University of Asia Pacific
Department of Civil Engineering
Final Examination Fall 2014
Program: B. Sc. Engineering (Civil)

Course Title: Structural Engineering II
Time: 3 hours

Course Code: CE 313
Full Marks: 10x10 = 100

[Answer **any 10 (ten)** of the following 14 (fourteen) questions]
(Symbols have their usual meanings)

1. For the 2-storied frame loaded as shown in Fig.1, (i) Use the Portal Method to determine the value of applied forces F_1 and F_2 if shear in beam *ab* and *cd* is -3.33 k and -8.33 k respectively, (ii) Also draw the BMD of the beams and the columns.

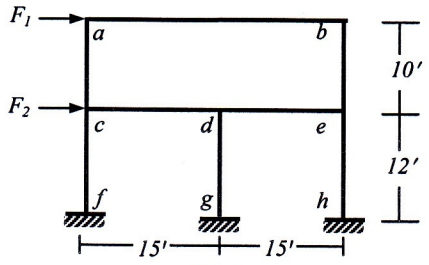


Fig 1

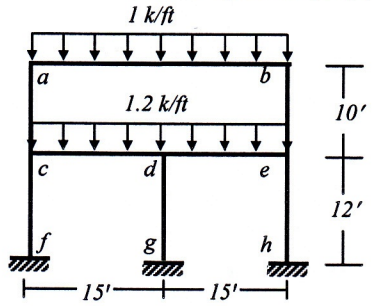


Fig 2

2. For the 2-storied frame loaded as shown in Fig.1, use Cantilever Method to draw the AFD of the columns when, F_1 = 12 k and F_2 = 20 k. Assume all column areas are equal.

3. For the 2-storied frame structure loaded as shown in Fig.2, use the approximate location of hinges to draw the SFD and BMD of the beams and columns.

4. Calculate the vertical deflection at point *b* of the beam shown in Fig.3, using Virtual Work Method [Given: EI= 40,000k-ft^2].

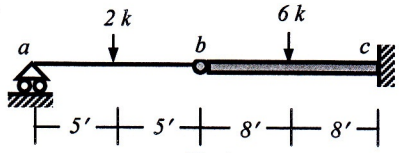


Fig 3

5. For the truss shown in Fig.4, use Virtual Work Method to calculate the vertical deflection of the point *f* due to the external loads applied [Given: EA/L = 500 kip/ft, for all the truss members].

6. Use the Virtual Work Method to calculate the vertical deflection at point *a* of the frame shown in Fig.5 [Given: EA = 400×10^3 k, GA* = 125×10^3 k, EI = 40×10^3 k-ft^2].

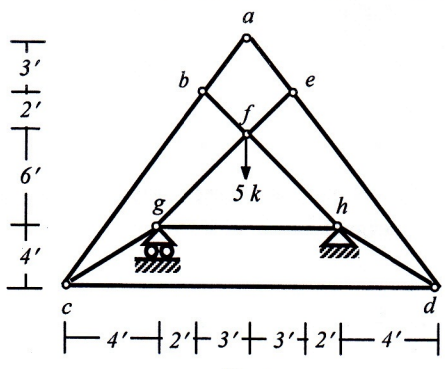


Fig 4

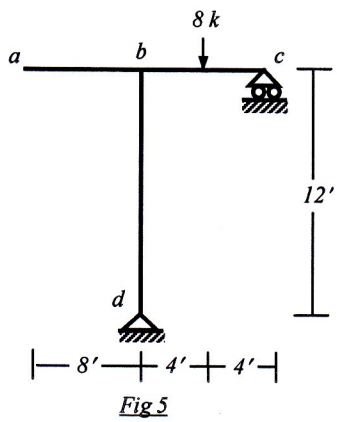


Fig 5

7. Use the Flexibility Method to calculate the member forces of the truss shown in *Fig.6*, if in addition to the applied load, support *g* moves 0.10' leftward [Given: EA/L= 1000 kips/ft].

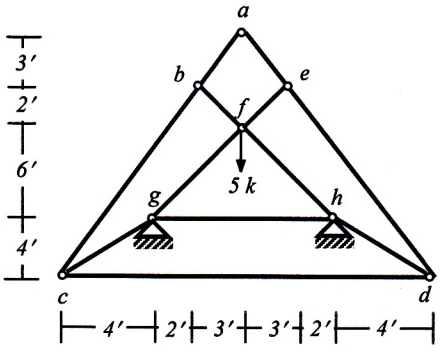


Fig 6

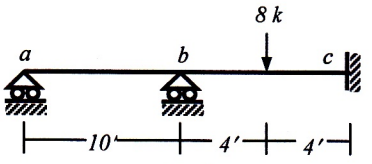


Fig 7

8. Use the Flexibility Method (considering flexural deformation only) to draw the bending moment diagram of the beam shown below, if in addition to the applied load, support *a* settles 0.10' downward [Given: EI = 40×10^3 k-ft^2].

9. Using Flexibility Method, draw the bending moment diagram of the frame shown in *Fig.8* [Given: EA = 400×10^3 k, GA* = 125×10^3 k, EI = 40×10^3 k-ft^2].

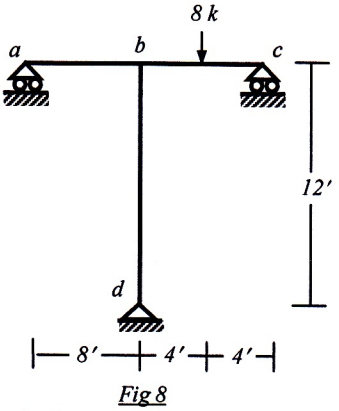


Fig 8

10. Use the Moment Distribution Method to calculate the joint moments and draw bending moment diagram of the beam shown in *Fig.9* [Given: $EI_{ab} = EI_{cd} = 2EI$, $EI_{bc} = EI$].

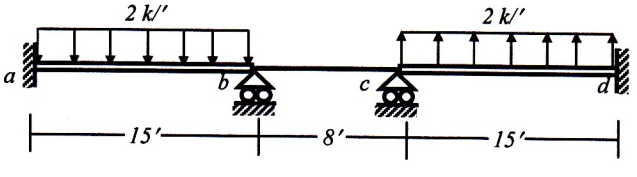


Fig. 9

11. Use the Moment Distribution Method to calculate the joint moments and draw bending moment diagram of the frame shown in *Fig.10* [Given: EI = Constant].

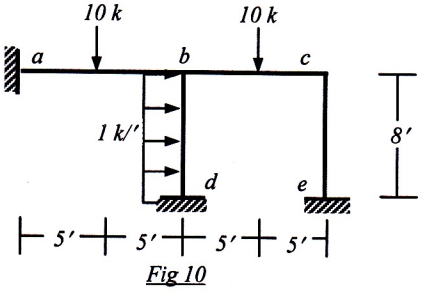


Fig 10

12. Use Moment Distribution Method to calculate the joint moments and draw bending moment diagram of the beam shown in *Fig.11*, if support *c* moves 0.1 ft upward and support *d* rotates 0.04 rad clockwise [Given: EI = 2000 k-ft^2].

