06 / 12 / 2017

University of Asia Pacific
Department of Civil Engineering
Mid Term Examination Fall 2017
Program: B. Sc. Engineering (Civil)

Course Title: Project Planning & Management | Course Code: CE 401
Time: 1 Hour | Full Marks: 60

[Assume Reasonable Values for Any Missing Data]

SECTION – A

There are **TWO** questions in this section. Answer any **ONE**.

1. **(a)** Define Project and write down its major characteristics. Show the three constraints of managing a project in a diagram. **(7 1/2)**

(b) Mention the negative sides of Project Management and the forces that foster Project Management. **(7 1/2)**

(c) Write down the challenges facing the construction industry. **(7 1/2)**

(d) Show the Project Life Cycle and the Effort required in different stages of the Project in separate graphs. **(7 1/2)**

2. **(a)** What are the elements of a legal contract? What are the best measures for an engineer to take when entering into a contract with a client? **(7 1/2)**

(b) List the 'Think Twice' contract clauses. **(7 1/2)**

(c) Write short notes on: **(7 1/2)**

(i) Open Tendering Method (OTM)

(ii) Limited Tendering Method (LTM)

(iii) Quality and Cost Based Selection (QCBS)

(d) Mention different sources of hazards in a construction site. **(7 1/2)**

SECTION – B

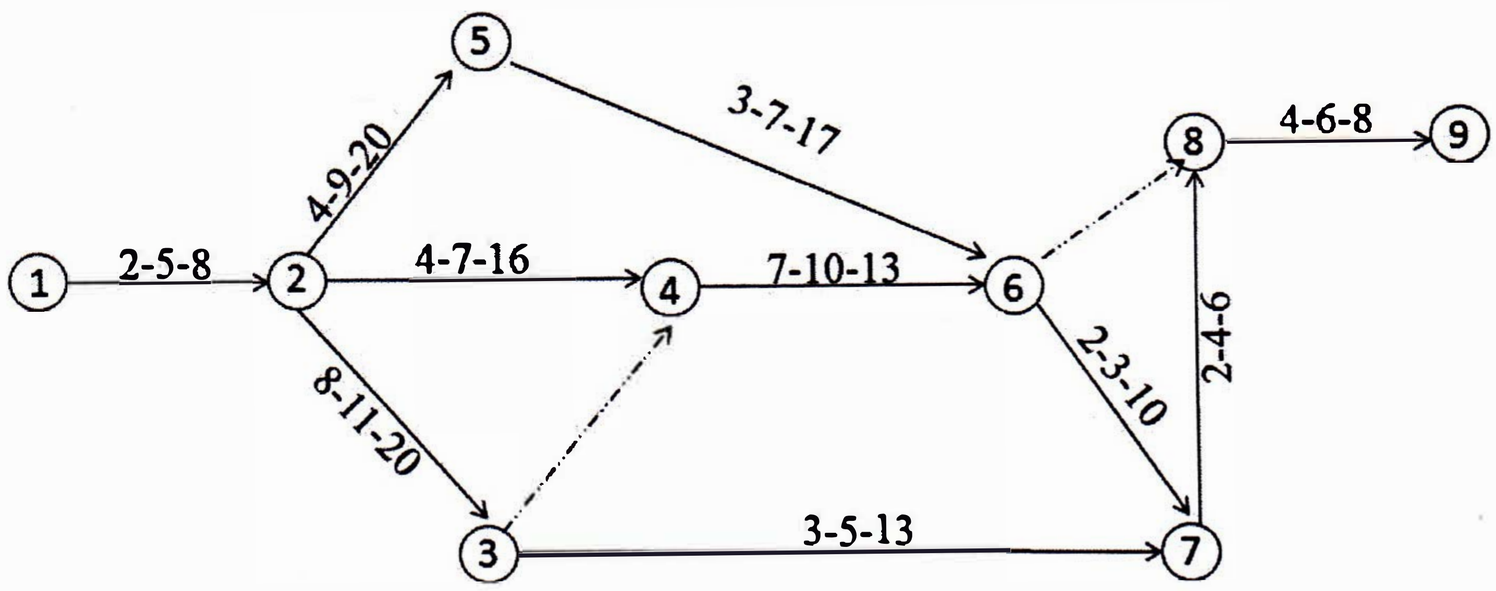
There are **THREE** questions in this section. **Question 3 is mandatory**. Answer any **ONE from Questions 4 & 5**.

3. **(a)** Fig. 1 shows the PERT network for a construction project along with the three time estimates of each activity. Determine: **(12)**

(i) Critical Path and its standard deviation

(ii) Probability of completion of project in 37 and 45 days

(iii) Time duration that will provide 95% probability of its completion in time



(b) What do you understand by a 'dummy activity'? What are its uses? **(3)**

4. (a) A project consists of eight activities M, N, O, P, Q, R, S and T. Draw the network and number the events if: **(9)**

(i) Activities M,N and Q can start concurrently

(ii) Activities O and P are concurrent, and depend on the completion of M and N respectively

(iii) Activities R and S are concurrent and depend on the completion of O

(iv) Activity T depends upon the completion of P, Q and R

(v) The project is complete when S and T are done

(b) Write short notes on: **(3x2)**

(i) Divestment Project (ii) Gantt Chart

5. (a) The following table shows the demand data of a product : **(9)**

Year	Demand
1993	2,000
1994	2,200
1995	2,100
1996	3,200
1997	3,600
1998	4,000
1999	3,900
2000	4,000
2001	4,200
2002	4,300

