L-4/T-1/CE **Date : 06/07/2013**

BANGLADESH UNIVERSITY OF ENGINEERING AND TECHNOLOGY, DHAKA

L-4/T-1 B. Sc. Engineering Examinations 2011-2012

Sub : **CE 411** (Structural Analysis and Design III)

Full Marks : 280 Time : 3 Hours

The figures in the margin indicate full marks.

Assume any reasonable value for missing data.

Symbols carry their usual meaning.

USE SEPARATE SCRIPTS FOR EACH SECTION

SECTION – A

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

1. (a) Analyze the plane frame shown in Fig. 1 using the Flexibility Method and draw shear force and bending moment diagrams. Suppose EI is constant and neglect axial deformation. **(25)**

   (b) Determine the stiffness matrix for the truss shown in Fig. 2. Given: A for horizontal members = 7.5 in^2, A for vertical members = 10 in^2 and A for diagonal members = 12.5 in^2. **(21⅔)**

2. (a) For the truss shown in Fig. 3, compute bar forces using the Flexibility Method. Given EA = 432000^k for all members. **(23⅔)**

   (b) For the plane grid shown in Fig. 4, calculate the unrestrained degrees of freedom. Ignore torsional deformation. Suppose EI = 3×10^6 k-in^2. **(23)**

3. (a) Calculate moment at the joint 'C' of the beam shown in Fig. 5. Assume, EI = 3×10^6 k-in^2 for the entire beam. **(23⅔)**

   (b) Write down the stiffness equations in matrix form for the plane frame shown in Fig. 6. Suppose, EI is constant. Ignore axial deformation of the beam only. **(23)**

4. For the plane truss shown in Fig. 7, determine the nodal coordinate matrix, combined load matrix, member connectivity matrix, member stiffness matrix (in global axes) and global stiffness matrix for the truss. (EA = 432000^k for all members). **(46⅔)**

SECTION – B

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

5. (a) Analyze the frame of Fig. 8 using moment distribution method and draw the bending moment diagram. **(23⅓)**

   (b) Determine the ordinates of influence line at midspan locations for the support moment at A of the beam shown in Fig. 9. EI constant throughout. **(23⅓)**

Contd P/2

CE 411 (CE)

6. (a) Analyze the beam of Fig. 10 using slope deflection method and determine vertical reaction at support B. E is constant. **(23 1/3)**

   (b) Analyze the frame of Fig. 11 using moment distribution method and draw shear force and bending moment diagram. **(23 1/3)**

7. Analyze the frame of Fig. 12 using moment distribution method and determine support reactions (forces and moments). **(46 2/3)**

8. (a) In addition to the load acting on the beam of Fig. 13 the support at A rotates clockwise 0.02 radian while the support at C settles down 0.2 ft. Solve the beam using slope deflection method and determine the support reactions (forces and moment). **(23 1/3)**

   (b) Draw influence line for moment at support A of the beam of Fig. 14. Determine ordinates at mid-span locations. Unit load moves from A to D. **(23 1/3)**

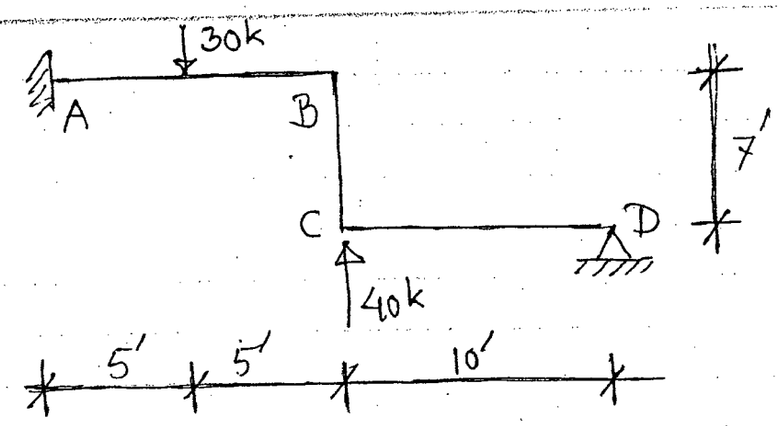

Fig. 1 Q. 1(a)

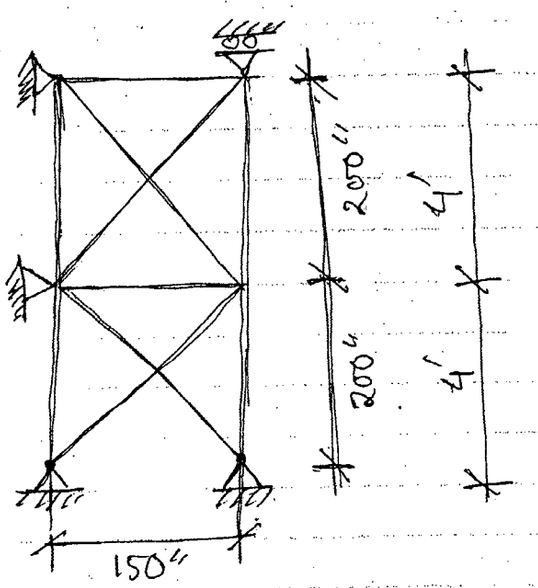

Fig. 2 Q. 1(b)

