L-4/T-1/ARCH **Date: 17/02/2018**

BANGLADESH UNIVERSITY OF ENGINEERING AND TECHNOLOGY, DHAKA

L-4/T-1 B. Arch Examinations 2016-2017

Sub: **CE 465** (Structure V: Reinforced Concrete Design)

Full Marks: 140 Time: 3 Hours

USE SEPARATE SCRIPTS FOR EACH SECTION

The figures in the margin indicate full marks

SECTION – A

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

Assume any reasonable value of missing data.

1. (a) The floor system shown in Fig. 01 consists of 3-in. slabs supported by 14-ft-span beams spaced 10 ft on center. The beams have a web width, b_w, of 14 in. and an effective depth, d, of 18.5 in. Calculate the necessary reinforcement for a typical interior beam if the factored applied moment is 5080 Kip-in. **(20)**

   Given, $f_c' = 3000$ psi, $f_s = 60$ ksi

   (b) Write down the criteria for effective flange width given in ACI code for symmetrical T beams integrated with slab. **(3⅓)**

2. (a) A reinforced concrete slab consists of more than two spans and has unrestrained discontinuous end. Design the one way slab panel 'S1' as shown in Fig. 02. The service live load is 100 psf in addition to its self-weight. Follow the provisions of ACI code. Use Fig. 03 to determine factored moment. Draw the reinforcement details also. **(20)**

   Given, $f_c' = 4000$ psi, $f_s = 60$ ksi

   (b) What is temperature and shrinkage reinforcement? Write down ACI code provisions for temperature and shrinkage reinforcement? **(3⅓)**

3. Design the two way slab panel 'S1' as shown in Fig. 04. The slab carries a uniform live load of 40 psf and a super-imposed dead load of 30 psf in addition to its self-weight. Draw the reinforcement details also. Use Table 1, 2 and 3 for calculation. **(23⅓)**

   Given, $f_c' = 3000$ psi, $f_s = 60$ ksi

4. (a) A flat plate floor has thickness h = 7 inch and is supported by 18 inch square columns spaced 20 ft on centers 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 reinforcement, if needed, using bent bars. Draw a neat sketch. **(18)**

   Given, $f_c' = 4000$ psi, $f_s = 60$ ksi

   (b) Draw neat sketch of different shear reinforcements for flat plates. **(5⅓)**

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CE 465/ARCH

SECTION – B

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

5. (a) Discuss the fundamental assumptions on which the mechanics of RCC is based. **(6)**

   (b) Draw the stress-strain curve of steel and concrete, and explain briefly. **(5)**

   (c) A rectangular beam as shown in Figure 5 is reinforced with 3-#8 bars. Determine the stresses caused by a bending moment, M = 90k-ft. **(12⅓)**

   Given, $f_c' = 4ksi$, $f_y = 60ksi, n = 8$, f_r (modulus of rupture) = $475psi$

6. (a) The T-beam section as shown in Figure 6 has a web width, b_w, of 10in., a flange width, b, of 40 in., a flange thickness of 4 in., and an effective depth, d, of 14.5 in. Determine the necessary reinforcement if the applied factored moment is 3350 k-in. **(18⅓)**

   Given, $f_c' = 3ksi$, $f_y = 60ksi$

   (b) What are the ways in which web reinforcement can augment the shear resistance of a beam after diagonal cracks have developed? **(5)**

7. (a) Discuss the behavior of diagonally cracked beams. **(9)**

   (b) Calculate the moment capacity of the beam shown in Fig. 5. **(10)**

   Given, $f_c' = 4ksi$, $f_y = 60ksi$

   (c) What do you mean by concrete cylinder strength, f_c' and yield strength of steel f_y? **(4⅓)**

8. (a) A simply supported rectangular beam 16 inch wide having an effective depth of 21 inch carries a total factored load of 10 kips/ft as shown in Figure 7. Design the web reinforcement of the beam. **(20)**