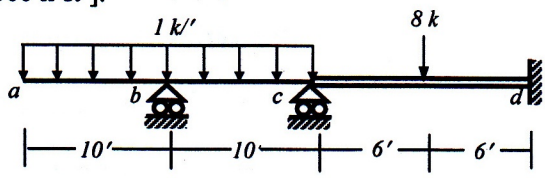
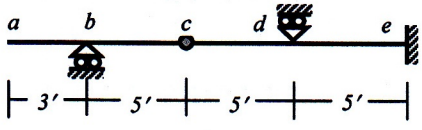


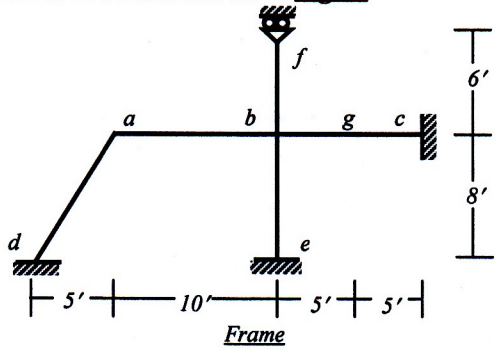
Fig 11

13. Draw the Qualitative Influence lines for the indeterminate structures shown in *Fig.12*

(i) R_b, R_d, $V_{d(L)}$, $V_{d(R)}$, M_e for the beam
(ii) $R_{c(y)}$, $R_{e(x)}$, V_g, M_g, M_a for the frame



Beam



Frame

Fig 12

14. For the beam shown in *Fig.13* calculate the maximum positive value of M_e , if the beam is subjected to a uniformly distributed DL = 1.5 k/ft and moving LL = 0.5 k/ft (uniformly distributed) and 3 k (concentrated) [Given: EI = Constant].

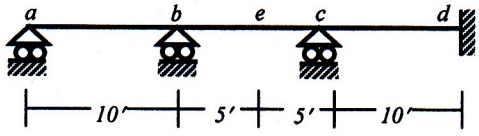


Fig. 13

Section B

University of Asia Pacific
Department of Civil Engineering
Final Examination Fall 2014
Program: B.Sc. Engineering (Civil)

Course Title: Design of Concrete Structures II — Course Code: CE 317
Time: 3.0 hr — Full Marks: 100

Part A

[Answer any five (05) out of following Seven (07) questions]

Full Marks: 25 [=5*(5)]

1. State the limitations of Direct Design Method (DDM) for two way slabs.
2. What is punching shear failure? Discuss the design options to prevent punching shear failure with neat diagram.
3. What is pre-stressed concrete? Discuss the advantages and types of pre-stressed concrete.
4. What kind of failure may occur in a retaining wall? Draw different types of Retaining wall.
5. What is short column? Mention and justify the maximum and minimum steel ratios specified by ACI for RC columns
6. Explain why transverse reinforcements are used in RC columns.
7. Mention different types of RC foundations and also mention when they are used.

Part B

[Answer any Five (05) out of following eight (08) questions]

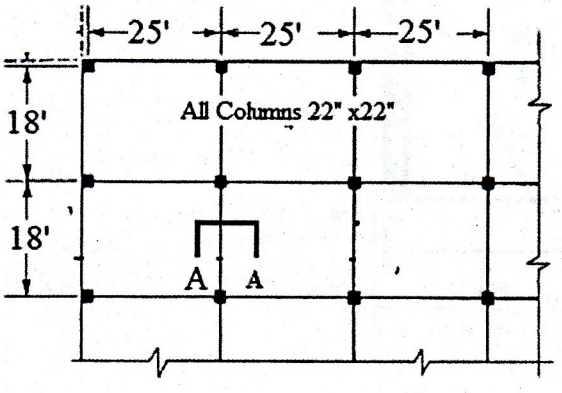
Full Marks: 75 [=5*15]

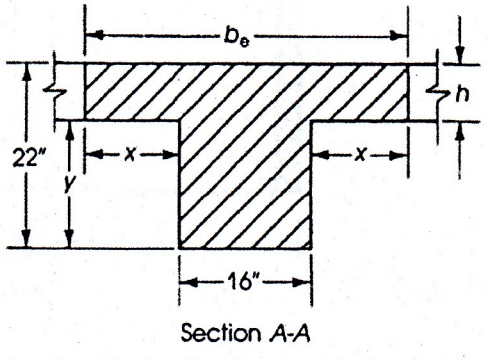
[Given: $f_c' = 3$ ksi, $f_y = 60$ ksi, $f_{call} = 1.35$ ksi, $f_{salt} = 30$, ksi for all questions]

[Assume reasonable values for any missing data]

All symbols have their usual meanings

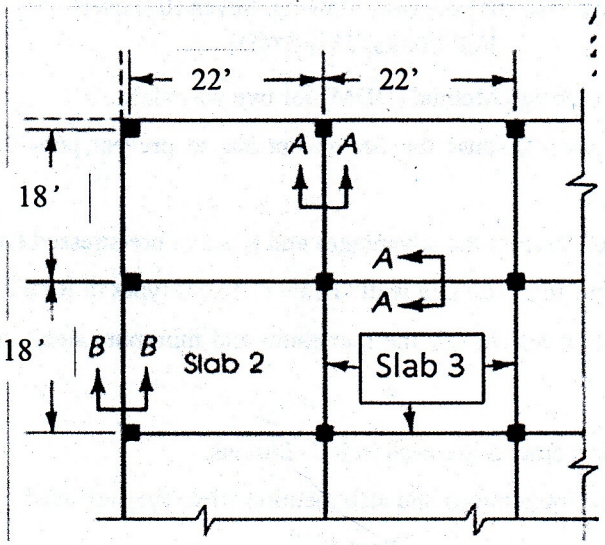
8. A floor system of panel 25′ by 18′ consists of solid slab and beams (Section A-A) shown below. The floor system is supported by column 18 x 18 in^2 columns. Determine the following for interior panel
   a) Determine I_{beam} and I_{slab}
   b) Determine α_{long} and α_{short}
   c) Determine minimum slab thickness required





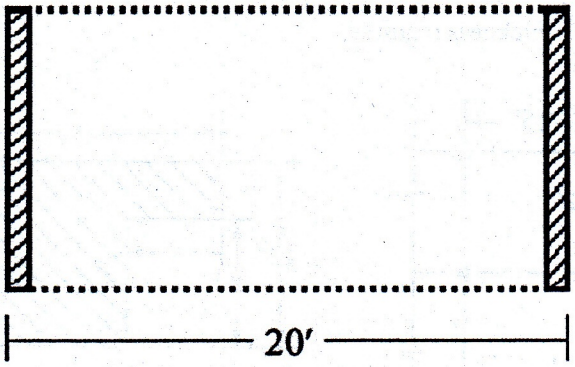
Section A-A

9. A flat slab system with column of 22 x22 inch^2 is shown below. The slab contains floor finish of 35 psf, random wall = 50 psf and live load = 75 psf . Determine the following for Slab 3 in USD : (Use DL and LL factor 1.4 and 1.7 respectively)
   a) Co-efficient $C_{a(D)+}$, $C_{a(L)+}$, C_{a-}, $C_{b(D)+}$, $C_{b(L)+}$, C_{b-},
   b) Moments, M_{a+} M_{b+} M_{a-} M_{b-}
   c) Reinforcement required , A_{sa+} A_{sa-} A_{sb+} A_{sb-}
   d) Draw reinforcement diagram in a neat figure