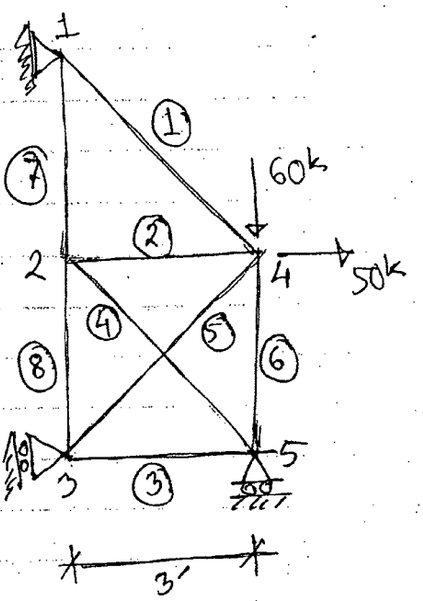

Fig. 3 Q. 2(a)

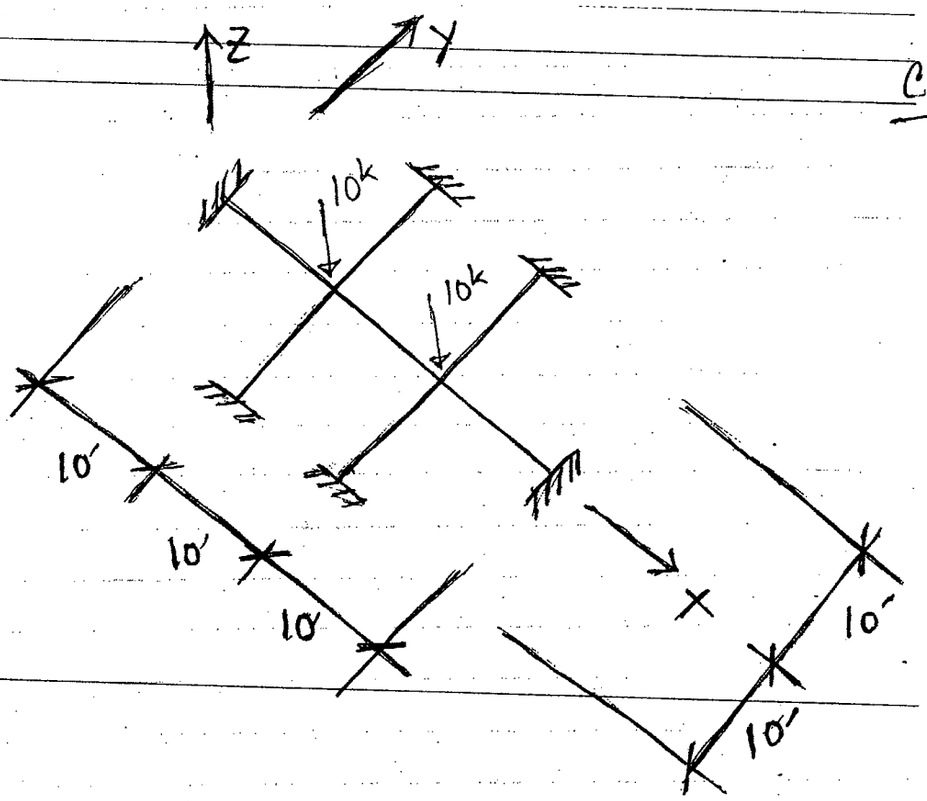

Fig. 4 Q. 2(b)

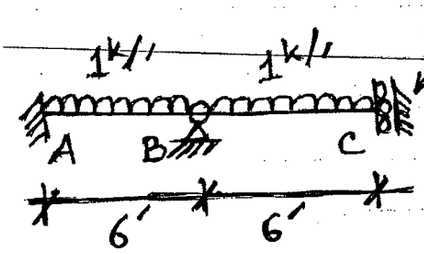

Fig. 5
Q. 3(a)

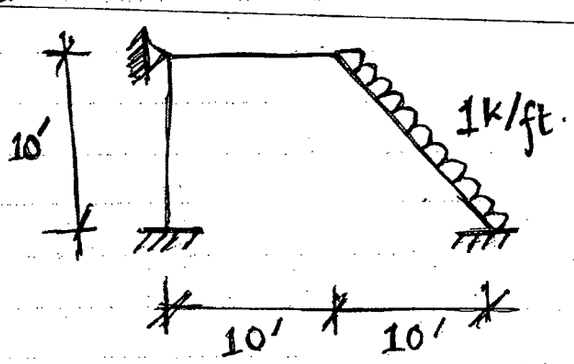

Fig. 6 Q. 3(b)

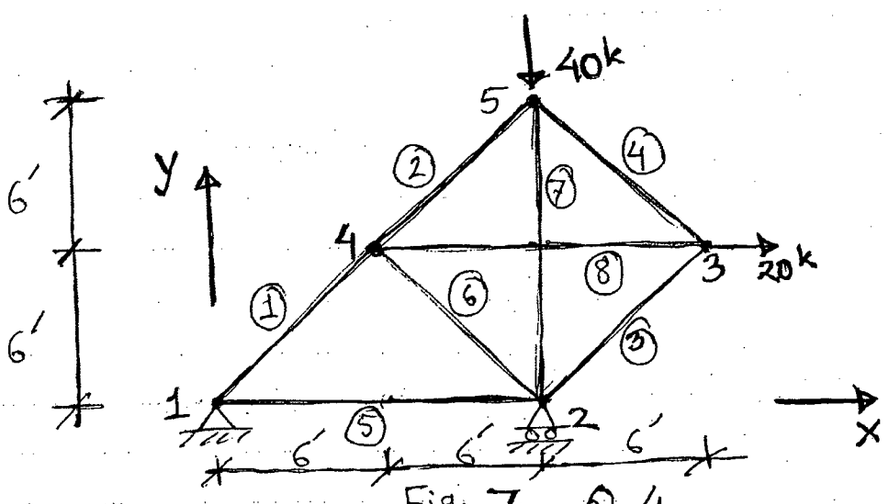

Fig. 7 Q. 4.