   Given, $f_c' = 4ksi$, $f_y = 60ksi$

   (b) Draw diagrams to show the various types of web reinforcement. **(3⅓)**

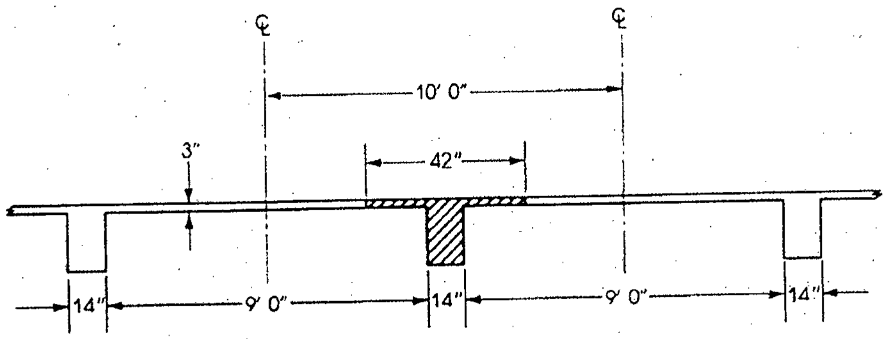

Figure: **01**

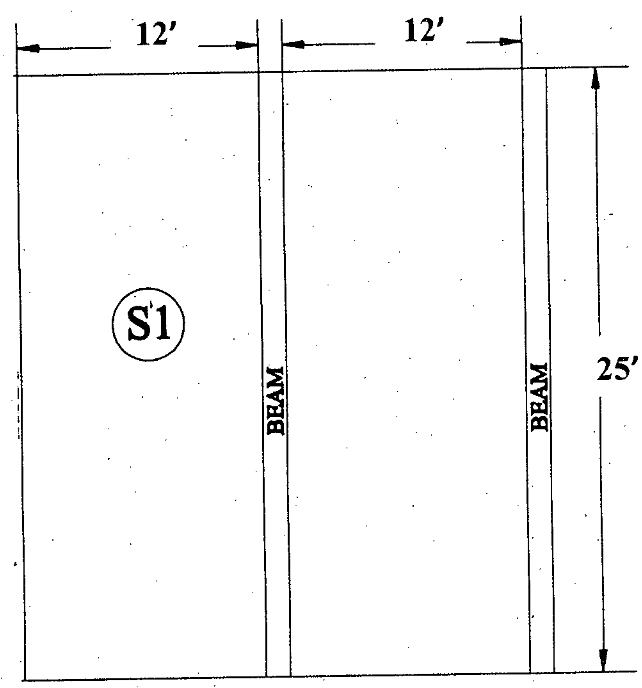

Figure: **02**

Summary of ACI moment coefficients: (*a*) beams with more than two spans; (*b*) beams with two spans only; (*c*) slabs with spans not exceeding 10 ft; (*d*) beams in which the sum of column stiffnesses exceeds 8 times the sum of beam stiffnesses at each end of the span.