(i) Find the least square regression line for the data given

(ii) Determine the demand of the product for the year 2020

(b) Write short notes on: **(3x2)**

(i) Delphi Method (ii) WBS

Standard Normal Probabilities

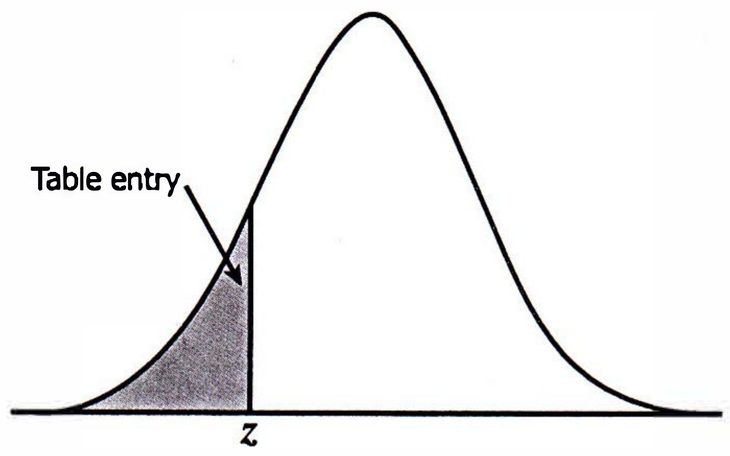


Table entry for z is the area under the standard normal curve to the left of z.

z	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
−3.4	.0003	.0003	.0003	.0003	.0003	.0003	.0003	.0003	.0003	.0002
−3.3	.0005	.0005	.0005	.0004	.0004	.0004	.0004	.0004	.0004	.0003
−3.2	.0007	.0007	.0006	.0006	.0006	.0006	.0006	.0005	.0005	.0005
−3.1	.0010	.0009	.0009	.0009	.0008	.0008	.0008	.0008	.0007	.0007
−3.0	.0013	.0013	.0013	.0012	.0012	.0011	.0011	.0011	.0010	.0010
−2.9	.0019	.0018	.0018	.0017	.0016	.0016	.0015	.0015	.0014	.0014
−2.8	.0026	.0025	.0024	.0023	.0023	.0022	.0021	.0021	.0020	.0019
−2.7	.0035	.0034	.0033	.0032	.0031	.0030	.0029	.0028	.0027	.0026
−2.6	.0047	.0045	.0044	.0043	.0041	.0040	.0039	.0038	.0037	.0036
−2.5	.0062	.0060	.0059	.0057	.0055	.0054	.0052	.0051	.0049	.0048
−2.4	.0082	.0080	.0078	.0075	.0073	.0071	.0069	.0068	.0066	.0064
−2.3	.0107	.0104	.0102	.0099	.0096	.0094	.0091	.0089	.0087	.0084
−2.2	.0139	.0136	.0132	.0129	.0125	.0122	.0119	.0116	.0113	.0110
−2.1	.0179	.0174	.0170	.0166	.0162	.0158	.0154	.0150	.0146	.0143
−2.0	.0228	.0222	.0217	.0212	.0207	.0202	.0197	.0192	.0188	.0183
−1.9	.0287	.0281	.0274	.0268	.0262	.0256	.0250	.0244	.0239	.0233
−1.8	.0359	.0351	.0344	.0336	.0329	.0322	.0314	.0307	.0301	.0294
−1.7	.0446	.0436	.0427	.0418	.0409	.0401	.0392	.0384	.0375	.0367
−1.6	.0548	.0537	.0526	.0516	.0505	.0495	.0485	.0475	.0465	.0455
−1.5	.0668	.0655	.0643	.0630	.0618	.0606	.0594	.0582	.0571	.0559
−1.4	.0808	.0793	.0778	.0764	.0749	.0735	.0721	.0708	.0694	.0681
−1.3	.0968	.0951	.0934	.0918	.0901	.0885	.0869	.0853	.0838	.0823
−1.2	.1151	.1131	.1112	.1093	.1075	.1056	.1038	.1020	.1003	.0985
−1.1	.1357	.1335	.1314	.1292	.1271	.1251	.1230	.1210	.1190	.1170
−1.0	.1587	.1562	.1539	.1515	.1492	.1469	.1446	.1423	.1401	.1379
−0.9	.1841	.1814	.1788	.1762	.1736	.1711	.1685	.1660	.1635	.1611
−0.8	.2119	.2090	.2061	.2033	.2005	.1977	.1949	.1922	.1894	.1867
−0.7	.2420	.2389	.2358	.2327	.2296	.2266	.2236	.2206	.2177	.2148
−0.6	.2743	.2709	.2676	.2643	.2611	.2578	.2546	.2514	.2483	.2451
−0.5	.3085	.3050	.3015	.2981	.2946	.2912	.2877	.2843	.2810	.2776
−0.4	.3446	.3409	.3372	.3336	.3300	.3264	.3228	.3192	.3156	.3121
−0.3	.3821	.3783	.3745	.3707	.3669	.3632	.3594	.3557	.3520	.3483
−0.2	.4207	.4168	.4129	.4090	.4052	.4013	.3974	.3936	.3897	.3859
−0.1	.4602	.4562	.4522	.4483	.4443	.4404	.4364	.4325	.4286	.4247
−0.0	.5000	.4960	.4920	.4880	.4840	.4801	.4761	.4721	.4681	.4641