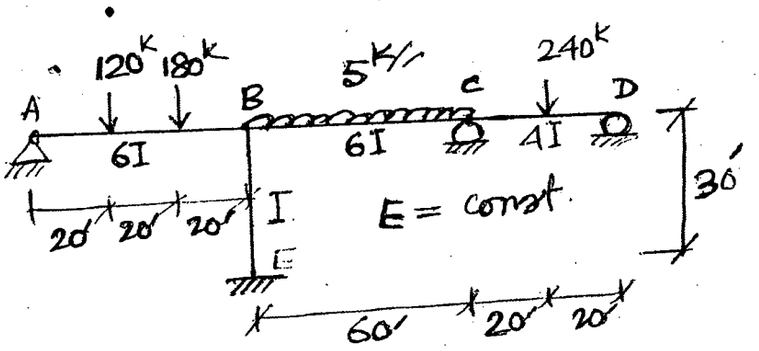

Fig 8. Q. 5(a)

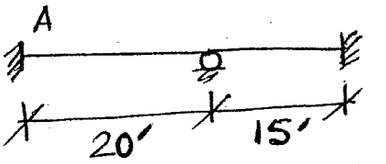

Fig. 9 Q. 5(b)

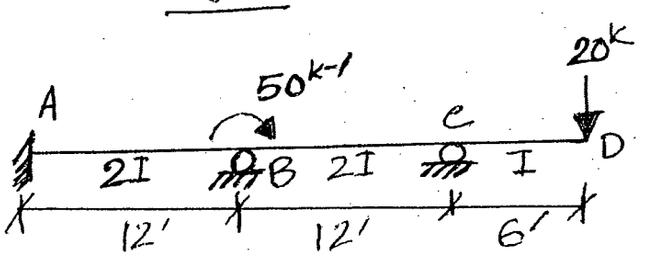

Fig. 10 Q. 6(a)

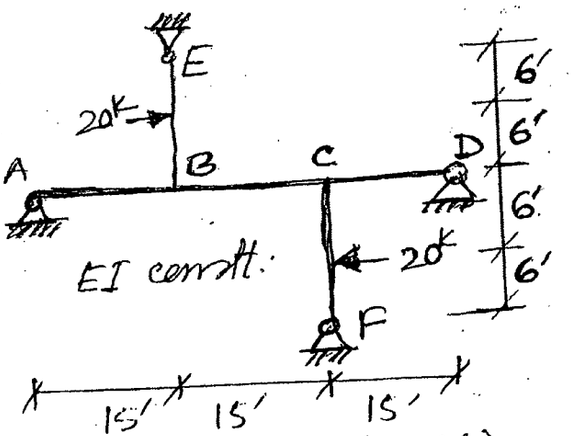

Fig 11 Q. 6(b)

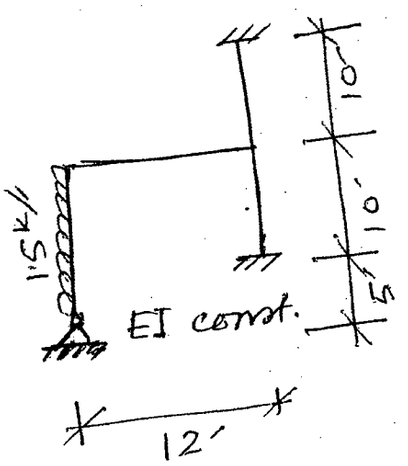

Fig. 12 Q. 7

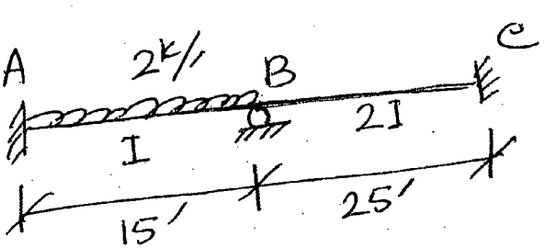

Fig 13 Q. 8(a)

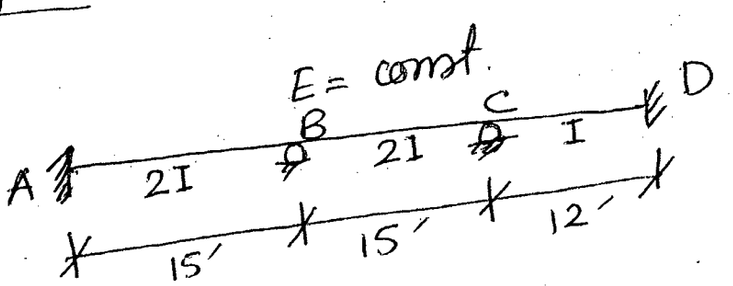

Fig 14 Q. 8(b)

L-4/T-1/CE **Date : 23/07/2013**

BANGLADESH UNIVERSITY OF ENGINEERING AND TECHNOLOGY, DHAKA

L-4/T-1 B. Sc. Engineering Examinations 2011-2012

Sub : **CE 401** (Project Planning and 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 'normal project time' 'normal cost', 'crash time', and 'crash cost'. What do you understand by 'cost slope'? **(8)**

(b) Figure-1 shows the network for a project, the data for the duration and costs of each activity are given in following Table. **(15)**

Activity	Normal duration (Weeks)	Normal Cost (Tk.)	Crash duration (weeks)	Crash Cost (Tk.)
1-2	6	7000	3	14500
1-3	8	4000	5	8500
2-3	4	6000	1	9000
2-4	5	8000	3	15000
3-4	5	5000	3	11000

The direct cost of the project is Tk. 3000/week. Determine the optimum duration of the project and the corresponding minimum cost.