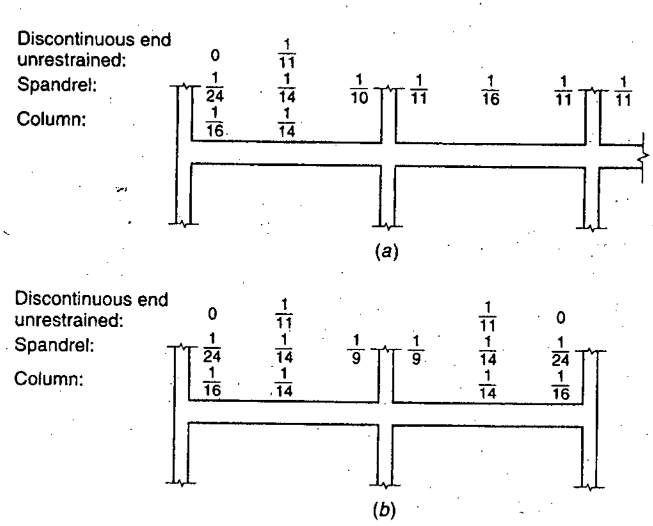

Figure: 03

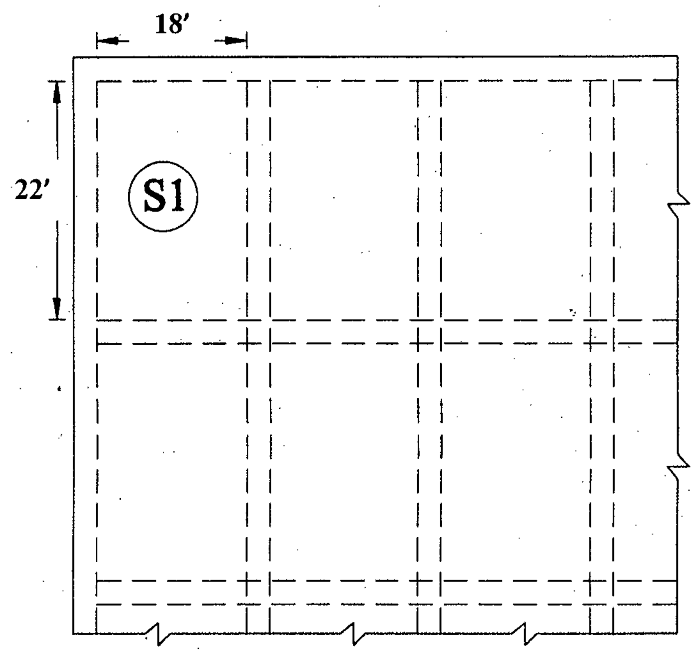

Figure: **04**

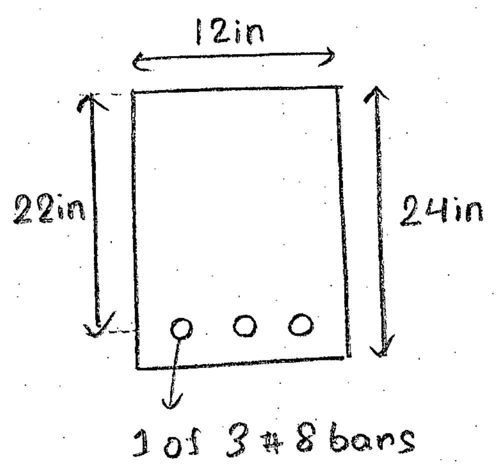

Figure 5

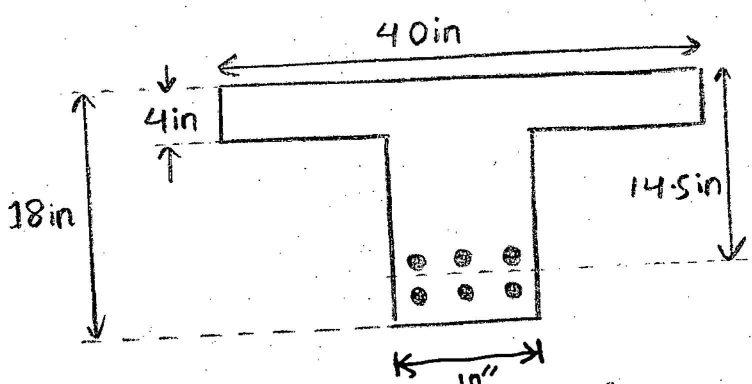

Figure 6

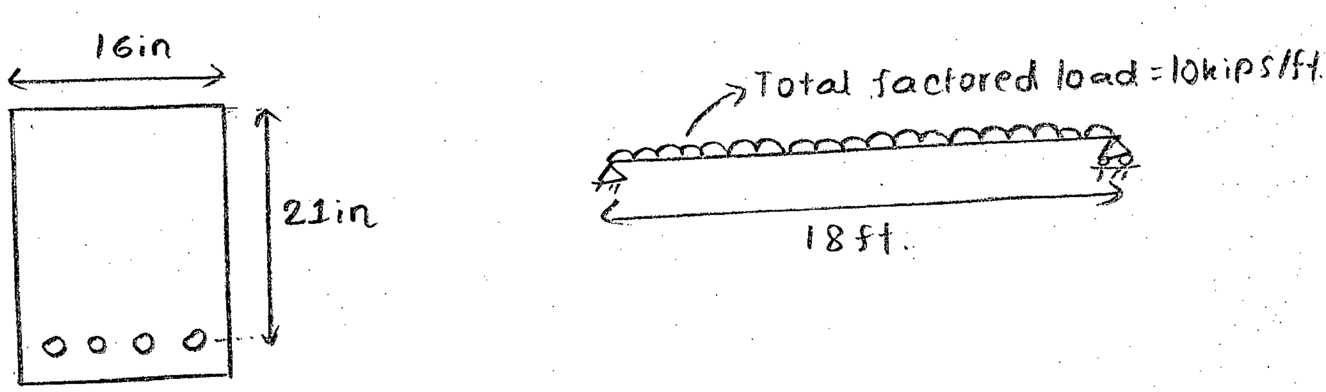

Figure 7

Table 1: Co-efficients for Negative Moments in Slabs

$M_{a,(negative)} = C_{a,(negative)} w L_a^2$; $M_{b,(negative)} = C_{b,(negative)} w L_b^2$; where, w = total uniform dead plus live load, L_a = shorter clear span & L_b = longer clear span of a slab panel