10. A flat plate floor has thickness h=8.5″ and is supported by 20″ columns spaced 20ft on centres each way. The floor will carry a total factored load of 300 psf. Check the adequacy of the slab in resisting punching shear at a typical interior column and provide shear at a typical interior column and provide shear reinforcement using bent bars. (Use WSD method, $V_c = 1.1\sqrt{f_c'}b_0d$ *and* $V_s = (V_u - \phi V_c)/\phi$)

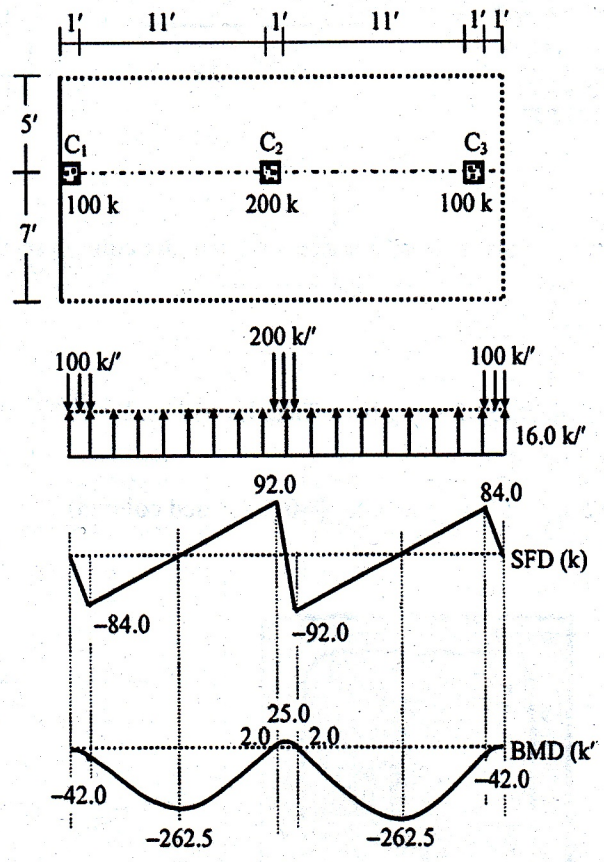
11. Use USD method to design the footing for the 14″-thick brick wall supporting RC slabs shown below (in a 7-storied building with 12′-high stories), if they carry loads including FF = 40 psf, RW = 55 psf and LL = 40 psf [Given: Depth of footing = 5 ft, Allowable soil bearing pressure = 4 ksf,)



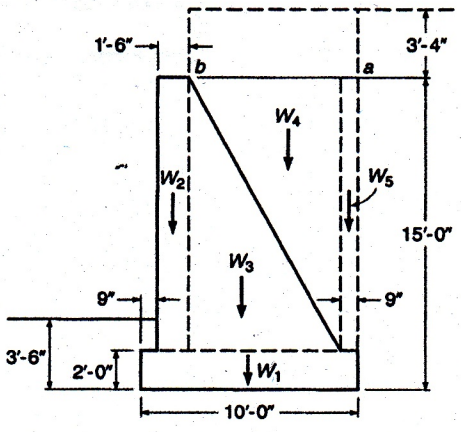
12. Figure below shows the working loads (half DL, half LL), arrangement of 12″×12″ columns C_1, C_2, C_3 and boundaries of other footings (firm lines for property lines and dotted lines for adjacent footing boundaries, Allowable soil bearing pressure = 2.0 ksf,).

    a. What type of footing can be provided in this area? Why?

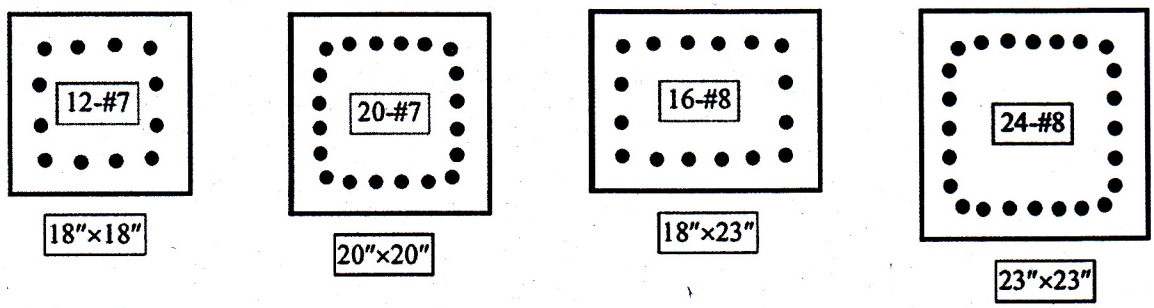
    b. Determine required thickness of the footing from shear and moment diagram (WSD)



13. A gravity wall is to retain a bank 11.5ft high whose horizontal surface is subject to a live load surcharge of 500psf. The soil is a stiff clay and the allowable bearing capacity is 8500psf. Determine whether the retaining wall designed below is safe against overturning



14. (a) Determine suitable tie arrangements (with spacing) for the following column sections in figure below, as per ACI Code

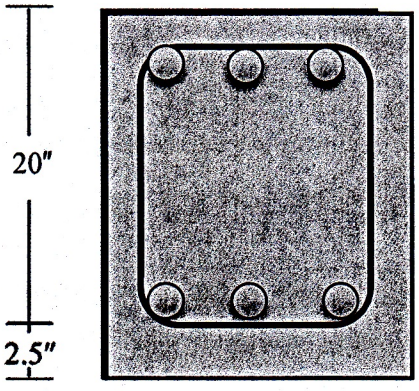


(b) Calculate the required spacing of spiral reinforcements for circular column sections of

i) 18″-dia, (ii) 30″-dia, with $d_{core} = d_{col} - 3''$

12. For the column section shown, select reinforcing bars. Take P_D =125k, P_L=140k, M_D= 75k-ft, M_L=90 k-ft. Assume section is compression controlled.

(Only for this problem, use f'_c=4 ksi, f_y=60ksi and take ϕ=0.7, for tied column)



Formula Sheet

(a) For $0.2 \le \alpha_m \le 2$

$$h = \frac{l_n\left(0.8 + \frac{f_y}{200{,}000}\right)}{36 + 5\beta(\alpha_m - 0.2)}$$

f_y in psi. But not less than 5 in.

