University of Asia Pacific
Department of Civil Engineering
Mid Term Examination Fall 2015
Program: B.Sc. Engineering (Civil)

Course Title: Project Planning and Management | Course Code: CE401
Time: 1 hour | Full Marks: 20

1(a) What are the basic resources of construction management? Briefly describe the points to be considered in managing those resources (at least 2 resources). 1+1

(b) Why construction industry is said to be a unique one? Give five reasons. 1

(c) What do you understand by WBS? What are the benefits of doing WBS? 1+1

2(a) What are the three major attributes needed to be consider for project management? Is it possible to maximize those? How and Why? 2

(b) What is a Project? Define the characteristics of a project. 2

(c) In your judgment, which is the most important phase of Project life cycle? Why? 1

3(a) Write down the differences between CPM and PERT? 1

(b) Describe briefly the drawbacks of Gantt Chart. 1

(c) Draw the network diagram. Find the total duration and critical path of a project from the following information: 4

Activity	Predecessor	Estimated Time
a	-	7
b	-	10
c	a, b	7.5
d	b	6
e	c	6.5
f	c, d	5
g	e, f	6

Also determine the free float and total float of each activity.

4(a) Write down the documents that form a contract. 2

(b) Why do we plan? Why plan fails? 2

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University of Asia Pacific
Department of Civil Engineering
Mid Semester Examination ~~Spring~~ 2015 (Fall)
Program: B.Sc. Engineering (Civil)

Section B (Set 1)

Course Code: CE 411 — Course Title: Structural Engineering III
Full Marks: 40 (= 4 × 10) — Time: 1 hour

1. Identify zero-force members and write down the boundary conditions of the truss *abcdef* shown in ***Figure 1***. Also calculate P_x if horizontal deflection at point 'a' is 0.10 inch [Given: S_x = constant = 500 k/ft].

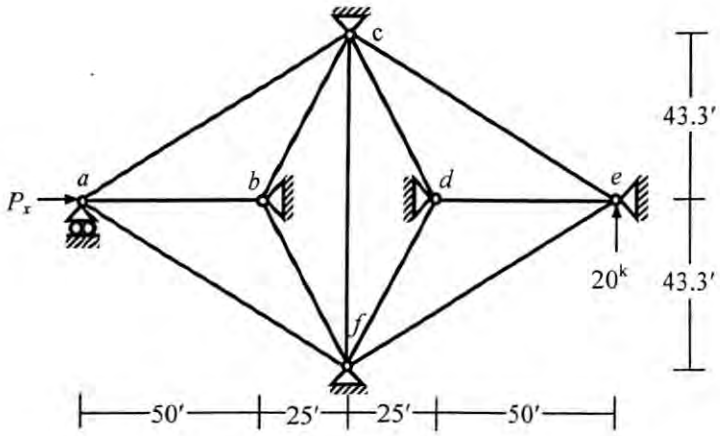
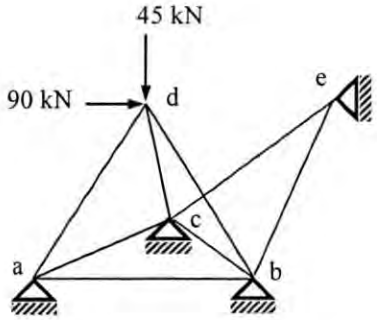


Figure 1



Nodal coordinates (meter):
a(-5,0,0), b(5,0,0), c(0,0,-10),
d(0,10,-5), e(10,10,-5)

Figure 2

2. Calculate the joint deflections and member forces of the space truss loaded as shown in ***Figure 2*** [Given: S_x = constant = 2×10^4 kN/m].

3. Determine the joint deflections and rotations of the beam loaded as shown in ***Figure 3*** [Given: EI = 40×10^3 k-ft^2].