Ratio $\frac{L_a}{L_b}$	Co-efficient	Case 1	Case 2	Case 3	Case 4	Case 5	Case 6	Case 7	Case 8	Case 9
1.00	$C_{a,(negative)}$	—	0.045	—	0.05	0.075	0.071	—	0.033	0.061
	$C_{b,(negative)}$	—	0.045	0.076	0.05	—	—	0.071	0.061	0.033
0.95	$C_{a,(negative)}$	—	0.05	—	0.055	0.079	0.075	—	0.038	0.065
	$C_{b,(negative)}$	—	0.041	0.072	0.045	—	—	0.067	0.056	0.029
0.90	$C_{a,(negative)}$	—	0.055	—	0.06	0.08	0.079	—	0.043	0.068
	$C_{b,(negative)}$	—	0.037	0.07	0.04	—	—	0.062	0.053	0.025
0.85	$C_{a,(negative)}$	—	0.06	—	0.066	0.082	0.083	—	0.049	0.072
	$C_{b,(negative)}$	—	0.031	0.065	0.034	—	—	0.057	0.046	0.021
0.80	$C_{a,(negative)}$	—	0.065	—	0.071	0.083	0.086	—	0.055	0.075
	$C_{b,(negative)}$	—	0.027	0.061	0.029	—	—	0.051	0.041	0.017
0.75	$C_{a,(negative)}$	—	0.069	—	0.076	0.085	0.088	—	0.061	0.078
	$C_{b,(negative)}$	—	0.022	0.056	0.024	—	—	0.044	0.036	0.014
0.70	$C_{a,(negative)}$	—	0.074	—	0.081	0.086	0.091	—	0.068	0.081
	$C_{b,(negative)}$	—	0.017	0.05	0.019			0.038	0.029	0.011
0.65	$C_{a,(negative)}$	—	0.077	—	0.085	0.087	0.093	—	0.074	0.083
	$C_{b,(negative)}$	—	0.014	0.043	0.015	—	—	0.031	0.024	0.008
0.60	$C_{a,(negative)}$	—	0.081	—	0.089	0.088	0.095	—	0.08	0.085
	$C_{b,(negative)}$	—	0.01	0.035	0.011	—	—	0.024	0.018	0.006
0.55	$C_{a,(negative)}$	—	0.084	—	0.092	0.089	0.096	—	0.085	0.086
	$C_{b,(negative)}$	—	0.007	0.028	0.008	—	—	0.019	0.014	0.005
0.50	$C_{a,(negative)}$	—	0.086	—	0.094	0.09	0.097	—	0.089	0.088
	$C_{b,(negative)}$	—	0.006	0.022	0.006	—	—	0.014	0.01	0.003

*A crosshatched edge indicates that the slab continues across or is fixed at the support; an unmarked edge indicates a support at which torsional resistance is negligible.

Table 2: Co-efficients for **Dead Load Positive Moments** in Slabs

$M_{a,(positive),DL} = C_{a,(positive)} w_{DL} L_a^2$; $M_{b,(positive),DL} = C_{b,(positive)} w_{DL} L_b^2$; where w_{DL} = total uniform dead load

