steady fresh-water discharge from an unconfined coastal aquifer into the sea is about 1.5 (m^3/day)/m along the shoreline. The hydraulic conductivity of the aquifer is 8.6 m/day and the horizontal impervious stratum is located 55 m below the sea level. Determine the location of the toe of the interface form the shoreline. Assume any reasonable value for any missing data. **(9)**

L-4/T-1/WRE Date : 24/10/2019

BANGLADESH UNIVERSITY OF ENGINEERING AND TECHNOLOGY, DHAKA

L-4/T-1 B. Sc. Engineering Examinations 2018-2019

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) Sketch a layout of irrigation canal network for a command area. **(6)**

(b) Briefly explain the factors on which duty depends on. **(6)**

(c) Define the following terms: soil-moisture deficiency, hygroscope water, crop factor, farm efficiency. **(6)**

(d) With neat sketch show the soil moisture regime concept of estimating depth and frequency of irrigation. **(6)**

(e) The base period, intensity of irrigation (I.I.), duty of water for various crops under a canal system are given below. The culturable command area is 60,000 ha, canal losses are 28% and reservoir loss is 12%. Determine the canal capacity and reservoir capacity. **(11)**

Crop	Crop calendar	Base period (days)	Duty (ha/cumec)	I.I (%)
Potato	Robi	80	1250	15
Wheat	Kharif-1	120	1100	20
Mustard	Robi	100	850	25
Rice	Kharif-1	120	720	15
Cotton	Kharif-2	110	1400	10

2. (a) Explain soil moisture depletion method of estimating consumptive water use of a plant. **(6)**

(b) With neat sketches show (i) borrow pit with appropriate dimensions (ii) section of a reciprocating pump (iii) yield Vs irrigation water depth graph. **(6)**

(c) Briefly explain the different ways of canal alignment. **(6)**

(d) Write down the arguments given by Lacey which were ignored by Kennedy for the concept of regime channel. **(6)**

(e) A volume of 2200 m^3 water is applied to a crop field of 1.8 ha. The root zone depth is 62 cm and soil porosity is 42%. When the moisture content in the soil falls to 35% of the available water between the field capacity (26%) of the soil and permanent wilting point (13%) of the soil, determine the water application efficiency. **(11)**

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3. (a) Draw the pump characteristics curve and explain it. **(5)**

   (b) List the main features, advantages and disadvantages of turbine pump. **(5)**

   (c) Write down the factors on which irrigation canal seepage loss depends. **(5)**

   (d) Describe the successful cases of irrigation water management and technological advancement in Bangladesh. **(10)**

   (e) A 35 KW capacity irrigation pump has to be installed with water discharge 52 *l/s* through a pipe of diameter 20 cm and Darcy-Weisbach friction factor for the pipe material is 0.07. The suction head is 10 m and delivery head is 7.5 m. If delivery efficiency of the shaft is 76% and motor efficiency is 84%, calculate the efficiency of the pump. **(10)**

4. (a) Discuss the irrigation coverage and move towards protective agriculture in Bangladesh. **(5)**

   (b) A distributary takes off from a branch canal having CBL 100 m and FSL 102.5 m. The culturable command area at the head of the distributary is 72,000 ha and after each km it is reduced by 8,000 ha. The intensity of irrigation for Rabi and Kahrif seasons are 48% and 32% respectively. Assume the following data: **(30)**

Length of distributary = 5 km
Channel losses occur at the rate of 0.5 cumec per km length of the distributary.
Chezy's C = 50 $m^{1/2}/s$
Critical velocity ratio for the soil = 0.90
Silt factor = 1.0
Peak water demand period for Rabi and Kharif crops are 3 weeks and 2 weeks respectively
Peak water demand for Rabi and Kharif crops are 18 cm and 26 cm respectively
Ground level at the head of the distributary is 101.5 m and land slope (down) along the proposed alignment is 0.5m/km.
Freeboard =0.5m, bank width = 3m.
Assume the reasonable value of any other data if needed.