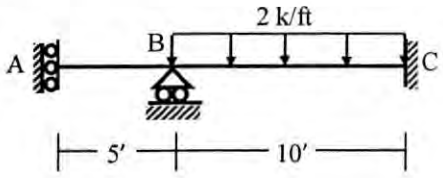


Figure 3

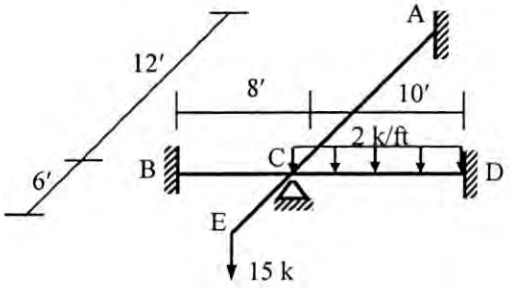


Figure 4

4. Determine the joint rotations at C of the grid loaded as shown in ***Figure 4*** if joint C settled 0.10 inch [Given: EI = 40×10^3 k-ft^2, GJ = 30×10^3 k-ft^2].

List of Useful Formulae for CE 411

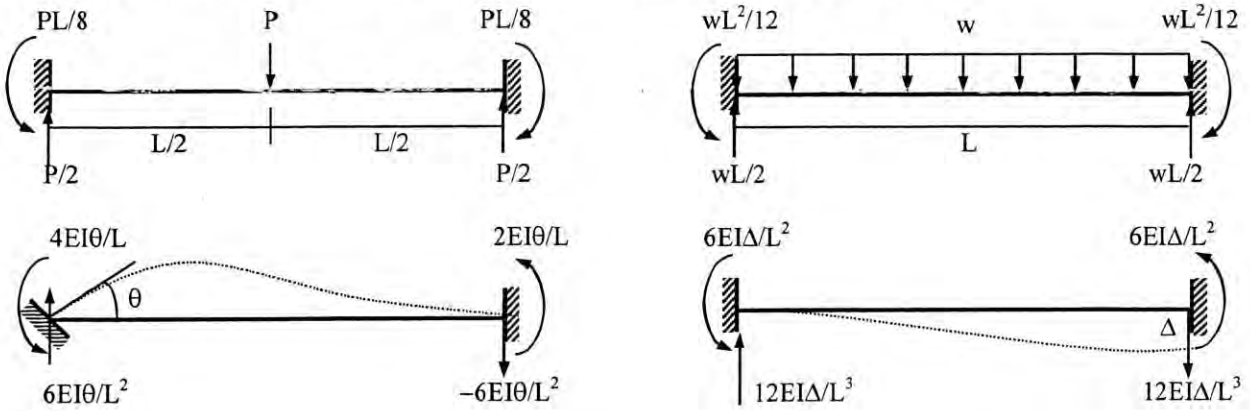
* The stiffness matrix $\mathbf{K_m}^G$ of a 2D truss member in the global axis system is given by

$$\mathbf{K_m}^G = S_x \begin{pmatrix} C^2 & CS & -C^2 & -CS \\ CS & S^2 & -CS & -S^2 \\ -C^2 & -CS & C^2 & CS \\ -CS & -S^2 & CS & S^2 \end{pmatrix}$$

and Truss member force, $P_{AB} = S_x [(u_B - u_A) C + (v_B - v_A) S]$

[where $C = \cos\theta$, $S = \sin\theta$]

* Fixed End Reactions for One-dimensional Prismatic Members under Typical Loadings



* The stiffness matrices $\mathbf{K_{AB}}$ of Beam AB and Column AB (for u_A, v_A, θ_A, u_B, v_B, θ_B) are

$$\mathbf{K_{Beam}} = \begin{pmatrix} S_x & 0 & 0 & -S_x & 0 & 0 \\ 0 & S_1 & S_2 & 0 & -S_1 & S_2 \\ 0 & S_2 & S_3 & 0 & -S_2 & S_4 \\ -S_x & 0 & 0 & S_x & 0 & 0 \\ 0 & -S_1 & -S_2 & 0 & S_1 & -S_2 \\ 0 & S_2 & S_4 & 0 & -S_2 & S_3 \end{pmatrix} \qquad \mathbf{K_{Column}} = \begin{pmatrix} S_1 & 0 & S_2 & -S_1 & 0 & S_2 \\ 0 & S_x & 0 & 0 & -S_x & 0 \\ S_2 & 0 & S_3 & -S_2 & 0 & S_4 \\ -S_1 & 0 & -S_2 & S_1 & 0 & -S_2 \\ 0 & -S_x & 0 & 0 & S_x & 0 \\ S_2 & 0 & S_4 & -S_2 & 0 & S_3 \end{pmatrix}$$

where $S_x = EA/L$, $S_1 = 12EI/L^3$, $S_2 = 6EI/L^2$, $S_3 = 4EI/L$, $S_4 = 2EI/L$