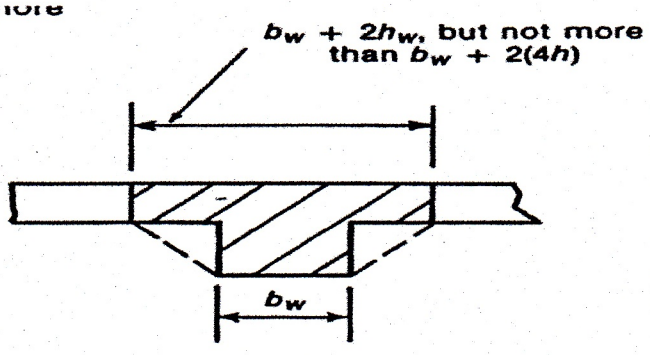
(b) For $2 < \alpha_m$

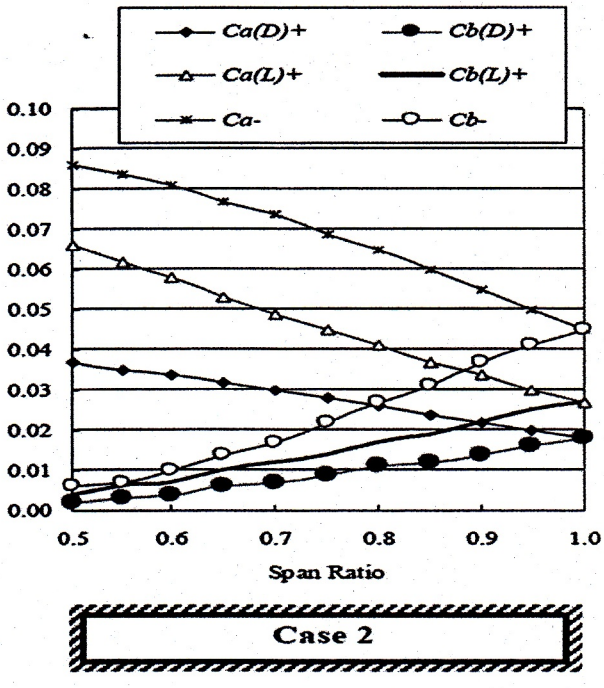
$$h = \frac{l_n\left(0.8 + \frac{f_y}{200{,}000}\right)}{36 + 9\beta}$$

f_y in psi. But not less than 3.5 in.

$$\alpha = \frac{4E_{cb}I_b/l}{4E_{cs}I_s/l} = \frac{E_{cb}I_b}{E_{cs}I_s}$$

E_{cb} = Modulus of elasticity of beam concrete
E_{sb} = Modulus of elasticity of slab concrete
I_b = Moment of inertia of uncracked beam
I_s = Moment of inertia of uncracked slab





Case 2

*-$M_A = C_{A-} \times W_T \times A^2$, *-$M_B = C_{B-} \times W_T \times B^2$

*+$M_A = C_{A(dl)} \times W_{DL} \times A^2 + C_{A(LL)} \times W_{LL} \times A^2$,

*+$M_B = C_{B(dl)} \times W_{DL} \times B^2 + C_{B(LL)} \times W_{LL} \times B^2$

$$A_s = (f_c/f_y)\,[1 - \sqrt{\{1 - 2\,M_n/(f_c\,bd^2)\}}]\,bd$$

$f_c = 0.85 f_c'$:

As(Temp) = 0.0030 bt

Design Table For Wall footing

Parameter	Equation
w_{Slab} (psf)	$SW + FF + RW + LL$
w_{Wall} (lb/′)	$t_{Wall} \times h_{Wall} \times \gamma_{Wall}$
w_f (k/′)	$N\,(w_{Slab}L/2 + w_{Wall})$
q_{net} (ksf)	w_{Wall}/B
V_{max} (k/′)	$q_{net}\,\{(B - t_{wall})/2 - d\}$
v_{max} (ksi)	V_{max}/bd
d_{reqs} (″)	$v_{max} = v_c$
M_{max} (k′/′)	$q_{net}\,\{(B - t_{wall})/2\}^2/2$
d_{reqm} (″)	$\sqrt{(M_{max}/Rb)}$
d (″)	$\geq d_{req}$
t (″)	$d + 3.5$
A_s (in²/ft)	$M_{max}/(f_{sall}jd)$, OR $0.85f_c'/f_y[1-\sqrt{(1-2M_n/(0.85f_c'bd^2)}]bd$
A_{st} (in²/ft)	$0.003bt$
L_d (″)	$0.020\,f_y/\sqrt{f_c'}\,d_b$ [Anchored]

For USD, $\rho_b = 87/(87 + f_y)\,(\alpha f_c'/f_y)$

$\Rightarrow R_u = \phi\,\rho_{max} f_y\,(1 - 0.59\rho_{max} f_y/f_c')$

Also $v_{cu} = 2\phi\sqrt{f_c'}$ $\quad \rho_{max} = 0.75\rho_b$

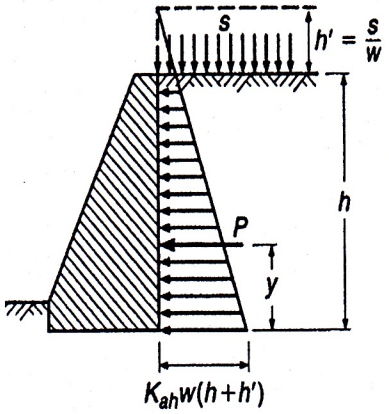
Design Table For Combined footing

Parameter	Equation
V_p (k)	$P_c - q_{net}\,(c_1+d)\,(c_2+d)$
A_p (in²)	$2(c_1+d + c_2+d)d$ OR $\{2(c_1+d) + c_2+d\}d$
Equation	$V_p/A_p = v_p$
d_{reqp} (″)	$V_p/A_p = v_p$
V_f (k)	$V_{max} - w_{net}\,d$
v_f (ksi)	V_f/bd
d_{reqs} (″)	$v_f = v_c$
M_{max} (k′)	*From BMD*
d_{reqm} (″)	$\sqrt{(M_{max}/Rb)}$
w_{tbm} (k/′)	$P_{c2}/B,\ P_{c1}/B$
M_{tbm} (k′)	$w_{tbm}L^2/2$
d_{reqt} (″)	$\sqrt{(M_{tbm}/Rb)}$

TABLE 17.1
Unit weights w, effective angles of internal friction ϕ, and coefficients of friction with concrete f

Soil	Unit Weight w, pcf	ϕ, deg	f
1. Sand or gravel without fine particles, highly permeable	110–120	33–40	0.5–0.6
2. Sand or gravel with silt mixture, low permeability	120–130	25–35	0.4–0.5
3. Silty sand, sand and gravel with high clay content	110–120	23–30	0.3–0.4
4. Medium or stiff clay	100–120	25–35[a]	0.2–0.4
5. Soft clay, silt	90–110	20–25[a]	0.2–0.3

[a] For saturated conditions, ϕ for clays and silts may be close to zero.