Design the canal section for first 2 km length of the distributary from its head and sketch

(i) one canal cross-section including bank for each km long distributary (for first 2 km length of distributary from its head).

(ii) the L-section of this 2 km length of distributary showing bed and water level elevation.

SECTION – B

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

5. (a) 'All the waters are not fit for irrigating crops'. Discuss briefly and critically the statement. **(10)**

   (b) Distinguish between (i) Subsurface irrigation and Furrow irrigation (ii) Border strip irrigation and Check basin irrigation (iii) Drainage and Water logging. **(10)**

   (c) Describe different components of Sprinkler irrigation system. What are the conditions which favor Sprinkler irrigation? **(3+5=8)**

Contd P/3

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Contd. ... Q. No. 5

(d) Determine the time required to irrigate a strip of hand of 0.04 hectare from a tube well with a discharge of 0.02 cumec. The infiltration capacity of the soil may be taken as 5 cm/hour and the average depth of the flow on the field as 10 cm. Also determine the maximum area that can be irrigated from this tube well. **(7)**

6. (a) Write down the ill effects of water logging? What are the preventive measures against water logging? **(10)**

(b) In a tile drainage system, the drains are laid with their centers 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 is 80 cm. If 1% of the annual rainfall is to be drained in 24 hours to keep the highest position of the water table 1 m below the ground level, determine the spacing of the drain pipes. Coefficient of permeability may be taken as 0.001 cm/sec. **(10)**

(c) What are the advantages of using groundwater over surface water? What is efflorescence? How saline soils effect the osmotic activity of the plants? **(3+2+3=8)**

(d) What is Leaching? Derive the equation for 'Leaching Requirement. **(7)**

7. (a) Draw a typical layout of diversion head works and write the function of its components. **(10)**

(b) What are the main functions of head regulator and cross regulator? Write down the function of energy dissipater and explain how it works. **(5+5=10)**

(c) What are the different types of cross drainage works and explain differences between Aqueduct and Super-passage? **(8)**

(d) What are the benefits that can be accrued from irrigation projects? **(7)**

8. (a) Write down the basic assumptions to derive the equation for subsurface drainage. What are the considerations to design a surface drainage channel? **(10)**

(b) Determine the size of a tile at the outlet of a 7 ha drainage system, if the drainage coefficient is 1.2 cm/day and the tile grade is 3%. Assume Manning's Roughness Coefficient for the tile drain as 0.012. **(10)**

(c) Draw a typical layout of different tile drainage system and explain each of these. **(8)**

(d) If you irrigate the land with the saline water, what problems will arise and what precautions you can take? **(7)**

L-4/T-1/WRE Date : 06/11/2019

BANGLADESH UNIVERSITY OF ENGINEERING AND TECHNOLOGY, DHAKA

L-4/T-1 B. Sc. Engineering Examinations 2018-2019

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

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**.

Symbols denote their usual meaning. Assume reasonable values if any data missing.

1. (a) What is remote sensing? Show the primary components of remote sensing in a diagram and explain. **(6⅓)**

   (b) (i) Derive the expression for the emission temperature of earth.

   (ii) The sun radiates maximum energy at 0.483 μm. Determine the luminosity and flux density of sun. Given the radius of sun is 6.96×10^{8} m. **(6)**

   (c) Define spectral response curve and critical spectral regions. What are the critical spectral regions of vegetation and soil? Explain your answer with qualitative spectral signatures of them. **(6)**

   (d) What do you think would be the best atmospheric conditions for remote sensing in the visible portion of the spectrum? Justify your answer. **(5)**

2. (a) (i) A side looking airborne radar (SLAR) is operating at a height of 6 km. Given, depression angle = 35°, pulse length = 10^{-3} microsecond, wavelength = 1 cm, antenna length = 4 m. Calculate the range resolution and along track resolution of the SLAR? What should be the minimum distance between two features on the surface if they are to be resolved as separate object in the image?