* The stiffness matrix of a 3D truss member in the global axes system [using $C_x = \cos\alpha$, $C_y = \cos\beta$, $C_z = \cos\gamma$] is

$$\mathbf{K_m}^G = S_x \begin{pmatrix} C_x^2 & C_xC_y & C_xC_z & -C_x^2 & -C_xC_y & -C_xC_z \\ C_yC_x & C_y^2 & C_yC_z & -C_yC_x & -C_y^2 & -C_yC_z \\ C_zC_x & C_zC_y & C_z^2 & -C_zC_x & -C_zC_y & -C_z^2 \\ -C_x^2 & -C_xC_y & -C_xC_z & C_x^2 & C_xC_y & C_xC_z \\ -C_yC_x & -C_y^2 & -C_yC_z & C_yC_x & C_y^2 & C_yC_z \\ -C_zC_x & -C_zC_y & -C_z^2 & C_zC_x & C_zC_y & C_z^2 \end{pmatrix}$$

* Direction cosines of 3D truss member $C_x = L_x/L$, $C_y = L_y/L$, $C_z = L_z/L$; where $L = \sqrt{[L_x^2 + L_y^2 + L_z^2]}$

* Member force $P_{AB} = S_x [(u_B - u_A) C_x + (v_B - v_A) C_y + (w_B - w_A) C_z]$

* Torsional stiffness = GJ/L

* Doki for 2D Truss = 2j – r, 3D Truss = 3j – r, Grid = 3j – r, 2D Frame = 3j – r, 3D Frame = 6j – r

University of Asia Pacific
Department of Civil Engineering
Mid Semester Examination ~~Spring~~ 2015 (Fall)
Program: B.Sc. Engineering (Civil)

Section B (Set 2)

Course Code: CE 411 | Course Title: Structural Engineering III
Full Marks: 40 (= 4 × 10) | Time: 1 hour

1. Determine the joint deflections and rotations of the beam loaded as shown in ***Figure 1*** [Given: EI = 16,500 kN-m^2].

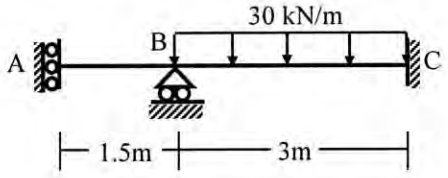


Figure 1

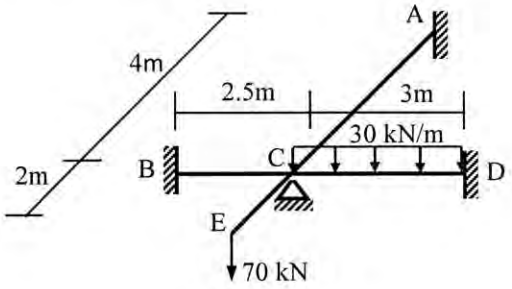


Figure 2

2. Calculate the joint rotations at C of the grid loaded as shown in ***Figure 2*** if joint C Settled 2.5 mm [Given: EI = 16,500 kN-m^2, GJ = 12,500 kN-m^2].

3. Identify zero-force members and write down the boundary conditions of the truss *abcdef* shown in ***Figure 3***. Also calculate P_x if horizontal deflection at point 'a' is 2.5 mm [Given: S_x= constant = 10^4 kN/m].