Standard Normal Probabilities

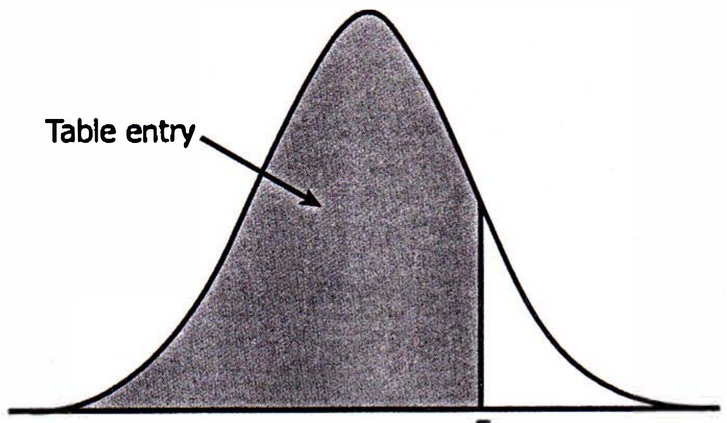


Table entry for z is the area under the standard normal curve to the left of z.

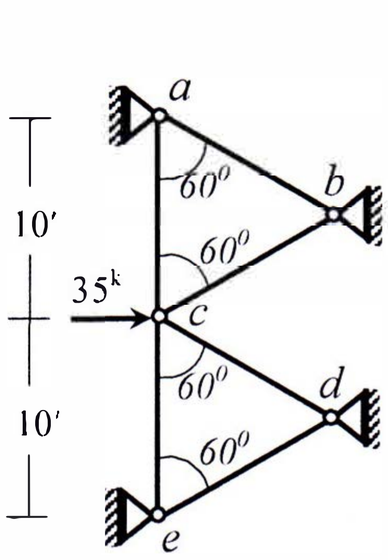
z	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
0.0	.5000	.5040	.5080	.5120	.5160	.5199	.5239	.5279	.5319	.5359
0.1	.5398	.5438	.5478	.5517	.5557	.5596	.5636	.5675	.5714	.5753
0.2	.5793	.5832	.5871	.5910	.5948	.5987	.6026	.6064	.6103	.6141
0.3	.6179	.6217	.6255	.6293	.6331	.6368	.6406	.6443	.6480	.6517
0.4	.6554	.6591	.6628	.6664	.6700	.6736	.6772	.6808	.6844	.6879
0.5	.6915	.6950	.6985	.7019	.7054	.7088	.7123	.7157	.7190	.7224
0.6	.7257	.7291	.7324	.7357	.7389	.7422	.7454	.7486	.7517	.7549
0.7	.7580	.7611	.7642	.7673	.7704	.7734	.7764	.7794	.7823	.7852
0.8	.7881	.7910	.7939	.7967	.7995	.8023	.8051	.8078	.8106	.8133
0.9	.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	.8830
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	.9922	.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

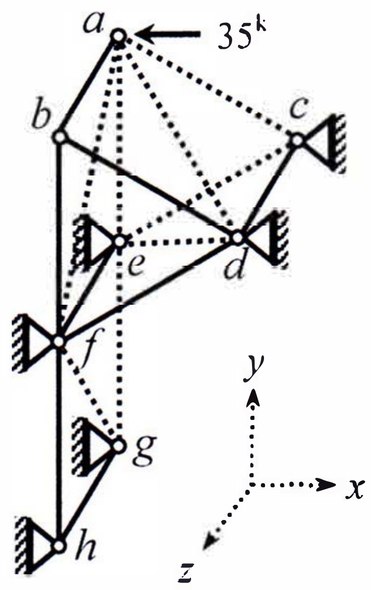
University of Asia Pacific
Department of Civil Engineering
Midterm Examination Fall 2017
Program: B.Sc. Engineering (Civil)

Course Title: Structural Engineering III — Course Code: CE 411
Time: 1 hour — Credit Hour : 3.0 — Full Marks: 4 x 10

ANSWER ALL QUESTIONS. *The figures are not drawn to scale*. Any missing data can be assumed reasonably.

1. Identify zero-force members of the truss ***abcde*** loaded as shown in ***Fig.1***. Determine the displacements of joint ***c*** [Given: EA/L = 1000 k/ft].





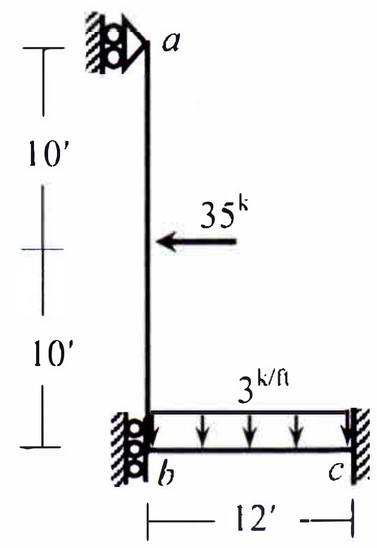


Fig. 1 ***Fig. 2*** ***Fig. 3***

2. Ignore zero-force members of the space truss ***abcdefgh*** as shown in ***Fig.2*** and apply boundary conditions to formulate stiffness matrix, force vector and load vector [Given: S_x = 1200 k/ft; Nodal Coordinates (ft) are *a*(0,10,-6), *b*(0,10,0), *c*(8,5,-6), *d*(8,5,0), *e*(0,0,-6), *f*(0,0,0), *g*(0,-10,-6), *h*(0,-10,0)].

3. Use Stiffness Method (neglect axial deformations) to calculate deflection and rotation of joint ***a*** of the frame ***abc*** shown in ***Fig.3*** [Given: EI = 20×10^3 k-ft^2].