   (ii) Why radar cannot take image directly beneath the antenna? **(6⅓)**

   (b) (i) Write short note on radiometric resolution and spectral resolution of satellites.

   (ii) What is the difference between optical satellites and radar? Explain among these two sensors which would be better to monitor root zone soil moisture. Also mention the temporal, spatial and spectral resolutions at which images should be acquired for this purpose. **(6)**

   (c) Explain the effect of slant range scale distortion, foreshortening and Layover in radar images with sketches. **(6)**

   (d) What is synthetic aperture radar (SAR)? Write down the operating principle of SAR with a neat sketch. **(5)**

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3. (a) Calculate (i) the land surface temperature and (ii) drought condition based on vegetation health index from a Landsat image acquired over Rajshahi in Low gain state. Following data were obtained from the image: **(6⅓)**

Digital numbers in Thermal infrared, Near-infrared and red band are 185,245 and 65, respectively. Given K2 =1282.71, K1 = 666.09 [W/(m^2.sr.μm)]; $NDVI_{max}$ = 0.85, $NDVI_{min}$ = 0.15; BT_{max} = 325 K, BT_{min} = 280 K; atmospheric vapor content =1.2 g/cm^2, Upwelling atmospheric radiance = 0.5 [W/(m2.sr.μm)], and downwelling atmospheric radiance = 0.84 [W/(m2.sr.μm)], Day of the year = 229, earth-sun distance =1.01244 (astronomical unit); solar zenith angle = 30°. Use Table 1 for information regarding satellite Landsat 7 ETM. Assume reasonable value if any data is missing.

(b) Write a short note on a land surface monitoring satellite and mention the application of its each band in remote sensing. **(6)**

(c) Write short note on (i) enhanced vegetation index, (ii) normalized difference vegetation index and (iii) soil adjusted vegetation index. **(6)**

(d) (i) What are the relative advantages and disadvantages of sensors carried on satellites over those carried on aircraft?

(ii) Most remote sensing systems avoid detecting and recording wavelengths in the ultraviolet and blue portions of the spectrum. Explain the reasons behind this. **(5)**

4. (a) Write down the advantages of using remote sensing in land use mapping. Also describe the data requirement (satellite features and resolutions) for this purpose. **(6⅓)**

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

(c) If an agricultural area, with crops such as wheat and corn, became flooded, what do you think these areas might look like on a radar image? Explain the reasons for your answers based on your knowledge of how radar energy interacts with a target.

(ii) Write down the factors that affect the radar signal. **(6)**

(d) Explain why the use of a synthetic aperture radar (SAR) is the only practical option for radar remote sensing from space. **(5)**

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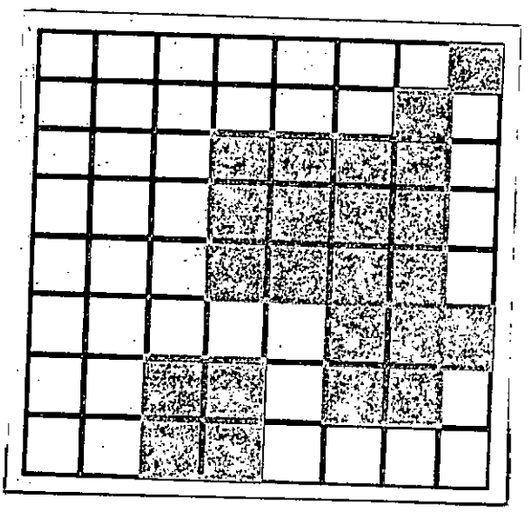
SECTION – B

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

5. (a) What are the different generalization techniques available in GIS? Discuss with necessary diagrams. **(10 ⅓)**

(b) Represent the following Raster using Quad tree compression technique. **(8)**



(c) What are the different types of GPS errors? Briefly discuss any two of the GPS errors. **(5)**

6. (a) Write down the application of GIS in (i) Business (ii) Environmental Studies and (iii) Water resources. **(4 ½)**