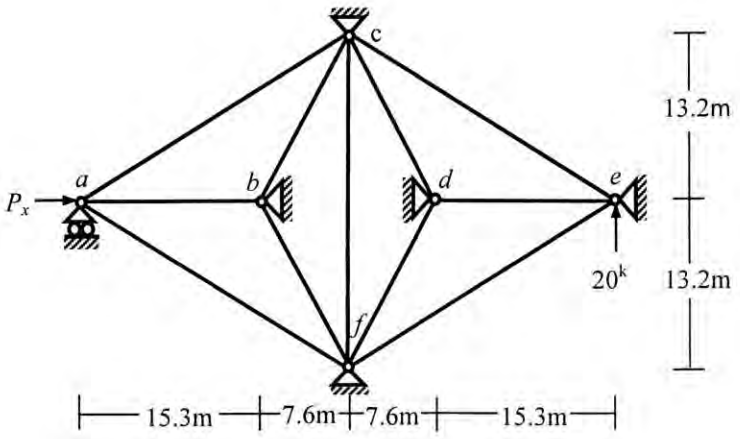
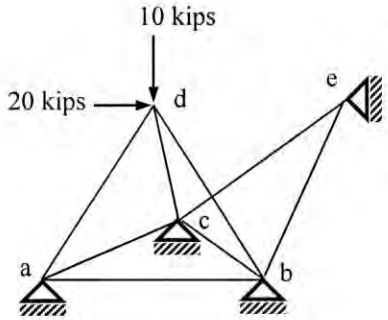


Figure 3



Nodal coordinates (ft):
a(- 6,0,0), b(6,0,0), c(0,0,-12),
d(0,12,- 6), e(12,12,- 6)

Figure 4

4. Calculate the joint deflections and member forces of the space truss shown in ***Figure 4*** [Given: S_x= constant = 1000 k/ft].

University of Asia Pacific
Department of Civil Engineering
MidTerm Examination Fall 2015
Program: B.Sc. Engineering (Civil)

Course Title: Geotechnical Engineering II — Course Code: CE 441
Time: 1 hour — Full Marks: 20

Answer all the questions. **(5x4=20 marks)**

1. (a) For what purposes can the disturbed samples be used? 1.5

   (b) Mention about the factors that should be considered in obtaining the number of borings. 1.5

   (c) In SPT at a depth of 7 m, the recorded blow counts are 3/5/6, for three consecutive 150 mm penetrations. 2

   Given Information: Borehole diameter = 100 mm; sampling method (Standard); rod length 5 m, and hammer efficiency is 0.73.

   Calculate the following:

   (i) Field SPT N (N_f)
   (ii) N_{60}
   (iii) $(N_1)_{60}$

2. According to the soil exploration report, the upper layer is found homogeneous and extends up to 10 m below the ground level. The ground water table is located at GL. Design a square shallow foundation (placed at a depth 1.5 m below the ground level) to support 300 kN load for the following soil data. Provide a factor of safety equal 3. Use Meyerhof's theory of bearing capacity. 5

   The data of this soil layer is as follows:

   Given data: γ_{sat} = 18.2 kN/m^3; c= 10 kPa; $\varphi = 35°$

3. Estimate the allowable bearing capacity of a 2 m wide strip footing, placed at a depth 1.5 m below the ground level. Provide a factor of safety equal 2. Use Meyerhof's theory of bearing capacity and Hanna's design charts for modified bearing capacity factors. 5

   According to the soil exploration report, the upper layer is found homogeneous and extends upto 3 m below the ground level. The ground water table is located at 1.5 m below GL. The data of the soil layers is as follows:

   Given data: γ_{sat} = 18.2 kN/m^3;

   Layer-1: $\varphi_1 = 22°$

   Layer-2: $\varphi_2 = 33°$

4. Calculate the immediate settlement of at the centre of a 2 m x 2 m square footing (Flexible), carrying a vertical load of 400 kN. The subsoil consists of silty clay (c_u = 40kPa) overlying medium sand. 5

Given data / relation / info:

γ_{sat} = 18.2 kN/m^3;