Co-efficient of active earth pressure = $K_{ah} = \dfrac{1 - \sin\phi}{1 + \sin\phi}$

Co-efficient of Passive earth pressure= $K_{ph} = \dfrac{1 + \sin\phi}{1 - \sin\phi}$

$y = \dfrac{h^2 + 3hh'}{3(h+2h')}$

$P = \dfrac{1}{2}K_{ah}wh(h+2h')$

Minimum ratio of spiral reinforcement $\Rightarrow \rho_s = 0.45(A_g/A_{core} - 1)(f_c'/f_y) =$

Spacing of spiral reinforcement $S = 4A_{sp}/(\rho_s\,d_{core})$

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Department of Civil Engineering
Final Examination Fall 2014
Program: B.Sc. Engineering (Civil)

Course Title: Environmental Engineering II | Course Code: CE 333

Time: 3.0 hours | Full Marks: 150 (=6×25)

[ANSWER ALL PARTS (i.e. a, b) OF EACH QUESTION TOGETHER]

[Assume reasonable values for any missing data]

SECTION –A

[Answer any 3 (Three) of the following 4 (Four) questions]

1. (a) What are the technical advantages of SBS over conventional sewerage system? (8)
What are the advantages of combined and separate sewerage systems? (5)

(b) A Residential area of 20 ha, has a total of 50 nos 6 storied buildings with two flats on each floor. The average occupancy is 6 persons per flat. The per capita water demand is 210 liter per day. (12)

The area has the following surface characteristics:

- The average area of the roof is 60 m^2/building, with runoff coefficient of 0.9.
- The roads occupy 30% of total area. Impermeability factor for these roads could be taken as 0.6.
- The remaining area is open space whose coefficient of runoff may be taken as 0.12.

(i) For a rainfall with 50 minutes duration and 20-year return interval, what will be the storm discharge from the area?
(ii) Also find the wet weather flow from the area.

2. (a) What are the advantages of pour-flush technologies over simple pit latrine? (5)

(b) In a 10 unit apartment building, 50 residents are generating an average wastewater flow of 160 lpcd. Design a double chamber septic tank for the building that will be desludged at every 3 years. For ensuring better effluent quality, it is recommended that the minimum hydraulic retention time for the tank be 1.0 day. Due to space constraints, specific tank area has to be restricted within 12 m^2. Assume wastewater temperature within the tank to be 25°C. Check clear space depth. Draw a net sketch showing details of septic tank dimensions and depth of different zones. (20)

3. (a) Draw typical bacterial growth pattern and indicate different phases. (4)
Which phase of bacterial growth is important for sewage treatment and why? (3)
Explain the relation between food/microorganism ratio and biomass settling characteristics with figure. (6)

(b) What are the objectives of sewage treatment? (5)
Briefly describe the unit operations in sewage treatment processes. (7)

4. (a) Write down the composition of a typical waste water sample. (5)
Briefly explain the significance of – (i) color, (ii) solid content and (iii) temperature of sewage in sewage treatment. (6)

(b) What are the basic differences between suspended and attached growth processes? Give examples of these treatment processes. (6)
Calculate the effluent BOD from a trickling filter having a depth of 1.5 m and a recirculation rate of 110 percent of the flow. The influent BOD is 150 mg/L following primary treatment. Laboratory determined value of k is 0.21. (8)
Also calculate the BOD removal efficiency of the filter. What adjustment should be made in the recycling ratio to increase the BOD removal efficiency?

SECTION –B

[Answer any 3 (Three) of the following 4 (Four) questions]

5. (a) What are the basic functional elements of the conventional sewerage system? (5)
What are the suitable conditions for combined and separate sewerage system? (5)

(b) A drainage area, having rain falls during five months of the year only, has an area of 25 ha, with 40 residential buildings/ha and 10 commercial buildings. The area has the following surface characteristics: (15)

(i) The average roof area are 50 m^2/ residential building and 20 m^2/commercial building. Here, the runoff coefficient is 0.85 for both types of buildings.
(ii) The roads occupy 30% of the total area. Impermeability factor for these roads could be taken as 0.75.
(iii) The remaining area is open space whose coefficient of runoff may be taken as 0.10.

If the rainfall records show that the intensity of an ordinary rainstorm is 5 cm/h, what will be the discharge from this district?

Determine the dry weather flow from the area if the population is 400 persons/ha and the rate of water supply is 240 lpcd.

Also find the ratio of storm sewage flow to dry weather flow and indicate the suitability of separate sewerage scheme in the area in preference to combined sewerage scheme.

6. (a) Which type of bacteria is important for aerobic treatment of sewage? (2)
Briefly describe the role of bacteria in sewage treatment. (6)
What are the purposes of secondary treatment process? (3)

(b) Classify bacteria according to metabolism. Also mention their carbon and energy sources. (4)
Briefly explain the metabolism of bacteria with relevant equations. (3)
What are the advantages and disadvantages of waste stabilization ponds? (7)

7. (a) Briefly explain – (i) Black water, (ii) Grey water, (iii) Building sewer, (iv) Lateral sewer and (v) Trunk sewer. (10)

(b) Using the enclosed nomogram (Fig. 3) and relevant equations, determine the maximum permissible and minimum required discharge in a 30 cm circular concrete pipe with Manning's roughness coefficient of 0.013. The self-cleansing and non-scouring velocities in a concrete pipe are 0.6 m/s and 3 m/s respectively. Also find the required slopes of the pipe to maintain self-cleansing and non-scouring velocities respectively. Now, if the pipe is laid on a slope of 0.03 and flowing half full, what will be the discharge and velocity through the pipe. Use the hydraulic elements diagram in Fig. 2. (15)

8. (a) What are the functions of aeration in activated sludge process? (3)
Explain the significance of high F/M ratio and low F/M ratio in activated sludge process. (6)

(b) Design a waste stabilization pond system to treat 1500 m^3/d of domestic sewage with a BOD contribution of 350 mg/l. The mean temperature of the coolest month is 22°C and 28°C during irrigation season. It is desired that the final effluent can be used for crop irrigation. Assume faecal coliform concentration in raw waste water to be 1×10^8 per 100 ml. The required effluent standards are FC < 1000 per 100 ml. Assume k and k_b as 0.23 d^{-1} and 2.6 d^{-1} respectively at 20 °C. (16)

Formulae:

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

$V_{sc} = 0.4\ V_{sl}$, $t_h = 1.5 - 0.3 \log (Pq)$, $V_h = 10^{-3}\ P\ q\ t_h$

$t_d = 30(1.035)^{35-T}$, $V_d = 0.5 \times 10^{-3}\ P\ t_d$, $V_{sl} = C \times P \times N$, $d_{sc} = 0.82 - 0.26A$