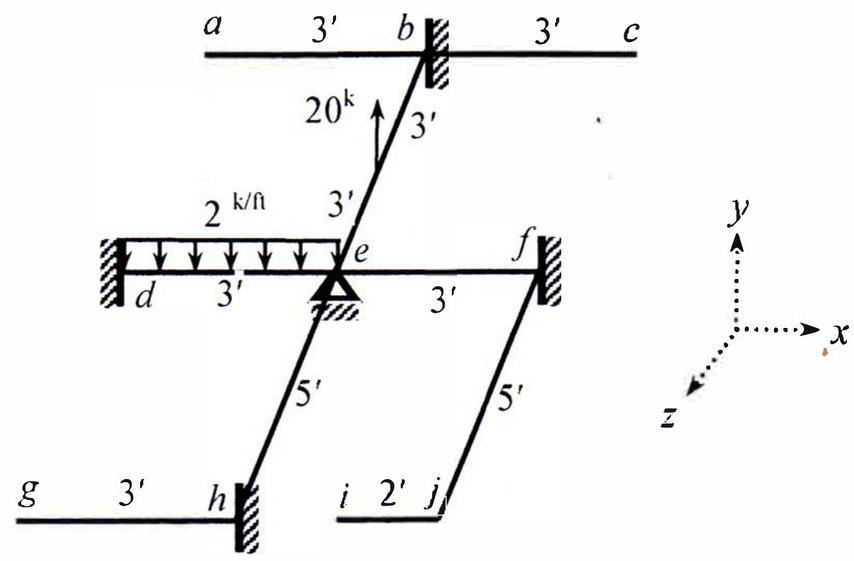


Fig. 4

4. Use Stiffness Method to calculate rotations of joint ***e*** of the frame ***abcdefghij*** shown in ***Fig.4*** [Given: EI = 20×10^3 k-ft^2 and GJ = 5×10^3 k-ft^2].

List of Useful Formulae for CE 411

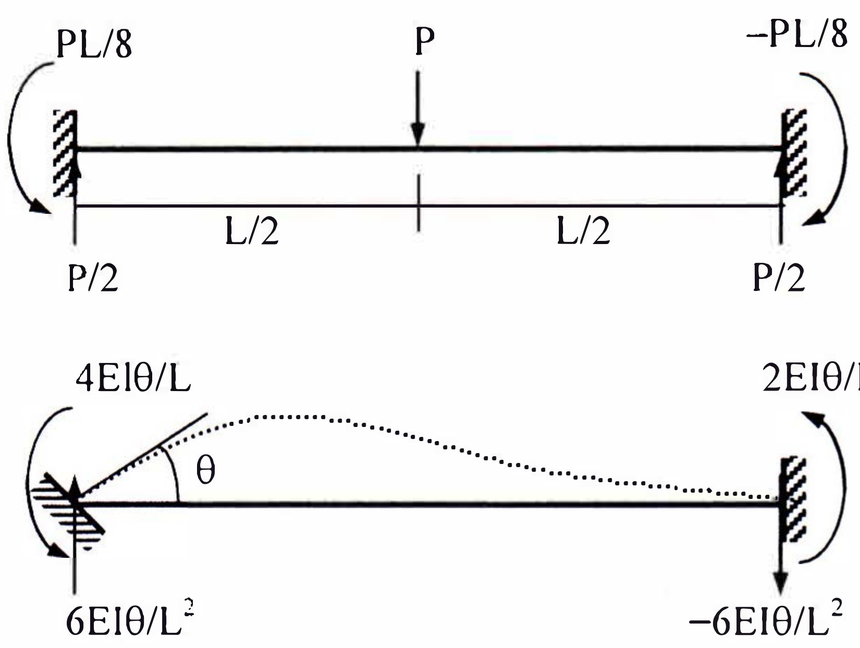
* The stiffness matrix $\mathbf{K_m}^G$ of a 2D truss member in the global axis system is given by

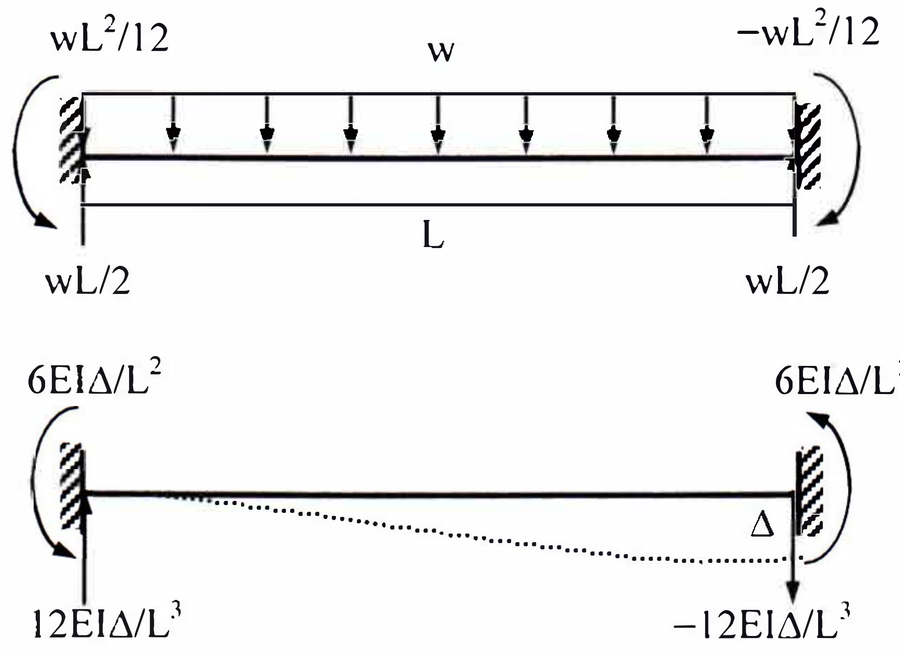
$$\mathbf{K_m}^G = S_x \begin{pmatrix} C^2 & CS & -C^2 & -CS \\ CS & S^2 & -CS & -S^2 \\ -C^2 & -CS & C^2 & CS \\ -CS & -S^2 & CS & S^2 \end{pmatrix}$$