(c) List the steps of process of time-cost optimization. **(6)**

(d) What is a milestone chart? How does it differ from a bar chart? How can mile-stone chart be developed into a network? **(6)**

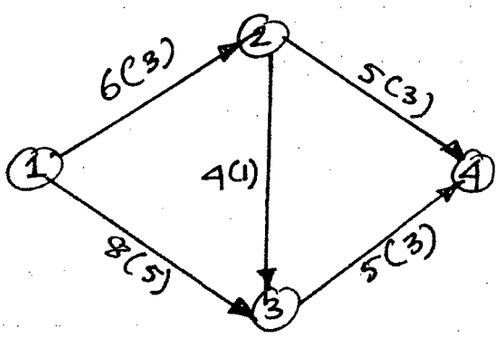

Figure-1 for question 1(b)

2. (a) Explain in brief the difference between PERT and CPM networks. Explain the circumstances under which one is preferred over the other. **(7)**

(b) Briefly discuss the standard form of Linear program (L.P) model. What are the assumptions that we made while using LP model. **(6)**

(c) A school is preparing a trip for 400 students. The company who is providing the transportation has 10 buses of 50 seats each and 8 buses of 40 seats each, but only has 9

Contd P/2

CE 401

Contd ... Q. No. 2(c)

drivers available. The rental cost for a large bus is USD 800 and USD 600 for a small bus. Calculate how many buses of each type should be used for the trip for the least possible cost using LP model. **(14)**

(d) Explain the importance of Equipment in construction Industry. State the uses of following construction equipment: **(8)**

Excavator, Cranes, Asphalt paver, Cold milling machine.

3. (a) For the network shown in Figure-2 determine the probability of completing the project in 31 days. Also calculate time duration that will provide 96% probability of its completion in time. Standard duration along the critical path 4.47. **(15)**

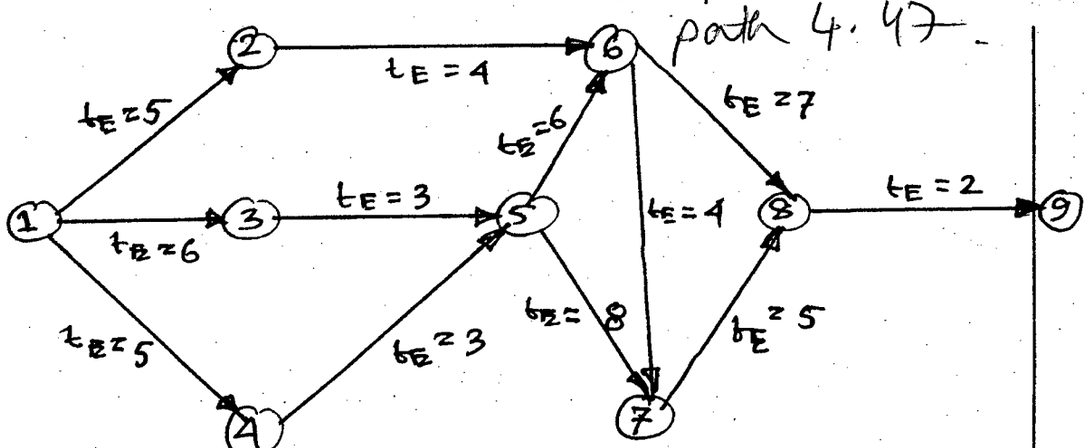

Figure-2

(b) The network of a certain project is shown in Figure-3 with estimated durations of various activities. Determine following: **(20)**

(i) event time of each event.

(ii) Earliest and latest start and finish times of each activity.

(iii) Total and free floats for each activity.

(iv) Critical paths for the network.

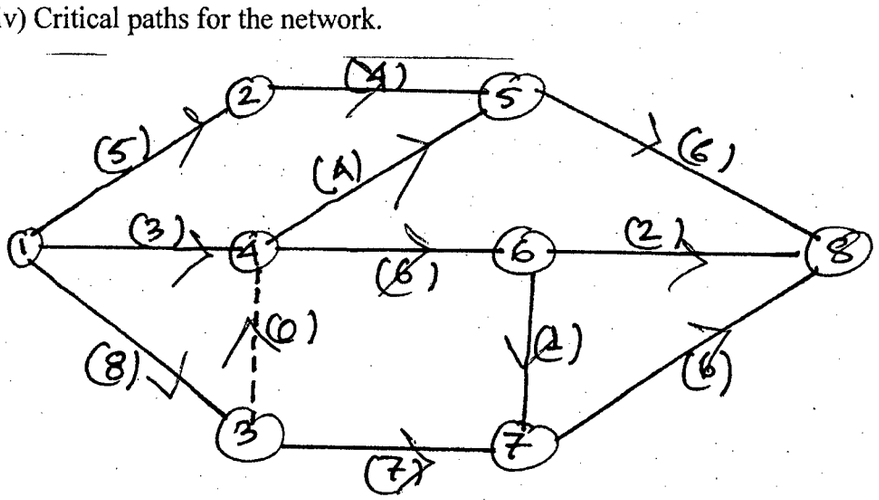

Figure-3

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4. (a) What steps should be taken to make a construction site safe? List some personal protective equipment used in construction site. **(11)**

(b) Explain "Tenders Inviting" phase and "Tenders Evaluation" Phase of a tendering process. **(9)**

(c) Explain application of Quality Control cycle to public works projects. Why are accidents increasing in construction industries in recent time? **(7)**

(d) The maintenance project of a building consists ten jobs. The predecessor relationships are identified by their node numbers, as indicated below: **(8)**

Job	Identifications	Job	Identifications
A	(1, 2)	F	(4, 5)
B	(2, 3)	G	(4, 7)
C	(2, 4)	H	(5, 8)
D	(3, 6)	I	(6, 8)
E	(3, 5)	J	(7, 8)

Draw the network diagram for the project.