(b) Write short note on (i) "Geoid" (ii) TIN data model **(6)**

(c) "All maps are wrong." Explain. **(4)**

(d) Briefly explain different types of map projections based on pattern of deformation. **(4 ½)**

(e) Represent the Raster given in the question 5 using (i) Run length encoding (ii) Block encoding compression techniques. **(4 ⅓)**

7. (a) What do you understand by Vector data and Raster data? Give two examples with description where raster data is more suitable than vector data. **(6)**

(b) Explain the stages of GIS data collection. **(5 ⅓)**

(c) Discuss the following spatial interpolation methods (i) Theissan polygon (ii) Kriging **(5)**

(d) "GIS data model is better than CAD data model for Water Resources Engineers." – Do you agree with this statement? Justify your answer. **(5)**

(e) What do you understand by Spatial Analysis in GIS? **(2)**

Contd P/4

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8. (a) Briefly describe different types of Attribute errors in GIS. **(8⅓)**

   (b) Explain "Military Grid" coordinate system with suitable example. **(8)**

   (c) Write short notes on (i) Rubber Sheeting (ii) Noise in raster data. **(5)**

   (d) Classify conic projection system. **(2)**

Table 1. for question 3(a)

ETM+ spectral range, post-calibration dynamic ranges, and mean exoatmospheric solar irradiance ($ESUN_\lambda$).

L7 ETM+ Sensor (Q_{calmin} = 1 and Q_{calmax} = 255)							
Band	Spectral range	Center wavelength	LMIN$_\lambda$	LMAX$_\lambda$	$G_{rescale}$	$B_{rescale}$	ESUN$_\lambda$
Units	µm		W/(m^2 sr µm)	W/(m^2 sr µm)	(W/m^2 sr µm)/DN	W/(m^2 sr µm)	W/(m^2 µ
Low gain (LPGS)							
1	0.452–0.514	0.483	-6.2	293.7	1.180709	-7.38	1997
2	0.519–0.601	0.560	-6.4	300.9	1.209843	-7.61	1812
3	0.631–0.692	0.662	-5.0	234.4	0.942520	-5.94	1533
4	0.772–0.898	0.835	-5.1	241.1	0.969291	-6.07	1039
5	1.547–1.748	1.648	-1.0	47.57	0.191220	-1.19	230.8
6	10.31–12.36	11.335	0.0	17.04	0.067087	0.07	N/A
7	2.065–2.346	2.206	-0.35	16.54	0.066496	-0.42	84.90
PAN	0.515–0.896	0.706	-4.7	243.1	0.975591	-5.68	1362
High Gain (LPGS)							
1	0.452–0.514	0.483	-6.2	191.6	0.778740	-6.98	1997
2	0.519–0.601	0.560	-6.4	196.5	0.798819	-7.20	1812
3	0.631–0.692	0.662	-5.0	152.9	0.621654	-5.62	1533
4	0.772–0.898	0.835	-5.1	157.4	0.639764	-5.74	1039
5	1.547–1.748	1.648	-1.0	31.06	0.126220	-1.13	230.8
6	10.31–12.36	11.335	3.2	12.65	0.037205	3.16	N/A
7	2.065–2.346	2.206	-0.35	10.60	0.043898	-0.39	84.90
PAN	0.515–0.896	0.706	-4.7	158.3	0.641732	-5.34	1362

BANGLADESH UNIVERSITY OF ENGINEERING AND TECHNOLOGY, DHAKA

L-4/T-1 B. Sc. Engineering Examinations 2018-2019

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

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**.

Neglect axial deformation of frame members unless otherwise noted.