Ratio $\frac{L_a}{L_b}$	Co-efficient	Case 1	Case 2	Case 3	Case 4	Case 5	Case 6	Case 7	Case 8	Case 9
1.00	$C_{a,(positive)}$	0.036	0.018	0.018	0.027	0.027	0.033	0.027	0.02	0.023
	$C_{b,(positive)}$	0.036	0.018	0.027	0.027	0.018	0.027	0.033	0.023	0.02
0.95	$C_{a,(positive)}$	0.040	0.02	0.021	0.03	0.028	0.036	0.031	0.022	0.024
	$C_{b,(positive)}$	0.033	0.016	0.025	0.024	0.015	0.024	0.031	0.021	0.017
0.90	$C_{a,(positive)}$	0.045	0.022	0.025	0.033	0.029	0.039	0.035	0.025	0.026
	$C_{b,(positive)}$	0.029	0.014	0.024	0.022	0.013	0.021	0.028	0.019	0.015
0.85	$C_{a,(positive)}$	0.050	0.024	0.029	0.036	0.031	0.042	0.04	0.029	0.028
	$C_{b,(positive)}$	0.026	0.012	0.022	0.019	0.011	0.017	0.025	0.017	0.013
0.80	$C_{a,(positive)}$	0.056	0.026	0.034	0.039	0.032	0.045	0.045	0.032	0.029
	$C_{b,(positive)}$	0.023	0.011	0.02	0.016	0.009	0.015	0.022	0.015	0.01
0.75	$C_{a,(positive)}$	0.061	0.028	0.04	0.043	0.033	0.048	0.051	0.036	0.031
	$C_{b,(positive)}$	0.019	0.009	0.018	0.013	0.007	0.012	0.02	0.013	0.007
0.70	$C_{a,(positive)}$	0.068	0.03	0.046	0.046	0.035	0.051	0.058	0.04	0.033
	$C_{b,(positive)}$	0.016	0.007	0.016	0.011	0.005	0.009	0.017	0.011	0.006
0.65	$C_{a,(positive)}$	0.074	0.032	0.054	0.05	0.036	0.054	0.065	0.044	0.034
	$C_{b,(positive)}$	0.013	0.006	0.014	0.009	0.004	0.007	0.014	0.009	0.005
0.60	$C_{a,(positive)}$	0.081	0.034	0.062	0.053	0.037	0.056	0.073	0.048	0.036
	$C_{b,(positive)}$	0.010	0.004	0.011	0.007	0.003	0.006	0.012	0.007	0.004
0.55	$C_{a,(positive)}$	0.088	0.035	0.071	0.056	0.038	0.058	0.081	0.052	0.037
	$C_{b,(positive)}$	0.008	0.003	0.009	0.005	0.002	0.004	0.009	0.005	0.003
0.50	$C_{a,(positive)}$	0.095	0.037	0.08	0.059	0.039	0.061	0.089	0.056	0.038
	$C_{b,(positive)}$	0.006	0.002	0.007	0.004	0.001	0.003	0.007	0.004	0.002

*A crosshatched edge indicates that the slab continues across or is fixed at the support; an unmarked edge indicates a support at which torsional resistance is negligible.

Table 3: Co-efficients for **Live Load Positive Moments** in Slabs

$M_{a,(positive),LL} = C_{a,(positive)} w_{LL} L_a^2$; $M_{b,(positive),LL} = C_{b,(positive)} w_{LL} L_b^2$; where w_{LL} = total uniform live load