SECTION – B

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

Necessary assumptions could be made for any missing information and data.

5. (a) How do you define management and in which way management is different from administration. State the main essential task of management and typical management questions that underlie decisions in each organisation. Briefly outline the elements of the process of management. **(17)**

(b) Discuss the concepts of delegation and authority relationships. List the factors in delegation and several problems of using a "Staff" man in an organization. Explain influencing and disciplining and state some leadership functions and guides for leaders' behaviour. **(18)**

6. (a) State some positive and negative outcomes of conflicts in management and the objectives of wage incentives. Discuss the following: **(15)**

(i) issuing orders and

(ii) collective bargaining

(b) State the importance, dimensions and limitations of planning. Write shorts notes on: **(18)**

(i) Creation of jobs and departmentation.

(ii) Stores and materials management and

(iii) Organizing Construction Supervision and the Staff requirements.

Contd P/4

CE 401

7. (a) Explain Maslow-McGregor models of human motivation. Discuss the fundamental principles of meeting human needs through organization. **(12)**

(b) Define and differentiate between internal rate of return and crossover discount rate. Alternative designs for a building are prepared:- one in structural steel work and other with reinforced concrete frame. Details are given below: **(23)**

	R.C Building	Steel Building
Initial Cost	$ 600,000	$ 220,000
Life	60 years	20 years
Maintenance/year	$ 5,000	$ 2,000
Salvage Value	$ 150,000	$ 25,000

Which building offers the better economic proposition, if the building owner has cost of capital of 12%? Explain the reasons.

8. (a) State the purpose of project analysis and your understanding about the details of project preparation and feasibility study with due regard to some emerging socio-environmental concerns. Explain the steps in the process of long-run manpower planning. **(19)**

(b) Explain the meaning and significance of (i) Payback period, (ii) First Year Rate of Return and (iii) Opportunity Cost of Capital.

Determine the internal rate of return for the project costing $ 1,000,000 with annual benefits of $ 100,000 for 25 years. **(16)**

L-4/T-1/CE **Date : 28/09/2013**

BANGLADESH UNIVERSITY OF ENGINEERING AND TECHNOLOGY, DHAKA

L-4/T-1 B. Sc. Engineering Examinations 2011-2012

Sub : **WRE 401** (Irrigation and Flood Control)

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) What do you mean by soil moisture suction? Briefly describe the working principle and limitations of a tensiometer. **(2+8=10)**

   (b) Distinguish between the terms: **(3×3=9)**

   (i) Hydraulic head and hydraulic gradient

   (ii) Infiltration rate and cumulative infiltration

   (iii) Check flooding and basin flooding.

   (c) A sandy loam soil has available water holding capacity of 130 mm/m. The root depth of the crop is 70 cm and the allowable depletion of water is 55%. The daily water use by the crop is 9 mm/day. Determine the frequency and net depth of irrigation. **(6)**

   (d) Explain how the soil structure influences irrigation? **(5)**

   (e) Explain why the infiltration rate is higher at the beginning of irrigation and approaches to a constant value with time. **(5)**

2. (a) Explain briefly the meteorological factors that influence Evapotranspiration. **(6)**

   (b) Rice is grown in an irrigation scheme of 25 ha area. The monthly reference crop evapotranspiration, effective rainfall and K_c values are given below. The seepage and percolation loss from the rice field is estimated to be 8 mm/day; application efficiency and conveyance efficiency are 85% and 65% respectively. For the month of March, calculate net irrigation requirement (mm/day), field irrigation requirement (mm/day) and discharge capacity (l/s) of a pump assuming that irrigation water supply is available for 15 hours a day. **(14)**

Month	December	January	February	March	April
ET_0, mm/d	2.9	3.3	5.5	7.2	6.7
R_e, mm/d	0	0	0.5	1.0	1.2
K_c	1.0	1.0	1.2	1.3	1.1

   (c) Discuss briefly with a sketch the non-weighing percolation type lysimeter method to determine consumptive use of a crop. **(6)**

   (d) Distinguish between the terms: **(3×3=9)**

   (i) Furrow irrigation and sub irrigation

   (ii) Weir type escape and sluice type escape

   (iii) Aqueduct and syphon aqueduct

Contd P/2

WRE 401

3. (a) Write down the conditions favoring the adoption of sprinkler irrigation. Also state its limitations. **(4+3=7)**

(b) Estimate the vapor pressure deficit in the month of April for the following monthly average climatic data for 25 years record at a climatic station. The altitude of the station is 25 m above MSL. **(7)**

Daily (average) maximum temperature = 34.39 °C
Daily (average) minimum temperature = 21.32 °C
Maximum relative humidity = 89.42%
Minimum relative humidity = 38.35%

Given that,

$$e^{o}(T) = 0.611 \exp\left[\frac{17.27\,T}{T + 237.3}\right]$$

(c) Show in a diagram the different components of diversion head works. Also write down the functions of the following components/structures: **(9)**

(i) Under-sluice
(ii) River training works
(iii) Cross regulator.