$Q = FCIA$

$\lambda_v = L_i\ Q / V_a$, $\lambda_s = 10\ L_i\ Q / A$, $Q = V/t$

$$N_e = \frac{N_i}{1+k_b t}, \qquad N_e = \frac{N_i}{(1+k_b t_a)\times(1+k_b t_f)\times(1+k_b t_m)^x}, \qquad t_{ml} = 10\ Li\ D_m / \lambda s$$

$t_m = \{[N_i / N_e\ (1+k_b\ t_a)\ (1+k_b\ t_f)]^{1/n} - 1\} / k_b$

$k_{b(T°C)} = k_{b(20°C)} \times (1.19)^{T-20}$, $k_{(T°C)} = k_{(20°C)} \times (1.05)^{T-20}$

$Q = AV$, $V = 1.486(R^{2/3}S^{1/2})/n$, $R = D/4$, $D = (2.16Qn/\sqrt{S})^{3/8}$

Table 1: Design values of λ_v and BOD removal rate at various temperatures

Temperature (° C)	Volumetric Loading Rate, λ_v (g/m^3 d)	BOD removal (%)
≤ 10	100	40
11	120	42
12	140	44
13	160	46
14	180	48
15	200	50
16	220	52
17	240	54
18	260	56
19	280	58
20	300	60
21	300	62
22	300	64
23	300	66
24	300	68
≥ 25	300	70

Table 2: Design values for surface BOD loading rates for facultative ponds at various temperatures

Temperature (°C)	Surface loading rate, λ_s (kg/ha d)	Temperature (°C)	Surface loading rate, λ_s (kg/ha d)
10	100	20	253
11	112	21	272
12	124	22	292
13	137	23	311
14	152	24	331
15	167	25	350
16	183	26	369
17	199	27	389
18	217	28	406
19	235	29	424