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 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

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

$C_x = L_x/L$, $C_y = L_y/L$, $C_z = L_z/L$
where $L = \sqrt{[L_x^2 + L_y^2 + L_z^2]}$

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

* Ignoring axial deformations, the matrices $\mathbf{K_m}^L$ and $\mathbf{G_m}^L$ of a frame member in the local axis system are

$$\mathbf{K_m}^L = \begin{pmatrix} S_1 & S_2 & -S_1 & S_2 \\ S_2 & S_3 & -S_2 & S_4 \\ -S_1 & -S_2 & S_1 & -S_2 \\ S_2 & S_4 & -S_2 & S_3 \end{pmatrix} \qquad \mathbf{G_m}^L = (P/30L) \begin{pmatrix} 36 & 3L & -36 & 3L \\ 3L & 4L^2 & -3L & -L^2 \\ -36 & -3L & 36 & -3L \\ 3L & -L^2 & -3L & 4L^2 \end{pmatrix}$$

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

*The general form of the stiffness matrix for any member of a 2-dimensional frame is

$$\mathbf{K_m}^G = \begin{pmatrix} S_xC^2+S_1S^2 & (S_x-S_1)CS & -S_2S & -(S_xC^2+S_1S^2) & -(S_x-S_1)CS & -S_2S \\ (S_x-S_1)CS & S_xS^2+S_1C^2 & S_2C & -(S_x-S_1)CS & -(S_xS^2+S_1C^2) & S_2C \\ S_2S & S_2C & S_3 & S_2S & -S_2C & S_4 \\ -(S_xC^2+S_1S^2) & -(S_x-S_1)CS & S_2S & S_xC^2+S_1S^2 & (S_x-S_1)CS & S_2S \\ -(S_x-S_1)CS & -(S_xS^2+S_1C^2) & -S_2C & (S_x-S_1)CS & (S_xS^2+S_1C^2) & -S_2C \\ -S_2S & S_2C & S_4 & S_2S & -S_2C & S_3 \end{pmatrix}$$

University of Asia Pacific
Department of Civil Engineering
Mid Term Examination Fall 2017
Program: B.Sc. Engineering (Civil)

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

Answer all the questions. **(4 + 14 + 2 = 20)**

1. In the site proposed for a project, cone penetration test was conducted at 1.5 m interval from GL up to 9 m depth. At depth 4.5 m, point resistance was measured 6000 kN/m^2.

(i) Calculate the relative density at 4.5 m depth; 1
(ii) Calculate the effective angle of internal friction at that depth; 1
(iii) Using the effective angle of internal friction obtained in question 1(ii), estimate N_{60} and $(N_1)_{60}$. 1
(iv) Are both CPT and SPT based relative densities aligned? 1

2.(a) For the individual shallow footing (Figure 1), calculate the following:

(i) the net allowable load if factor of safety of the rectangular footing is 2.25, when the load is concentric but inclined 10° with the vertical. Given that the soil is homogeneous clay having cohesion of 25 kPa. 3

(ii) the net ultimate bearing capacity, if eccentricity along footing length is 0.38 m and the load is vertical. Given that the soil is homogeneous sand having φ' of 35°. 2.5

(iii) the net ultimate bearing capacity, if eccentricity along footing width is 0.38 m and the load is vertical. Given that the soil is homogeneous sand having φ' of 35°. 2.5

(iv) the ultimate (gross) bearing capacity if two homogeneous sand layers are found from GL upto 12 m. The upper sand layer (having φ'of 25°) is found from GL upto 3.5 m and the underlying sand layer has φ'of 45°. 4

(b) Evaluate both the eccentricities (question 2a(ii) and 2a(iii)) from safety point of view and also by giving consideration to ultimate bearing capacity. 2

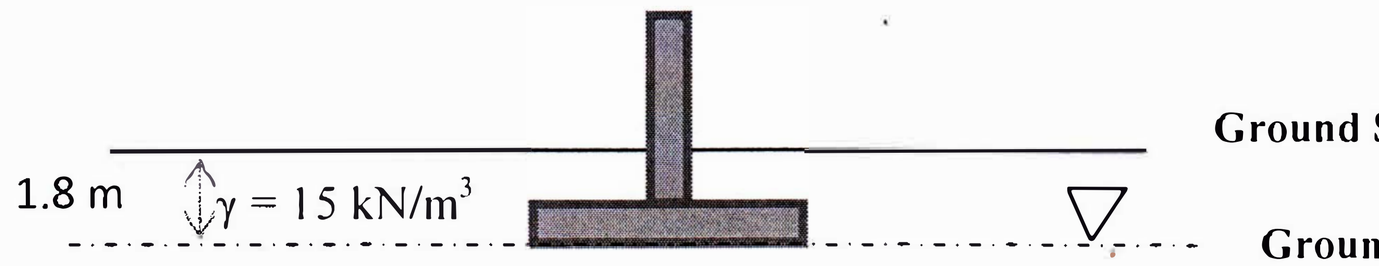


Figure 1

3.(a) Calculate the depth of a compensated mat foundation. 2

The clay layer (16 m deep) is located at the depth of 3 m. The water table is located 1.5 m below the ground level.