(d) Write down the purposes of measuring irrigation water. Briefly describe and give advantages and disadvantages of a constant head orifice. **(12)**

4. (a) Define "flexibility" and "sensitivity" as applied to irrigation outlets and derive a relationship between them. **(9)**

(b) A direct driven centrifugal pump lifts 150 m^3 of water per hour against a total static head of 12 m. The head loss in the suction and discharge pipe may be assumed to be 2.5 m and 6.5 m respectively. Compute the cost of electrical energy in the month of July if the pump is operated 15 hours a day and electrical cost is Tk. 5 per unit. Assume the efficiencies of the pump and motor are 75% and 90% respectively. **(8)**

(c) Describe with a sketch the working principle of a centrifugal pump. Give a comparison between a volute type centrifugal pump and a vertical turbine pump. **(10)**

(d) State the rules for setting and operating weirs to measure irrigation water. **(8)**

SECTION – B

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

5. (a) Define irrigation. What are the objectives of irrigation? **(5)**

(b) What do you understand by 'mixed cropping'? Under what conditions it is favorable. Why mixed cropping is not generally acceptable? **(6)**

(c) Write short notes on (i) counter berm (ii) borrow pit (iii) non-silting and non-scouring velocity. **(9)**

Contd P/3

WRE 401

Contd ... Q. No. 5

(d) A reservoir is proposed to be constructed for a gross command area of 1.5×10^5 hectares of which 80% is cultivable irrigable. Following data are given: **(15)**

Crop	Delta (cm)	Intensity of irrigation (%)	Kor-depth (cm)	Kor-period (day)
Paddy	120	40	19	21
Wheat	40	20	13.5	28
Sugarcane	90	15	16.5	12

(i) Work out the storage required for the reservoir, assuming canal losses at 20% of the head discharge, and reservoir evaporation and dead storage losses at 15% of gross capacity.
(ii) For the above crop pattern, determine the channel capacity in the head reaches, assuming a time factor equal to 0.80.

6. (a) Discuss the general causes of flood in Bangladesh. **(15)**
(b) What is waterlogging in irrigation? Discuss the causes of waterlogging. What reclamation methods may be adopted for a waterlogged area? **(12)**
(c) Classify the irrigation water based on the electrical conductivity and sodium hazards and state the suitability of these classes with respect to soils and crops. **(8)**

7. (a) Briefly describe the types of flood that are common in Bangladesh. **(7)**
(b) Define: (i) base period (ii) duty (iii) kor watering (iv) intensity of irrigation (v) time factor (vi) alluvial canal. **(9)**
(c) What is leaching? How leaching requirement is determined? **(4)**
(d) Design an irrigation canal having double tile lining (n = 0.014) and laid at a longitudinal stope of 1 in 1100. The design discharge is 30 m^3/s and the side slope is 1H : 1V. Use Kennedy's method assuming the maximum permissible velocity as 2.50 m/s. **(15)**

8. (a) Briefly explain with necessary sketches, the engineering measures adopted for the protection of flood prone areas. **(15)**
(b) Draw the layout of a typical canal irrigation system. **(4)**
(c) Is groundwater irrigation advantageous than surface water irrigation? Justify your answer. **(6)**
(d) A sample of water from a well showed that it has an electrical conductivity of 800 micro-mho/cm and a density of 0.99 g/cm^3. A field with a bulk density of soil of 1.50 g/cm^3 and saturation point of 40 percent will be irrigated. Determine the depth of irrigation that may turn the 35 cm depth of soil saline ignoring the precipitation and leaching of salts that may occur. What is the classification of this water if the concentration of Mg. Ca and Na are 2, 10 and 30 milli-equivalent/litre, respectively? **(10)**

L-4/T-1/CE **Date : 21/09/2013**

BANGLADESH UNIVERSITY OF ENGINEERING AND TECHNOLOGY, DHAKA

L-4/T-1 B. Sc. Engineering Examinations 2011-2012

Sub : **CE 333** (Environmental Engineering – III)

Full Marks: 280 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) List the pathways of "Inflow" to the sewer systems from surface sources. **(8)**

(b) What is sustained loading in a WWTP? Explain, with approximate example, why sustained loading low-flow curves are necessary in a WWTP employing secondary treatment. **(15)**

(c) Design a septic tank for a family of 12 members. The average wastewater flow rate is 100 lpcd, and the tank is to be desludged every 3 years. To ensure acceptable effluent quality, a minimum hydraulic detention time of at least 0.85 days should be maintained. Also, draw: (i) a plan showing dimensions of chambers of the designed septic tank (consider 2-chamber tank); (ii) a section showing dimensions and positions of inlet and outlet devices, and partition wall; (iii) a section showing depths of different zones of septic tank. [Assume a design temp. of 25^0C; assume reasonable values for parameters not given]. **(23⅔)**

2. (a) Draw a schematic diagram depicting the different treatment units of an ETP where both chemical and biological treatments are performed. On the diagram identify separately the sampling locations for: **(8)**

   (i) Assessing the compliance of the ETP with the disposal standards set for surface water disposal.

   (ii) Assessing the performance of the chemical treatment units only.

   (iii) Assessing the performance of the biological treatment units only.

Provide brief explanations for selecting the sampling locations for each of the above.

(b) Identify the elements of a Small Bore Sewerage System (SBS). Explain how inclusion of a septic tank in the system brings in changes in sewer network design in SBS system. **(15)**

(c) Design a suitable latrine for a family of seven members living in a village where tube-well based water supply is available; however, facilities for mechanical desludging is not available. The average wastewater flow ate is 8 lpcd. The soil in the area is silty clay loam with long-term infiltration rate of 19 L/m^2.day, and the height of groundwater level is 3.55 m below ground surface. The pit is to be constructed with concrete rings of 1.1 m diameter and 0.30 m depth. What kind of latrine would you suggest? Justify your answer. Design the latrine (including venting system), and estimate its design life. Also, draw a neat sketch (both plan & section) showing all elements of the designed latrine. [Assume reasonable values for parameters not given]. **(23⅔)**

Contd P/2

CE 333

3. (a) Define "Composite sampling" in reference to its importance in ETP. **(8)**

(b) What do you understand by "black water" and "grey water"? Classify excreta-related diseases and provide examples of each class. With an approximate figure, show how disease is transmitted via different routes, along with sanitation barriers for prevention of disease transmission. **(15)**