1. (a) Compute the elements of the global stiffness matrix of the truss shown in Fig. 1, and determine the support reactions at A. Note that AE is constant for all members. **(20)**

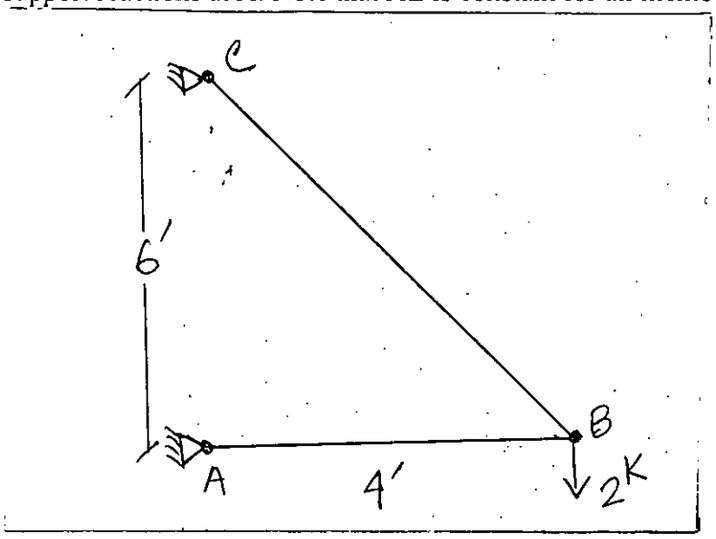

Fig. 1

(b) Find out the reactions at A for the frame shown in Fig. 2. Note that EI is constant for all members. Use stiffness method. **(15)**

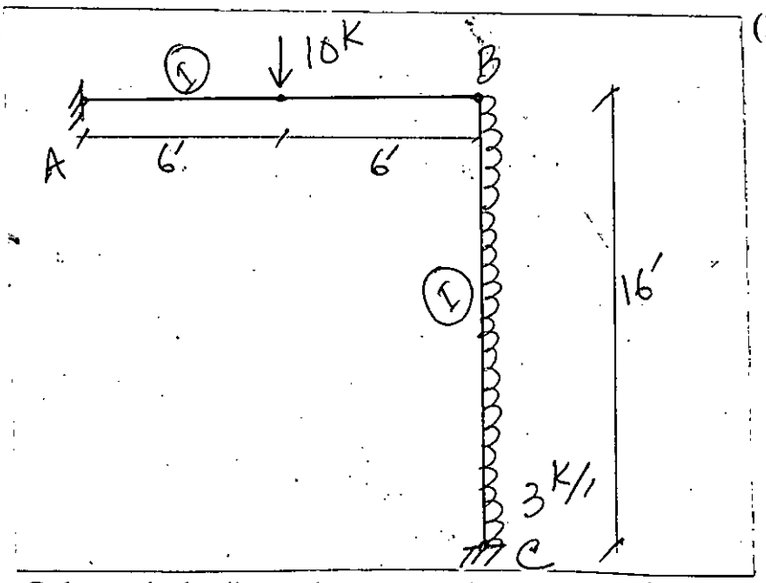

Fig. 2

2. (a) Determine support reaction at B due to the loading and support settlements given for the beam shown in Fig. 3. Support B settles down by 0.15 ft. Given EI = 5000 k-ft^2. Use stiffness method. **(18)**

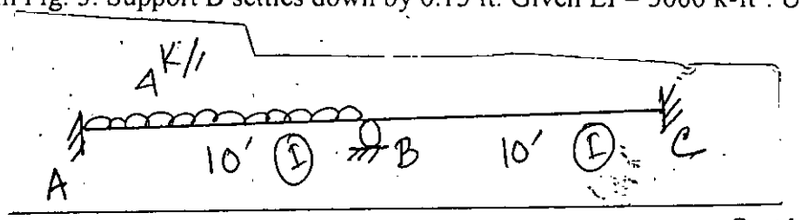

Fig. 3

Contd P/2

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(b) Determine the horizontal displacement at B of the frame shown in Fig. 4. EI is constant for all members. Use stiffness method. **(17)**