Ratio $\frac{L_a}{L_b}$	Co-efficient	Case 1	Case 2	Case 3	Case 4	Case 5	Case 6	Case 7	Case 8	Case 9
1.00	$C_{a,(positive)}$	0.036	0.027	0.027	0.032	0.032	0.035	0.032	0.028	0.03
	$C_{b,(positive)}$	0.036	0.027	0.032	0.032	0.027	0.032	0.035	0.03	0.028
0.95	$C_{a,(positive)}$	0.040	0.03	0.031	0.035	0.034	0.038	0.036	0.031	0.032
	$C_{b,(positive)}$	0.033	0.025	0.029	0.029	0.024	0.029	0.032	0.027	0.025
0.90	$C_{a,(positive)}$	0.045	0.034	0.035	0.039	0.037	0.042	0.04	0.035	0.036
	$C_{b,(positive)}$	0.029	0.022	0.027	0.026	0.021	0.025	0.029	0.024	0.022
0.85	$C_{a,(positive)}$	0.050	0.037	0.04	0.043	0.041	0.046	0.045	0.04	0.039
	$C_{b,(positive)}$	0.026	0.019	0.024	0.023	0.019	0.022	0.026	0.022	0.02
0.80	$C_{a,(positive)}$	0.056	0.041	0.045	0.048	0.044	0.051	0.051	0.044	0.042
	$C_{b,(positive)}$	0.023	0.017	0.022	0.02	0.016	0.019	0.023	0.019	0.017
0.75	$C_{a,(positive)}$	0.061	0.045	0.051	0.052	0.047	0.055	0.056	0.049	0.046
	$C_{b,(positive)}$	0.019	0.014	0.019	0.016	0.013	0.016	0.02	0.016	0.013
0.70	$C_{a,(positive)}$	0.068	0.049	0.057	0.057	0.051	0.06	0.063	0.054	0.05
	$C_{b,(positive)}$	0.016	0.012	0.016	0.014	0.011	0.013	0.017	0.014	0.011
0.65	$C_{a,(positive)}$	0.074	0.053	0.064	0.062	0.055	0.064	0.07	0.059	0.054
	$C_{b,(positive)}$	0.013	0.01	0.014	0.011	0.009	0.01	0.014	0.011	0.009
0.60	$C_{a,(positive)}$	0.081	0.058	0.071	0.067	0.059	0.068	0.077	0.065	0.059
	$C_{b,(positive)}$	0.010	0.007	0.011	0.009	0.007	0.008	0.011	0.009	0.007
0.55	$C_{a,(positive)}$	0.088	0.062	0.08	0.072	0.063	0.073	0.085	0.07	0.063
	$C_{b,(positive)}$	0.008	0.006	0.009	0.007	0.005	0.006	0.009	0.007	0.006
0.50	$C_{a,(positive)}$	0.095	0.066	0.088	0.077	0.067	0.078	0.092	0.076	0.067
	$C_{b,(positive)}$	0.006	0.004	0.007	0.005	0.004	0.005	0.007	0.005	0.004

*A crosshatched edge indicates that the slab continues across or is fixed at the support; an unmarked edge indicates a support at which torsional resistance is negligible.

L-4/T-1/ARCH **Date: 27/02/2018**

BANGLADESH UNIVERSITY OF ENGINEERING AND TECHNOLOGY, DHAKA

L-4/T-1 B. Arch. Examinations 2016-2017

Sub: **ARCH 431** (Environment and Design IV: Landscape Design)

Full Marks: 140 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 **Q. No. 1** and any **TWO** from the rest.

1. (a) How the definition of landscape ecology is different from the conventional definition of landscape design? State the foci of landscape ecology. **(10)**

   (b) Propose the native plant community for the geological context in Dhaka. Use historical reference in terms of geology and vegetation pattern. **(12)**

   (c) How elephants play an important role in maintaining the biodiversity of the ecosystem in which they live? **(8)**

2. (a) What is ecological services? Why we need to learn about ecological services offered by any given ecosystem? **(10)**

   (b) Why we need to preserve the mangrove forests in Bangladesh? **(10)**

3. (a) Portray the role of trees in keeping the health of soil and vice-versa explaining soil ecosystem. **(12)**

   (b) How does nitrogen fixation benefit an ecosystem? **(8)**

4. What strategies would you follow to design open spaces to attain ecologically and culturally responsive neighborhood in the context of New Dhaka. **(20)**

SECTION – B

There are **FOUR** questions in this section. Answer **Q. No. 5** and any **TWO** from the rest.

5. (a) Define "Mapping" in landscape design process. Explain how "Mapping" plays an important role during any landscape design process. Use necessary sketches. **(15)**

   (b) What are the sustainable site development principles? **(8)**

   (c) State the steps involved in planting. **(7)**

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ARCH 431

6. (a) What is 'Altered Landscape'? Propose appropriate measures to mitigate flooding in urban context due to 'Altered Landscape'. **(13)**

   (b) Write about green roofing system. Use sketches showing necessary details. **(7)**

7. (a) What are the reasons behind "Land Erosion" in Bangladesh? Can vegetation play any role to mitigate land erosion? Explain why? **(10)**

   (b) What is 'Green infrastructure'? Why do we need to adapt and practice the concept of 'Green Infrastructure' in Bangladesh? **(10)**

8. (a) Define 'Water Smart Landscaping'. Suggest the means to attain 'Water Smart Landscaping' stating the benefits. **(12)**

   (b) How watershed ecosystem services influence health, safety and welfare. **(8)**