(c) Sewage sample collected on March 01, 2013 from the Special Sewage Diversion Structure (SSDS#1) near Sonargaon Hotel had a BOD_3 and BOD_7 of 360 and 410 mg/l, respectively. Following cleanup of the sewers on May 01, 2013 part of the deposited organic sludge was discharged through the sewers. The BOD_5 of the wastewater sample collected from the same location on the day following cleanup was 680 mg/l. **(23⅔)**

In both the cases sewage was diverted into twin sewers each with internal diameter 1.830 m laid on a slope of 0.0008. Sewage flows in each of the pipes at the times of sampling were measured to be 0.60 m^3/sec. while flowing 1/3 rd full. Estimate the sulfide conditions of the sewage on those dates based on "Z" values. Comment on your results. [Given: Laboratory BOD decay rate is k = 0.3/day and temp. T = 25^0C].

4. (a) Draw the schematic diagram showing the generation of H_2S in wastewater with more than 1 mg/l DO. Write the relevant chemical reactions to H_2S generation under this condition. **(8)**

(b) What do you understand by a "hygienic latrine"? Do you consider the different forms of "Pit latrines" to be hygienic? Explain. What are the relative advantages and disadvantages of VIP and ROEC latrines? Provide neat sketch of a single-pit VIP latrine. **(15)**

(c) A sewer pipe of internal diameter 1.830 m and thickness 0.150 m will be laid in a trapezoidal trench (as shown in Figure 4(c)). The invert of the sewer pipe will be at –0.45 m PWD. The finished road level is set at +6.05 m PWD. The back fill will be of damp clay. Determine the load on sewer pipe in tons/meter. (Assume reasonable values for missing data. Provide justifications of your assumption). **(23⅔)**

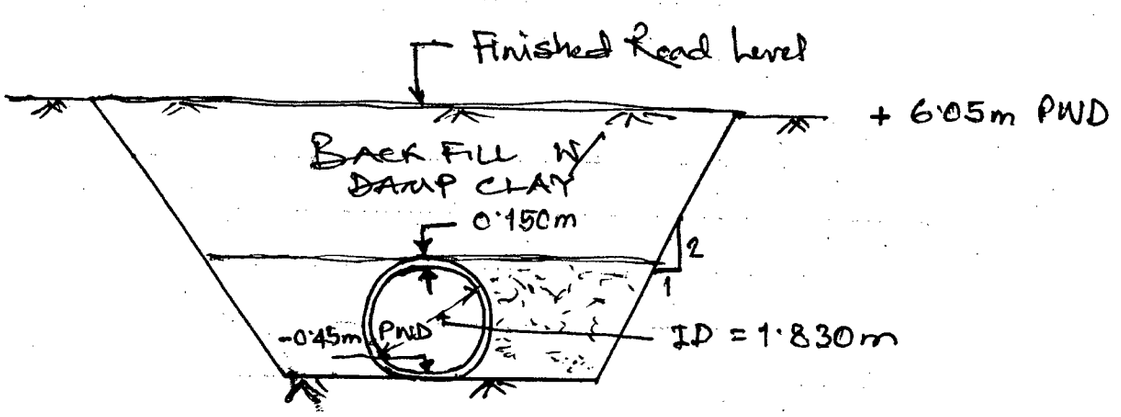

Figure for Q# 4(c)

Contd P/3

CE 333

SECTION – B

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

5. (a) Differentiate between "natural processes" and "engineered processes" of waste treatment. What are the principles of waste treatment? **(7)**

(b) Discuss briefly the impact of humans upon the environment. **(10⅔)**

(c) What are the drawbacks of high water pressures in a plumbing system? How will you control it? **(5)**

(d) Draw a neat sketch of a house water service and label it. **(7)**

(e) State the principles of water supply for tall buildings. **(7)**

(f) In a downfeed zone of water supply the pressure available in the riser at a certain floor is 9.5 psi. Calculate the permissible pressure drop per 100 ft of riser to supply water at a floor 24 ft below, where the pressure requirement is 16 psi. **(10)**

6. (a) What are the different stacks of the drainage system of a building? State their functions. **(6)**

(b) Differentiate between "self siphonage" and "induced siphonage" of a building drainage system. How will you avoid these? **(6)**

(c) State four most important general requirements about installation of drainage pipes in a building. **(6)**

(d) What do you mean by sustainability of water supply and sanitation systems? List the merits of community participation in water and sanitation services. **(13)**

(e) Explain how you can make rural sanitation sustainable. **(15⅔)**

7. (a) Draw a typical bacterial growth curve and food utilization showing different phases in a batch culture. Explain the F/M ratio and biomass settling characteristics. **(10)**

(b) Explain the symbiosis between bacteria and algae in a facultative pond. **(8⅔)**

(c) What are the purposes of primary treatment of municipal wastewater? **(6)**

(d) For a BOD test at 25^0C, initial DO = 7.5 mg/l. After 5 days of incubation, DO = 2.8 mg/l. Given, dilution factor = 50, BOD rate constant, k = 0.20/day at 20^0C (base e) and $\theta = 1.047$. Calculate the BOD_5 at 20^0C and the BOD remaining after 5 days at the same temperature. **(15)**

(e) State the merits and demerits of Imhoff tank. **(7)**

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8. (a) Explain the basic principle of Activated Sludge Method in treatment of municipal wastewater. What are the advantages of this method over waste stabilization ponds? **(12)**

(b) Classify bacteria based on energy source and carbon source for metabolism. What are the different steps involved in bacterial metabolism? **(12)**

(c) Define "Recirculation ratio" in the context of Trickling Filters. Why recirculation of treated wastewater is done in Trickling Filters? **(7⅔)**

(d) Calculate the effluent BOD from a trickling filter having a depth of 1.8 m and a recirculation rate of 200% of the flow. The influent BOD_5 is 180 mg/l following primary treatment. Use the following formula **(15)**

$$C_e = \left(\frac{C_i + C_e}{1 + r} \right) e^{-kD}$$

where the symbols have their usual meanings. (Assume any reasonable value for a missing data if required)

L-4/T-1/CE **Date : 05/10/2013**

BANGLADESH UNIVERSITY OF ENGINEERING AND TECHNOLOGY, DHAKA

L-4/T-1 B. Sc. Engineering Examinations 2011-2012

Sub : **CE 351** (Transportation Engineering I : Transport and Traffic Design)

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**.