Given that the moist unit weight of the clay soil is 16 kN/m^3 and the saturated unit weight is 18 kN/m^3.

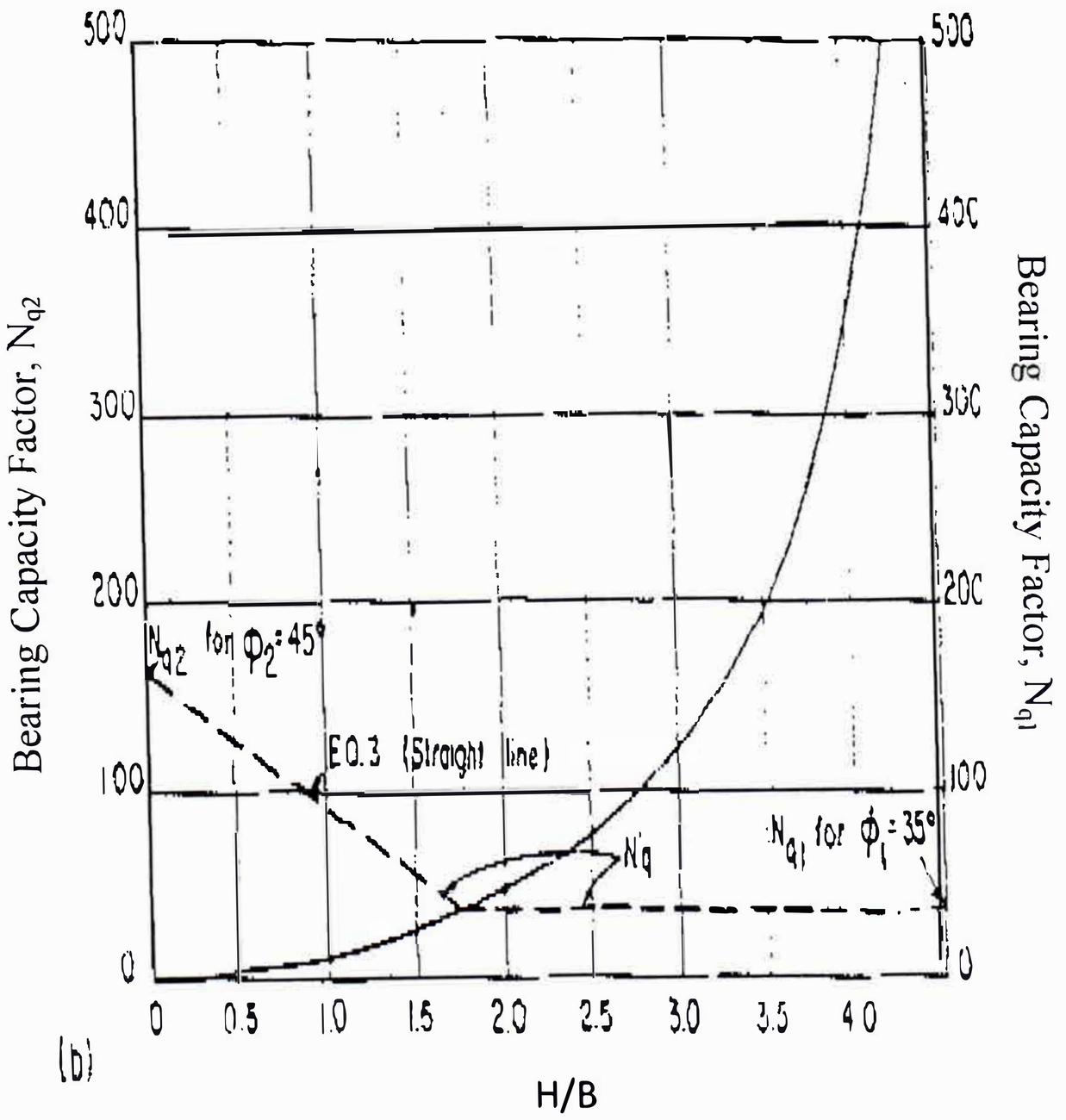
Total column load = 22500 kN

Dimensions of Mat foundation: 12 m x 16 m

Table: Shape, Depth and Inclination Factors

Factor	Condition	Equation
Shape	$\varphi = 0^\circ$	$F_{cs} = 1 + 0.2\,(\frac{B}{L})$ $F_{qs} = F_{\gamma s} = 1$
	$\varphi \geq 10^\circ$	$F_{cs} = 1 + 0.2\,(\frac{B}{L})tan^2(45^\circ + \frac{\varphi}{2})$ $F_{qs} = F_{\gamma s} = 1 + 0.1\,(\frac{B}{L})tan^2(45^\circ + \frac{\varphi}{2})$
Depth	$\varphi = 0^\circ$	$F_{cs} = 1 + 0.2\,(\frac{D_f}{B})$ $F_{qs} = F_{\gamma s} = 1$
	$\varphi \geq 10^\circ$	$F_{cd} = 1 + 0.2\,(\frac{D_f}{B}).tan(45^\circ + \frac{\varphi}{2})$ $F_{qd} = F_{\gamma d} = 1 + 0.1\,(\frac{D_f}{B}).tan(45^\circ + \frac{\varphi}{2})$
Inclination	Any φ	$F_{ci} = F_{qi} = (1 - \frac{\alpha^\circ}{90^\circ})^2$
	$\varphi > 0^\circ$	$F_{\gamma i} = (1 - \frac{\alpha^\circ}{\varphi^\circ})^2$
	$\varphi = 0^\circ$	$F_{\gamma i} = 0$