$I\rho$ = 1.12

υ = 0.28

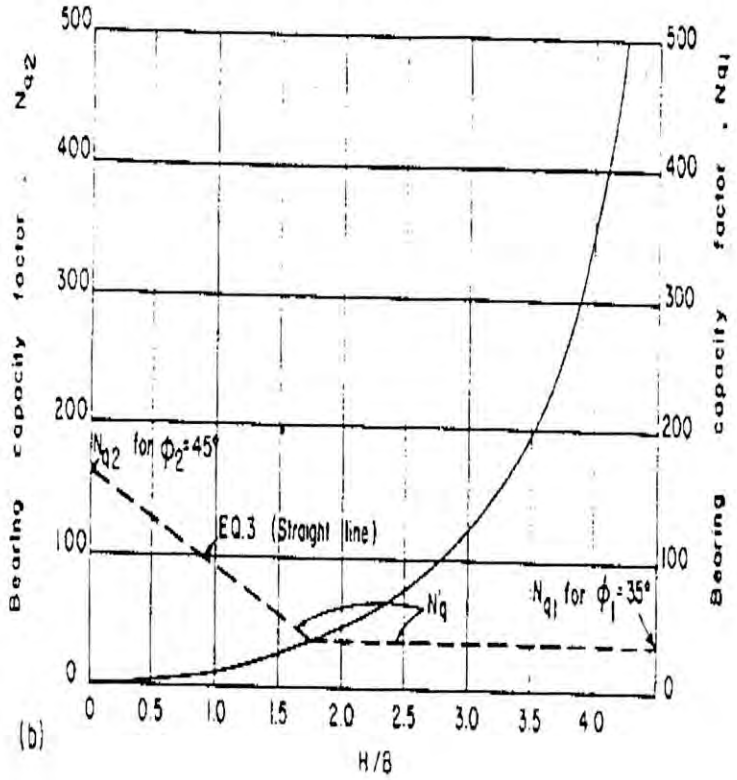
E = 600 c_u

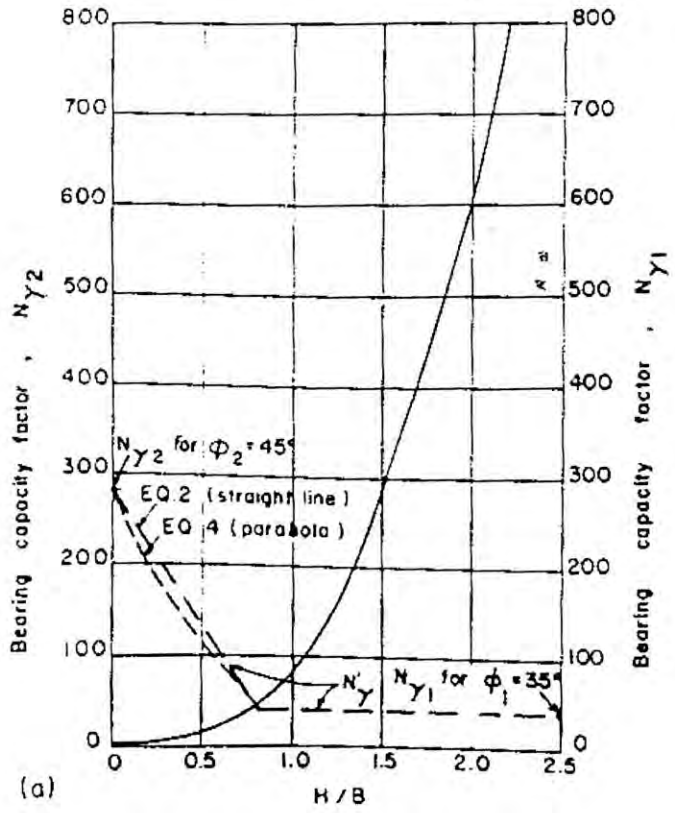
Depth correction factor = 0.88

Additional Information:

TABLE 4.4 BOREHOLE, SAMPLER, AND ROD CORRECTION FACTORS (Adapted from Skempton, 1986).

Factor	Equipment Variables	Value
Borehole diameter factor, C_B	65–115 mm (2.5–4.5 in)	1.00
	150 mm (6 in)	1.05
	200 mm (8 in)	1.15
Sampling method factor, C_S	Standard sampler	1.00
	Sampler without liner (not recommended)	1.20
Rod length factor, C_R	3–4 m (10–13 ft)	0.75
	4–6 m (13–20 ft)	0.85
	6–10 m (20–30 ft)	0.95
	>10 m (>30 ft)	1.00


Bearing capacity factor , N_{q2}
Bearing capacity factor , N_{q1}
N_{q2} for $\phi_2=45°$
EQ.3 (Straight line)
N'_q
N_{q1} for $\phi_1=35°$
(b)
H/B