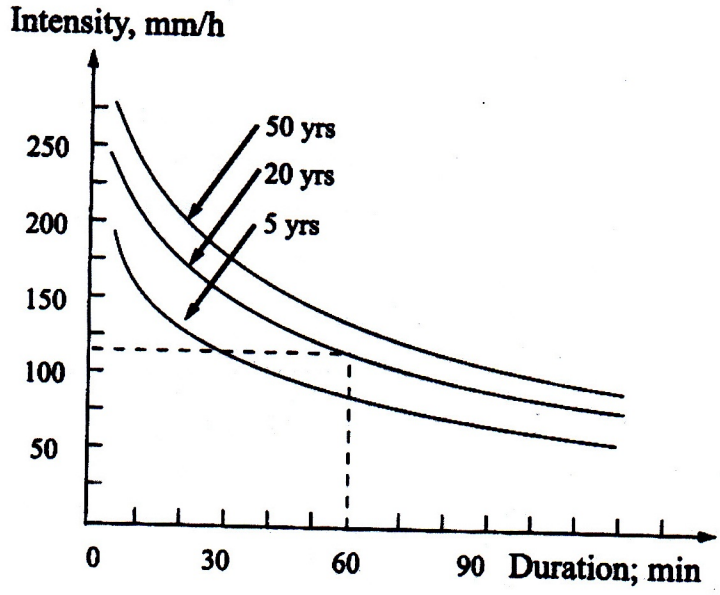

Figure 1: Rainfall Intensity-Duration-Frequency Curves

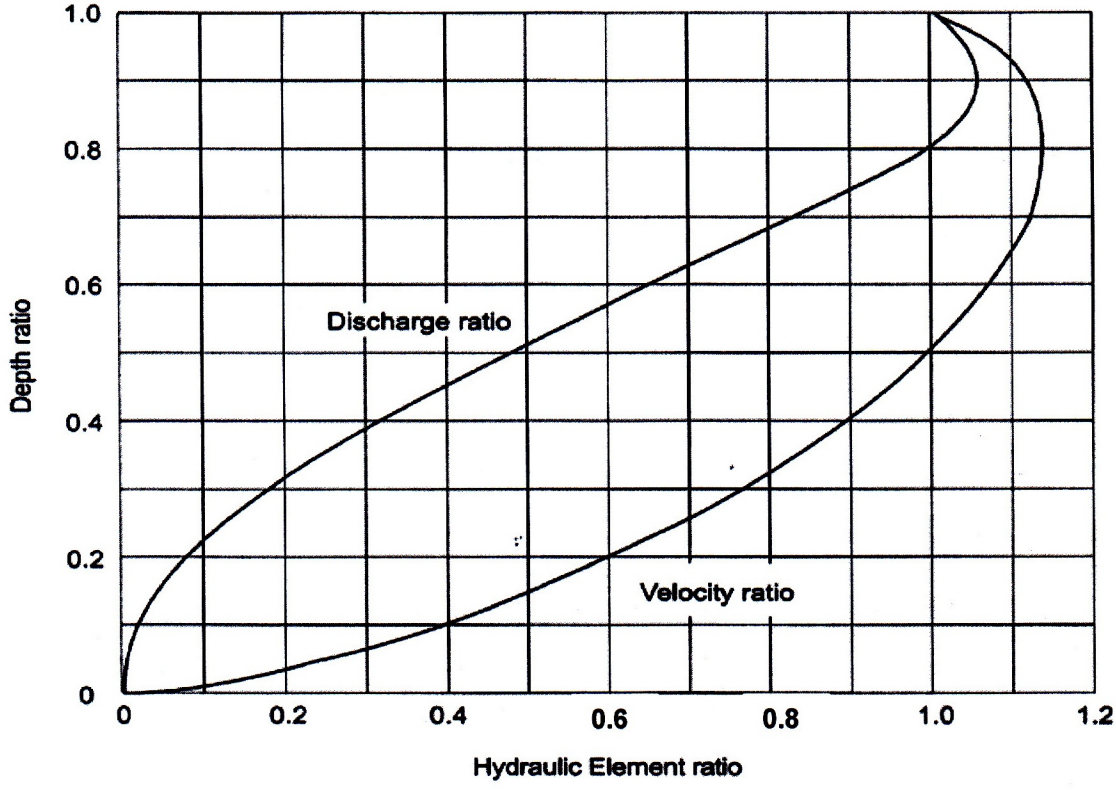

Figure 2: Hydraulic elements diagram

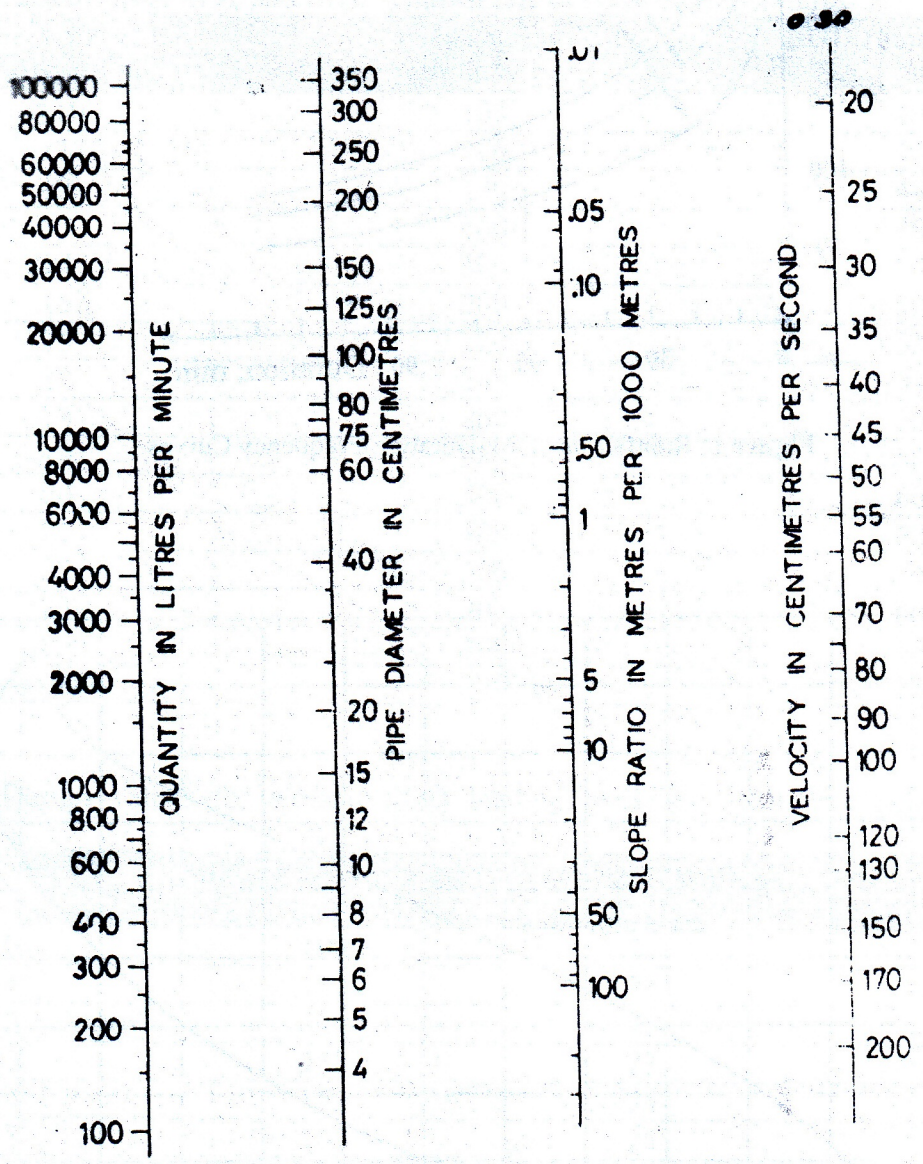

Figure 3: Nomogram based on Manning's formula for circular pipes running full (for n = 0.013)

University of Asia pacific
Department of Civil Engineering
Final Examination Fall 2014
Program: B.Sc. Engineering (Civil)

Course Title: Transportation Engineering I (Transport and Traffic Design) Course Code: CE 351
Time: 3 Hours Full Marks: 150

Instructions:

1. Use separate scripts for each section.
2. Figures in the right margin indicate marks for each question.
3. Notations and symbols used here carry their usual meanings.
4. Assume reasonable values for missing data.

Section-A
(Answer any three questions)

1. a) What should be the regulations of an effective bus terminal? 7
   b) What are the possible benefits of street lighting? Name the key locations where adequate street lighting is necessary. 8
   c) What is traffic calming devise? Explain how traffic calming devises are creating more problems than solving it in Dhaka city. 10

2. a) What does the parking study include? 5
   b) The following spot speeds (km/hr) were observed for 30 vehicles traversing a segment of a highway. 20
   39, 46, 59, 53, 55, 53, 54, 48, 65, 46, 45, 43, 37, 45, 45, 68, 55, 56, 65, 66, 35, 49, 42, 55, 48, 38, 34, 43, 35, 73.
   Calculate the design speed, average speed, safe speed, median speed and lower limit of speed. (Consider pace as **11-20, 21-30** and so on)

3. a) Write short note: 12
   (i) Cautionary Traffic Sign
   (ii) Park and ride system
   (iii) Reaction time
   b) Design a two-phase signal at an isolated cross-junction for the following data: 13
   Intergreen time for N-S: 9 sec and E-W: 6 sec.
   Lost time due to starting and end delays : 3 sec (N-S) and 2 sec (E-W)

	N	S	E	W
Flow(q), veh/hr	650	710	860	690
Saturation flow(s) veh/hr	2250	2450	2790	2650

   Also draw the bar diagram.

4. a) What are the causes of delay? Describe them. 8
   b) What are the factors affecting the speed of vehicles? 4
   c) Draw a neat and clean diagram of a simple circular curve and illustrate the following: 13

   i) Mid-ordinate

ii) Apex distance
iii) Tangent distance
iv) Long chord
v) Length of curve

Section-B

(Answer any three questions)

5. a) Define mobility and accessibility in terms of highway classification. 9
   b) A 4 degree curve (measured at the centerline of the inside lane) is being designed for a highway for a design speed of 80m/hr. What is the closest any roadside object may be placed to the centerline of the inside lane of the roadway? 16

6. a) Write short notes on any **three**: 12
   i) Sag vertical curve ii) Color vision
   iii) Brake reaction time iv) Glare recovery
   b) A horizontal curve with a radius of 600 ft is designed for a two-lane highway that has a posted speed limit of 65 mi/h. If the highway is level at this section determine the minimum distance that any roadside object can be placed from the centerline of the inside lane of the curve. Assume PR time 2.5 sec and friction factor 0.4. 13

7. a) Name the main components that influence highway geometric design? 5
   b) A vehicle initially traveling at 88 km/h skids to a stop on a 3% downgrade, where the pavement surface provides a coefficient of friction equal to 0.3. How far does the vehicle travel before coming to a stop? 10
   c) Consider a section of rural freeway with a design speed of 80 mi/h. On a section of 3% upgrade terrain, what safe stopping distance must be provided? Consider the AASHTO standard reaction time of 2.5 s. 10

8. a) Describe the various constraints in different transport sector of Bangladesh. 15
   b) Explain the function of transportation in economical development of Bangladesh. 10

University of Asia Pacific
Department of Civil Engineering
Final Examination Fall 2014
Program: B.Sc. Engineering (Civil)

Course # : CE 363 Course Title: Engineering Hydrology
Full Marks: 150 Time: 3 hours
Assume any reasonable value, if not given

Section A
Marks: 75
There are FOUR questions answer any THREE

1(a) What is residence time? Assuming that all the water in the oceans is involved in the hydrological cycle, calculate the average residence time of ocean water. Use the following data. (6)

Volume of ocean water = 1 338 000 000 km^3
Precipitation rate = 458 000 km^3 /yr on ocean
Precipitation rate = 119 000 km^3 /yr on land
Evaporation = 505 000 km^3 /yr from ocean
Evaporation = 72 000 km^3 /yr from land

1(b) Calculate in a one step, the precipitable water in a saturated air column of 2000m high above 1 m^2 of ground surface. The surface pressure is 101.3 kPa, the surface air temperature is 30^0C and the lapse rate is 6.5^0C/km. (10)

1(c) Describe following: (3x3=9)

i) Climate of Bangladesh
ii) Hydrologic related works
iii) Raingauge network as per WMO

2(a) Describe the procedure to estimate precipitable water from a static atmospheric air column. (10)

2(b) For a drainage basin of 575 km^2, isohyetals drawn for a storm gave the following data: (10)

Isohyetals interval (cm)	31-21	26–21	21-16	16-11	11-6	6-1
Inter isohyetal area (km^2)	80	100	120	150	75	50

Estimate the average depth of precipitation over the catchment.