Design Charts for N_q and N_γ (weak sand over strong sand)



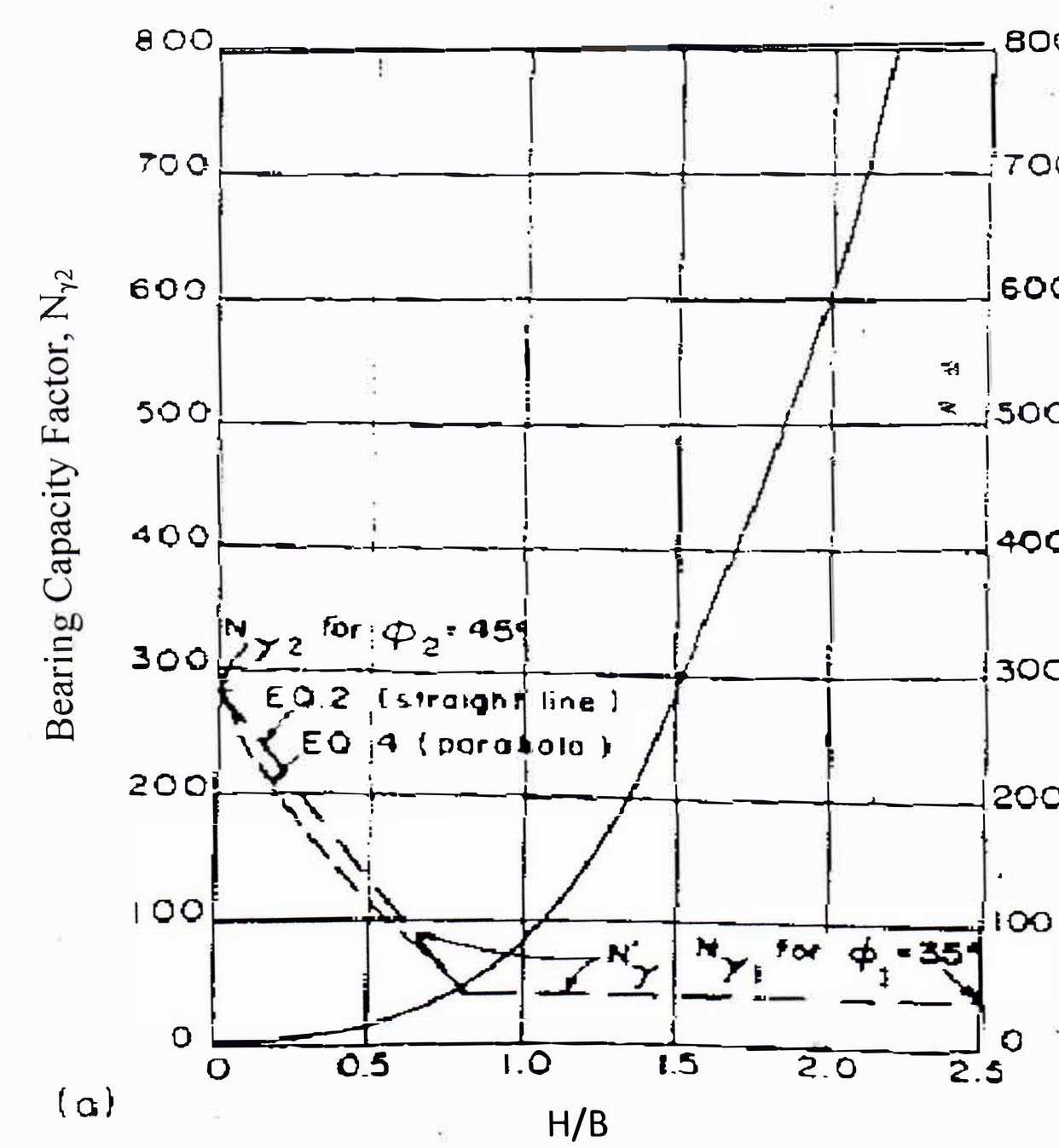


Table: Bearing Capacity Factors (Meyerhof's Chart)