Bearing capacity factor , $N_{\gamma 2}$
Bearing capacity factor , $N_{\gamma 1}$
$N_{\gamma 2}$ for $\phi_2=45°$
EQ.2 (straight line)
EQ.4 (parabola)
N'_γ
$N_{\gamma 1}$ for $\phi_1=35°$
(a)
H/B

ϕ	N_c	N_q	N_γ
17	12.34	4.77	1.66
18	13.10	5.26	2.00
19	13.93	5.80	2.40
20	14.83	6.40	2.87
21	15.82	7.07	3.42
22	16.88	7.82	4.07
23	18.05	8.66	4.82
24	19.32	9.60	5.72
25	20.72	10.66	6.77
26	22.25	11.85	8.00
27	23.94	13.20	9.46
28	25.80	14.72	11.19
29	27.86	16.44	13.24
30	30.14	18.40	15.67
31	32.67	20.63	18.56
32	35.49	23.18	22.02
33	38.64	26.09	26.17

For $\varphi = 35^o$; $N_c = 46.12$, $N_q = 33.3$ and $N_\gamma = 37.15$

$S_c = 1 + 0.2\ (B/L)$
$S_q = 1 + 0.2\ (B/L)$
$S_\gamma = 1 + 0.4\ (B/L)$

$d_c = 1 + 0.2\ (D_f/B)$
$d_q = d_\gamma = 1 + 0.1\ D_f \tan(45^o + \varphi/2)$

University of Asia Pacific
Department of Civil Engineering
Mid Semester Examination Fall 2015
Program: B.Sc. Engineering (Civil)

Course Title: Transportation Engineering II | Course Code: CE 451
Time: 1 Hour | Full Marks: 30

There are **Four** questions. Answer any **Three**

1. (a) What are the factors you should consider in choosing gauge? (04)

   (b) Mention some advantages we get from using flat footed rails. (02)

   (c) Discuss: (04)
   1) Corrosion of rails
   2) Corrugated rails

2. (a) Compare between Steel sleeper and Cast Iron sleeper. (04)

   (b) Derive the equation for minimum depth of ballast cushion. (02)

   (c) What are the functions geotextile may serve in stabilizing railway formation? (04)

3. (a) List some of the requirements of an ideal fastening. (05)

   (b) Define: (05)
   1) Shift
   2) Bending of rail
   3) Stock Rail
   4) Point
   5) Crossing

4. (a) Write short notes on: (10)
   1) Semaphore Signal
   2) Home Signal
   3) Calling on signal
   4) Automatic signaling
   5) Interlocking

University of Asia Pacific
Department of Civil Engineering
Midterm Examination Fall 2015
Program: B.Sc. Engineering (Civil)

Course code: CE 461
Course title: Irrigation and Flood Control

Time: 60 Minutes Total marks: 20

Answer all questions

1. Write the benefits of irrigation and the harmful effects of excess irrigation. **(1.5)**

2. For using surface water as a source for irrigation, what factors you need to consider? **(0.5)**

3. a) What are the different methods of irrigation water distribution? **(1)**
   b) Explain *Furrow irrigation* method. **(1)**

4. Draw the schematic diagram of soil-water-plant relationship. **(1)**

5. a) What is the classification of irrigation water having the following characteristics: Concentration of Na, Ca and Mg are 30, 2 and 2.5 milli-equivalents per liter respectively, and the electrical conductivity is 300 μmhos/cm at 25° C? **(1.5)**
   b) What problems might arise in using this water for irrigation? **(1)**
   c) What remedies do you suggest to overcome this trouble? **(1)**

6. Determine the time required to irrigate a strip of land of 600 m^2 in area from a tube-well with a discharge of 0.05 m^3/second. The infiltration capacity of the soil may be taken as 1 millimeter/minute and the average depth of flow on the field as 200 millimeter. **(2)**

7. a) What are the structural and non-structural measures of flood control and management in Bangladesh? **(2.5)**
   b) Define the following: i) Integrated Water Resources Management; ii) Flood; iii) Polder **(2)**
   c) Explain the impacts of floods **(1.5)**

8. a) Explain six different flood environments in Bangladesh **(2)**
   b) Graphically show how flood hazards vary with different geological conditions in Bangladesh **(1.5)**