Assume any reasonable value for missing data.

1. (a) What is meant by "Transportation Planning"? Show with a neat sketch the basic elements of Transportation Planning. **(11)**

   (b) Explain schematically the relationship between access and movement function of street. **(12)**

   (c) Calculate the inter zonal trips using a simple gravity model from the following data. Assume the exponent of travel time as 0.6. **(12)**

Production Zone i	Employment Zone	Employments	Travel time from Zone i
T_i = 450 work trips	1	750	9 minutes
	2	400	5 minutes
	3	300	7 minutes

2. (a) Show with a diagram the representation of a transportation network for transportation system modeling. **(11)**

   (b) What are the advantages and disadvantages of a rotary intersection? **(12)**

   (c) A driver moving at a speed of 65 mph on a 3 percent upgrade section of a highway sights an obstruction 500 ft away and applied the brake. If the coefficient of friction for the pavement is 0.29 and acceleration due to gravity is 32.2 ft/sec^2, would the driver be able to stop the car before hitting the obstruction? **(12)**

3. (a) Explain the factors to be considered in setting warrants for NMV/bicycle facilities. **(11)**

   (b) Show diagrammatically the method of attaining superelevation considering pavement revolved about the centre line. **(12)**

   (c) Show with neat sketches the minimum passing sight distance for a two-lane two-way highway for right-hand drive vehicle and keep-to-left convention. **(12)**

4. (a) Name five emerging transportation technologies. Explain their scope and impact on transportation system with illustration of relevant tools in each cases. **(11)**

   (b) What are the key technological characteristics of public transport? Discuss the features and advantages of Bus Rapid Transit (BRT) with respect to traditional transit system. **(12)**

   (c) "During the last three decades, overall Bangladesh transport system has shifted towards unsustainable trend" – Explain with supporting data and graphical trend. **(12)**

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SECTION – B

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

5. (a) Illustrate a schematic model for transportation system. Also, show the linkage between conceptual and real system elements. **(9)**

(b) Explain how transportation system can be evaluated in terms of its three basic attributes giving reference to Highway, Railway and Waterway based systems. **(9)**

(c) Explain the hierarchies and road classification in urban and intercity conditions. Also, discuss the justification of investment priority on the basis of classification considering their relative uses. **(9)**

(d) Name six factors influencing urban transport system. Explain the concept of Walking city, Transit city and Automobile city. **(8)**

6. (a) What are the typical design speeds of Bangladesh RHD roads. Draw Standard cross-sections for Type 1 and Type 4a RHD roads. Also, name speed related four design parameters. **(9)**

(b) Discuss the potential, constraints and opportunities of Bangladesh Railway business sectors. Differentiate between traffic signs and markings. **(5+5)**

(c) Write down the objectives of speed studies? Differentiate between geometric-delay and operation-delay. List the locations where parking should be prohibited. Briefly differentiate between On-street and off-street parking. **(3+3+3+3)**

(d) Spot speed data were collected at a section of highway during an improvement work. The speed characteristics are given below. Determine whether there was any significant difference between the average speeds at the 95% confidence level (Z critical = 1.96). **(4)**

$U_1 = 37.4$ mph $\quad U_2 = 40.2$ mph

$S_1 = 8.6$ mph $\quad S_2 = 9.5$ mph

$n_1 = 300$ $\quad n_2 = 285$

7. (a) Define: (i) Design vehicle (ii) 30th HV (iii) PCU (iv) PIEV (v) AADT. **(3×5=15)**

(b) When to undertake O-D survey? Discuss the ways of collecting O-D data. **(4+4)**

(c) The following travel times were observed for 5 vehicles traversing a 2 km segment of highway: **(4)**

Vehicle	Time (min)
1	1.8
2	1.3
3	1.9
4	1.7
5	2.1

Calculate the space and time mean speeds of the vehicles.

(d) Briefly explain the importance of street lighting. Define: Terminal, Depot and Workshop. **(5+3)**

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8. (a) Write down the objectives and methods of carrying out traffic volume studies. **(4+4)**

(b) Calculate safe speed, design speed, pace, modal speed for the following data: **(12)**

Speed Range (kmph)	No. of vehicle observed (f)
0 – 5	0
5 – 10	5
10 – 15	18
15 – 20	40
20 – 25	110
25 – 30	200
30 – 35	250
35 – 40	120
40 – 45	40
45 – 50	20
50 – 55	11
55 – 60	6
60 – 65	2
65 – 70	0
Total	822

(c) List different types of signal controller. **(5)**

Design a two phase signal of an isolated cross-junction for the following data: **(10)**

	N-S phase	E-W phase
Inter-green period =	7 sec	4 sec
Initial and final lost time =	3 sec	2 sec

	North	South	East	West
Flow (pcu/hr) =	600	450	700	650
Saturated flow (pcu/hr) =	2000	1900	2200	2100

Assume reasonable value for any missing data. Draw phase and cycle time bar diagram.