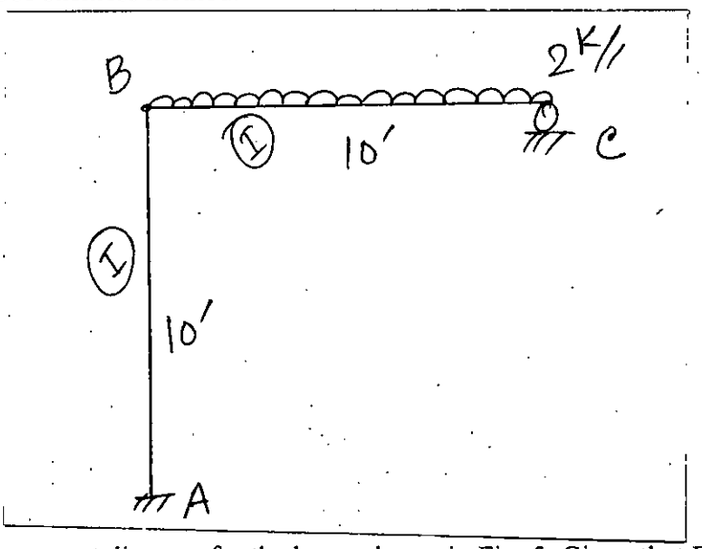

Fig. 4

3. (a) Draw bending moment diagram for the beam shown in Fig. 5. Given that E is constant for all members. Use stiffness method. **(18)**

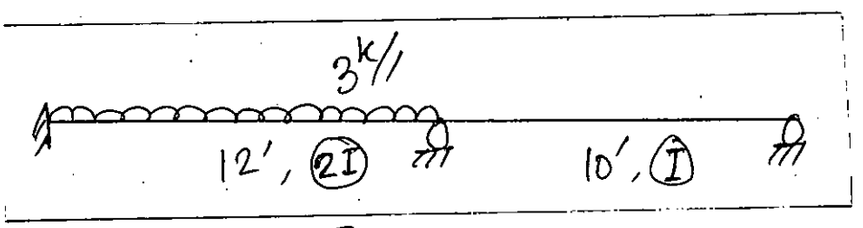

Fig. 5

(b) Determine displacements and rotations at B of the frame shown in Fig. 6. Consider both axial and rotational degrees of freedom at joints. Given that E is constant for all members. Use stiffness method. **(17)**