ϕ	N_c	N_q	N_γ (Meyerhof)	ϕ	N_c	N_q	N_γ (Meyerhof)	ϕ	N_c	N_q	N_γ (Meyerhof)
0°	5.10	1.00	0.00	17°	12.34	4.77	1.66	34°	42.16	29.44	31.15
1°	5.38	1.09	0.00	18°	13.10	5.26	2.00	35°	46.12	33.30	37.15
2°	5.63	1.20	0.01	19°	13.93	5.80	2.40	36°	50.59	37.75	44.43
3°	5.90	1.31	0.02	20°	14.83	6.40	2.87	37°	55.63	42.92	53.27
4°	6.19	1.43	0.04	21°	15.81	7.07	3.42	38°	61.35	48.93	64.07
5°	6.49	1.57	0.07	22°	16.88	7.82	4.07	39°	67.87	55.96	77.33
6°	6.81	1.72	0.11	23°	18.05	8.66	4.82	40°	75.31	64.20	93.69
7°	7.16	1.88	0.15	24°	19.32	9.60	5.72	41°	83.86	73.90	113.99
8°	7.53	2.06	0.21	25°	20.72	10.66	6.77	42°	93.71	85.37	139.32
9°	7.92	2.25	0.28	26°	22.25	11.85	8.00	43°	105.11	99.01	171.14
10°	8.34	2.47	0.37	27°	23.94	13.20	9.46	44°	118.37	115.31	211.41
11°	8.80	2.71	0.47	28°	25.80	14.72	11.19	45°	133.87	134.87	262.74
12°	9.28	2.97	0.60	29°	27.86	16.44	13.24	46°	152.10	158.50	328.73
13°	9.81	3.26	0.74	30°	30.14	18.40	15.67	47°	173.64	187.21	414.33
14°	10.37	3.59	0.92	31°	32.67	20.63	18.56	48°	199.26	222.30	526.46
15°	10.98	3.94	1.13	32°	35.49	23.18	22.02	49°	229.93	265.50	674.92
16°	11.63	4.34	1.37	33°	38.64	26.09	26.17				

Correlations

$$D_r(\%) = 68\left[\log\left(\frac{q_c}{\sqrt{P_a \sigma'_0}}\right) - 1\right]$$

$$\varphi' = tan^{-1}\left[0.1 + 0.38\log\left(\frac{q_c}{\sigma'_o}\right)\right]$$

$$\varphi' = tan^{-1}\left[\frac{N_{60}}{12.2 + 20.3\left(\frac{\sigma'_0}{P_a}\right)}\right]^{0.34}$$

$$\varphi' = \sqrt{20(N_1)_{60} + 20}$$

University of Asia Pacific
Department of Civil Engineering
Mid Semester Examination Fall 2017
Program: B.Sc. Engineering (Civil)

Course Title: Transportation Engineering II — Course Code: CE 451
Time: 1 Hour — Full Marks: 20

1. Answer any 2 (2X5 =10)

a. Write short note on i) Jointed Plain Concrete Pavement, and ii) Continuous Reinforced Concrete Pavement?
b. Write five differences between Flexible Pavement and Rigid Pavement?
c. What are the requirements of bituminous mix?

2. Answer following (1X10 = 10)

The aggregate mix used for the design of an asphalt mixture consists of 42% coarse aggregates, 51% fine aggregates, and 7% mineral fillers. If the respective bulk specific gravities of these materials are 2.60, 2.71, and 2.69, and the effective specific gravity of the aggregates is 2.82, determine the **optimum asphalt content** as a percentage of the total mix if results obtained using the Marshall method are shown in the table 1. The specific gravity of the asphalt is 1.02. The pavement has to be built for medium traffic (Use Table 2 for required specifications.)

Table 1: Marshal Test result

Percent Asphalt	Weight In Air (g)	Weight In Water (g)	Stability (lb)	Flow (0.01 in.)	Maximum Specific Gravity of Paving Mixture
5.5	1325.3	785.6	1796	13	2.54
6	1330.1	793.3	1836	14	2.56
6.5	1336.2	800.8	1861	16	2.58
7	1342	804.5	1818	20	2.54
7.5	1347.5	805.1	1701	25	2.56

Table 2: Suggested Test Limit

(a) Maximum and Minimum Values			
Marshall Method Mix Criteria	**Light Traffic**	**Medium Traffic**	**Heavy Traffic**
Stability N (lb)	3336(750)	5338 (1200)	8006 (1800)
Flow, 0.25 mm (0.1 in)	8 to 18	8 to 16	8 to 14
Air Voids %	3 to 5	3 to 5	3 to 5

(b) Mineral Precent Voids in Mineral Aggregates	
Standard Sieve Designation	**%**
No. 16	23.5
No. 4	21
No. 8	18
3/8 in.	16
1/2 in.	15

3/4 in.	4
1 in.	13
1 1/2 in.	12
2 in.	11.5
2 1/2 in.	11

Required Formula

$$G_{mb} = \frac{W_a}{W_d - W_w}$$

$$G_{sb} = \frac{P_{ca} + P_{fa} + P_{mf}}{\frac{P_{ca}}{G_{bca}} + \frac{P_{fa}}{G_{bfa}} + \frac{P_{mf}}{G_{bmf}}}$$

$$VMA = 100 - \frac{G_{mb} P_s}{G_{sb}}$$

$$P_a = 100 \frac{G_{mm} - G_{mb}}{G_{mm}}$$

University of Asia Pacific
Department of Civil Engineering
Midterm Examination Fall 2017
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. For using ground water as a source for irrigation, what factors you should consider? **(1)**
2. Select an irrigation method that you think most water efficient in the context of Bangladesh in comparison with other irrigation methods. Justify your selection. **(1+2)**
3. a) What is the classification of irrigation water having the following characteristics: Concentration of Na, Ca and Mg are 29, 2.5 and 2.6 milli-equivalents per liter respectively, and the electrical conductivity is 327 μmhos/cm at 25° C? **(2)**
   b) What problems might arise in using this water for irrigation? **(1)**
   c) What remedies do you suggest to overcome this trouble? **(1)**
4. 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)**
5. a) Explain the appropriate structural and non-structural measures of flood control and management in Bangladesh? **(2 + 2)**
   b) Explain the following: i) Integrated Water Resources Management; ii) Irrigation. **(2)**
6. a) Explain the delta formation process. **(2)**
   b) Graphically show how flood hazards vary with different geological conditions in Bangladesh **(2)**

GOOD LUCK