2(c). A catchment area has five rain gauge stations. In a year the annual rainfall recorded by the gauges are as follows:

Station	A	B	C	D	E
Rainfall (cm)	88	104	138	78	56

For a 10% error in the estimation of the mean rainfall, calculate the minimum number of additional stations required to be established in the catchment. (5)

3(a) Describe the different types of evaporimeters. What are the different analytical methods of evaporation estimation? (6+4=10)

3(b) Why pan coefficient is introduced to calculate evaporation using different evaporation pan? (5)

3(c) Estimate the daily potential evapotranspiration for the following data by Penman's formula: (10)

i) Slope of the saturation vapour pressure vs. temperature at the mean air temperature = 1.00 mm/°C
ii) Mean temperature = 19°C
iii) Relative humidity = 75%
iv) Wind velocity at 2 m height = 85 km/day
v) Saturated vapour pressure e_w = 16.5 mm of Hg
vi) Net radiation = 1.99 mm of water per day
vii) Psychrometric constant = 0.49 mm of Hg/°C

4(a) Explain the following (any Three) (9)

a) Depth-duration-frequency curve
b) Infiltration capacity
c) Rational method to estimate the magnitude of a flood peak
d) Consistency test for rainfall records

4(b) Rainfall of magnitude 3.8 cm and 2.8 cm occurring on two consecutive 4-h durations on a catchment of area 27 km^2 produced the following hydrograph of flow at the outlet of the catchment. Estimate the rainfall excess and Φ-index. (7)

Time (h)	-6	0	6	12	18	24	30	36	42
Observed Flow (m^3/s)	6	5	13	26	21	16	12	9	7

Time (h)	48	54	60	66
Observed Flow (m^3/s)	5	5	4.5	4.5

4(c) Distinguish between: (3x3=9)

e) Actual and potential evapotranspiration
f) Field capacity and permanent wilting point
g) Recording and non-recording rain gauges

Section B
Marks: 75
There are FOUR questions answer any THREE

5(a) The following are the ordinates of the hydrograph of flow from a catchment area of 780 km^2 due to a 6-hr rainfall. Derive the ordinates of 6-hr unit hydrograph for the basin. Assume base flow to be uniform at $12m^3/s$. (15)

Time (hr)	0	6	12	18	24	30	36	42
Discharge(cumec)	12	40	64	215	360	405	350	270
Time (hr)	48	54	60	66	72	78	84	
Discharge(cumec)	205	145	100	70	50	42	11	

5(b) The ordinates of 4-hr UH are given below. Derive the ordinates of an 8-hr UH by the S-curve method. (10)

Time (hr)	0	4	8	12	16	20	24	28
4-hr UH ordinates (cumec)	0	24	82	159	184	151	103	64
Time (hr)	32	36	40	44				
4-hr UH ordinates (cumec)	36	17	6	0				

6(a) How does channel routing differ from reservoir flood routing? What are the factors to be considered in choosing the routing interval? (5)

6(b) The inflow and outflow hydrographs for a reach of a river are given below: (20)

Time (hr)	Inflow (cumec)	Outflow (cumec)
0	20	20
12	191	30
24	249	120
36	164	176
48	110	164
60	82	135
72	62	116
84	48	90
96	32	68
108	28	52

Determine the best values of the Muskingum coefficients k and x for the reach.

7(a) Derive the required expression and different steps for reservoir routing. What data are required for reservoir routing? (10)

7(b) The inflow hydrograph readings for a channel reach are given for which the Muskingum coefficients of k=30 hr and x=0.2. Route the flood through the reach and determine the attenuation and time lag of outflow. Outflow at the beginning of the flood may be taken as the same as inflow. (15)

Time (hr)	0	12	24	36	48	60	72	84	96
Inflow (cumec)	15	16	31	96	121	102	85	70	57

Time (hr)	108	120	132	144	156	168	180	192	204
Inflow (cumec)	47	39	32	28	24	22	20	19	18

Time (hr)	216	228	240
Inflow (cumec)	17	16	15

8(a) Describe different methods to estimate the magnitude of a flood peak. (7)

8(b) Annual maximum recorded floods in a tributary of the river Brahmaputra for the period 1939 to 1968 is given below which fits well the Gumbel extreme value distribution. Estimate the flood discharge with recurrence interval of 100 years and also find 95% confidence limits for these estimates. (18)

Year	1939	1940	1941	1942	1943	1944	1945	1946	1947	1948
Flood (cumec)	14570	8440	14000	22620	4820	29300	24200	12450	7270	6230

Year	1949	1950	1951	1952	1953	1954	1955	1956	1957	1958
Flood (cumec)	18300	9680	6480	3680	11430	21240	8500	9720	5810	19650

Year	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968
Flood (cumec)	37300	7220	20860	18700	7650	6090	4390	10340	12880	42450

University of Asia Pacific
Department of Civil Engineering
Final Examination Fall 2014
Program: B.Sc. Engineering (Civil)

Course Title: Principles of Management | Course Code: IMG 301
Time: 2 Hour | Full Marks: 50

Answer All the Questions

1(a)	What is meant by Power?		1
(b)	Briefly describe Economic and Cultural Power with examples.		2+2
(c)	What is meant by Authority? Briefly describe Charismatic Authority with examples.		3
2	Write short notes on: (a) 80/20 rule (b) Strategy Vs Tactics (c) Dream Vs Goal (d) At least 2 Strength, Weakness, Opportunity and Threat (SWOT) of UAP Civil Engineering Department (e) Manager Vs Leader	(2x5)	10
3(a)	What is meant by leadership? What are the differences between a leader and a manager?		1+2
(b)	What are the 3 common traits found among many leaders?		2
(c)	Briefly describe autocratic leadership style and its limitation.		3
4(a)	Why an organization needs control?		2
(b)	What are the benefits of control?		2
(c)	What are the demerits of 3 organizational controls? Write al least 2 of each.		4
5(a)	Why is Time Management important?		2
(b)	What are the building blocks of Time Management? Describe Priority Matrix of Time Management with examples.		1+3
(c)	Mention at least 4 time wasters with examples.		2
6(a)	What is Ethics? Why is it important?		1+2
(b)	Briefly describe ethical decision making rules with examples.		3
(c)	What are the major causes of corruption? Explain with examples.		2

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