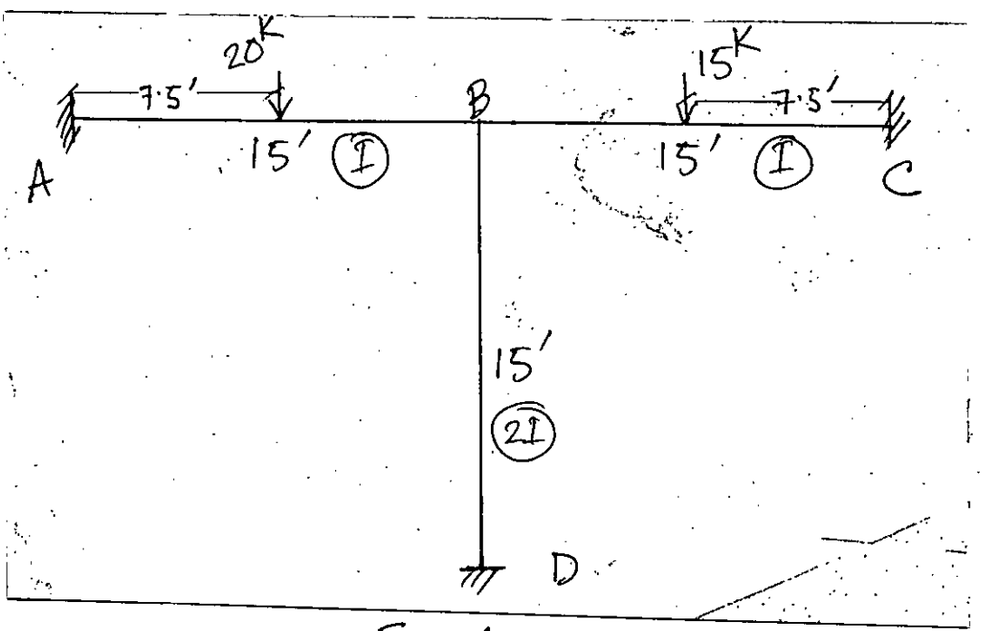

Fig. 6

Contd P/3

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4. Draw influence line diagram for moment just left of joint B ($M_{B(left)}$) of the frame shown in Fig 7. Determine the influence line ordinate for $M_{B(left)}$ at $0.3L$, $0.5L$ and $0.7L$ of the girder AB, BC and CD, where L is the span of each girder. Given E is constant for all members. **(35)**

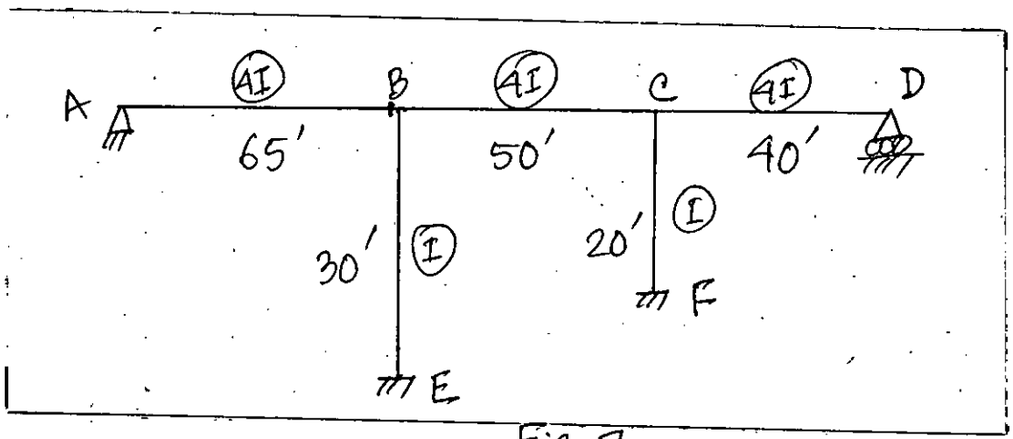

Fig. 7

SECTION – B

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

Assume any reasonable value of missing data.

5. (a) Can you determine the support reactions for the truss shown in Figure 8 by using the moment-distribution method? Explain. **(7)**

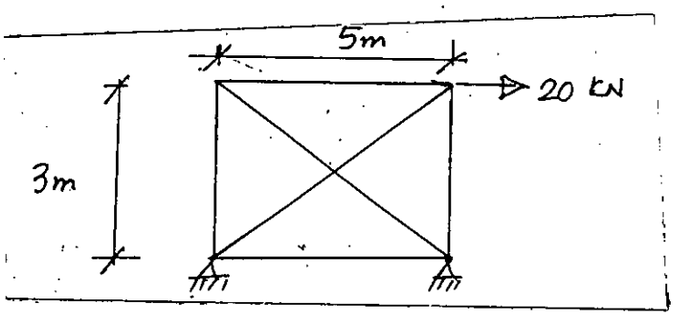

Fig. 8

(b) Draw the shear force and bending moment diagrams for the beam shown in Figure 9 due to the applied loads as well as ½ inch support settlement at C. Consider E = 2900 ksi, I = 800 in^4 for the beam and use the moment-distribution method. **(28)**

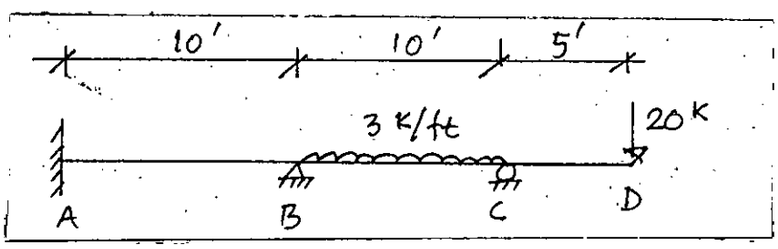

Fig. 9

Contd P/4

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6. (a) Draw the shear force diagram for the beam ABC of the frame shown in Figure 10 under applied loads. Consider E = 29000 ksi is constant for all the member of the frame and I = 800 in^4. Use the moment-distribution method. **(20)**

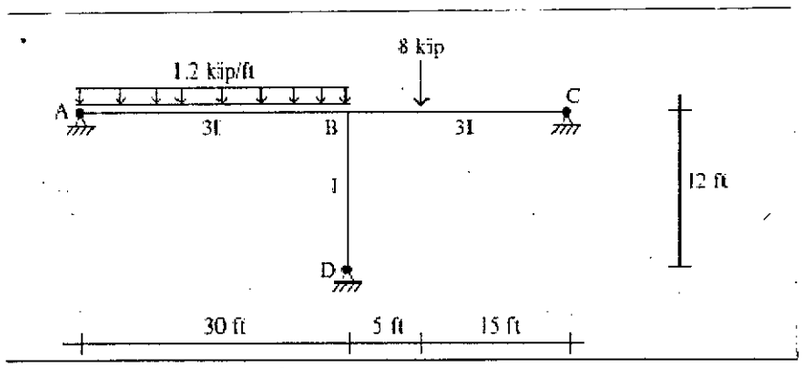

Fig. 10

(b) Determine the reactions for the nonprismatic beam loaded shown in Figure 11 by using the moment-distribution method. Portion AB has inertia I and portion BC has inertia 21. E is constant for the beam ABC. **(15)**

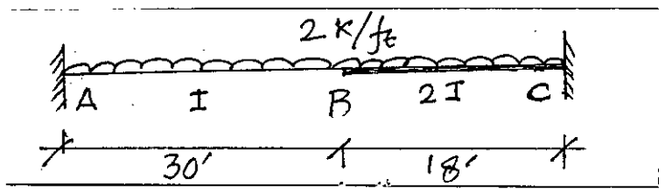

Fig. 11

7. Draw the bending moment diagram for each member of the frame loaded as shown in Figure 12 by using the moment-distribution method. Assume the supports at A and B are pins. EI is constant. **(35)**

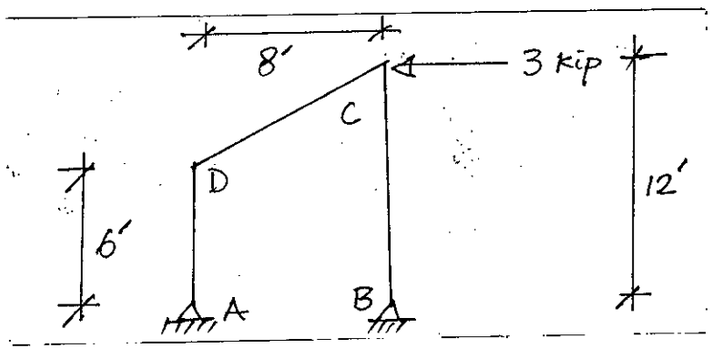

Fig. 12

8. Draw shear force and bending moment diagrams for the beam shown in Figure 13 due to applied loads and 1.5-inch settlement at support B. Consider, E = 29000 ksi, I = 750 in^4 for the beam. Use method of consistent deformation. **(35)**

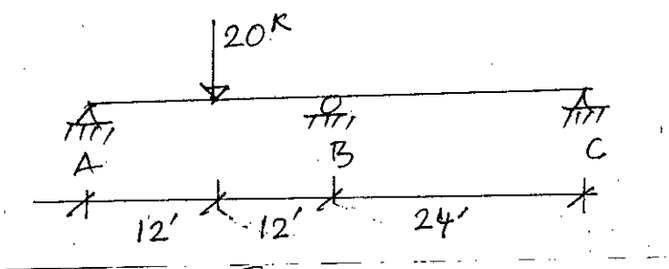

Fig. 13