

NATIONAL UNIVERSITY OF SCIENCE AND TECHNOLOGY
FACULTY OF ARCHITECTURE AND QUANTITY SURVEYING

DEPARTMENT OF ARCHITECTURE
BACHELOR OF ARCHITECTURAL STUDIES (HONOURS) DEGREE

PART III END OF SECOND SEMESTER EXAMINATIONS – JUNE 2004
AAR 3203 – BUILDING SERVICES II

Instructions

Time : 4 Hours

Answer Question 1 and any other two.

QUESTION 1

- a) Discuss the importance of luminaires in proper illumination of the rooms/spaces. [14]
- b) A workshop is 12m by 6m by 4m high and has work benches 0,8m high. Discharge lamps, each with an output of 3 700 lm and to be fitted in aluminium industrial reflectors at ceiling level. The surface have reflectances 0,7 for ceiling and 0,5 for the walls. The maintenance factor is 0,75. The illuminance required on the work benches is 500lx. The luminaire fitting is Alminium Industrial reflector.
- i) Find the utilization factor for the room using table provided.
- ii) Calculate the number of lamps required and suggest a layout for them.
- NB. Table I has been provided for this question. [20]

QUESTION 2

- a) Write short notes on emergency electricity [16]
- b) Discuss firefighting necessary for:
- i) Basement for car parking [8]
- ii) A supermarket [9]

QUESTION 3

- a) Suggest the most suitable mechanism for upward and downward moment of people in a four storey commercial shop. [11]
- b) Determine the number of lifts in a rectangular residential buildings with single occupancy. Allow for a Ground floor with 10 upper floors at a uniform floor to floor height of 3 metres. Dimensions for all floors are 200 x 12m. Quality of services is good. Use table (2) for your calculations assuming light speed to be 1,5m/sec while capacity is 20 persons and door is power operated centre. [22]

QUESTION 4

- a) Explain in briefly the materials and methods used to control the quality of sound in buildings. [18]
- b) i) Discuss the aims of ventilating and air conditioning rooms. [6]
- ii) A fan absorbs 3,3 kW of power and discharges $2,3\text{m}^3/\text{s}$ when the impeller angular velocity is 100s revolutions per minute. If the impeller angular velocity is increased to 1 250 revolutions per minute, calculate the discharge in m^3/s and power absorbed for this new condition. [9]

TABLE I

Utilisation factors for some luminaires




Description of fitting	Typical outline LOR	Basic downward LOR %	Ceiling	Reflectances								
			Room index	0.7			0.5			0.3		
				0.5	0.3	0.1	0.5	0.3	0.1	0.5	0.3	0.1
Aluminium industrial reflector, Aluminium or enamel high-bay reflector		70	0.6	0.39	0.36	0.33	0.39	0.36	0.33	0.39	0.35	0.33
			0.8	0.48	0.43	0.40	0.46	0.43	0.40	0.46	0.43	0.40
			1.0	0.52	0.49	0.45	0.52	0.48	0.45	0.52	0.48	0.45
			1.25	0.56	0.53	0.50	0.56	0.53	0.49	0.56	0.52	0.42
			1.5	0.60	0.57	0.54	0.59	0.57	0.53	0.59	0.55	0.53
			2.0	0.65	0.62	0.59	0.63	0.60	0.58	0.63	0.59	0.57
			2.5	0.67	0.64	0.62	0.65	0.62	0.61	0.65	0.62	0.60
			5.0	0.71	0.68	0.67	0.69	0.67	0.65	0.69	0.66	0.64
Near-spherical diffuser, open beneath		50	0.6	0.28	0.22	0.18	0.25	0.20	0.17	0.22	0.18	0.16
			0.8	0.39	0.30	0.26	0.33	0.28	0.23	0.27	0.25	0.22
			1.0	0.43	0.36	0.32	0.38	0.34	0.29	0.31	0.29	0.26
			1.25	0.48	0.41	0.37	0.42	0.38	0.33	0.34	0.32	0.29
			1.5	0.52	0.46	0.41	0.46	0.41	0.37	0.37	0.35	0.32
			2.0	0.58	0.52	0.47	0.50	0.46	0.43	0.42	0.39	0.36
			2.5	0.62	0.56	0.52	0.54	0.50	0.47	0.45	0.42	0.40
			5.0	0.68	0.64	0.61	0.60	0.56	0.54	0.51	0.48	0.46
Recessed louvre trough with optically designed reflecting surfaces		50	0.6	0.28	0.25	0.23	0.28	0.25	0.23	0.28	0.25	0.23
			0.8	0.34	0.31	0.28	0.33	0.30	0.28	0.33	0.30	0.28
			1.0	0.37	0.36	0.32	0.37	0.34	0.32	0.37	0.34	0.32
			1.25	0.40	0.38	0.35	0.40	0.37	0.35	0.40	0.37	0.35
			1.5	0.43	0.41	0.38	0.42	0.40	0.38	0.42	0.39	0.38
			2.0	0.46	0.44	0.42	0.45	0.43	0.41	0.44	0.42	0.41
			2.5	0.48	0.46	0.44	0.47	0.45	0.43	0.46	0.44	0.43
			5.0	0.51	0.50	0.49	0.50	0.49	0.48	0.49	0.48	0.47

TABLE 2

No. of passengers	Entrance lobby loading time in second.	Transfer time i.e. loading and unloading time at upper floors
8	7	1
13	12	1'25
16	14	1'5
20	17	1'6

Lift speed m/s	Rate of acceleration m/sec ²
1	0'50
1'5	0'75
2'5	1'00
more than 2'4 to 8	2'50
more than 8 and floors more than 50	4'00

TABLE 2 contd

Recommended occupant load for various buildings

Type	Occupancy area/per person
1. Residential	12.5
2. Educational	4
3. Institutional	15
4. Assembly hall with	
(a) dance floor	0.6
(b) dining	1.5
5. Business	10
6. Mercantile	
(a) with basement	3
(b) with shops on uppers	6
7. Industrial	10
8. Storage	30
9. Hazardous	10

Probable number of stops.

No. of upper floors served	Number of passenger/trip (car capacity)					
	10	12	14	16	18	20
18	8	9	10	11	12	13
16	8	9	10	10	11	12
14	7	8	9	9	10	11
12	7	8	9	9	10	10
10	6	7	8	8	9	9
8	6	6	7	7	8	8
6	5	5	6	6	7	7

Type of door operation	Capacity			
	8	13	16	20
(a) Power operated single slide	3.8	3.8	—	—
(b) Power operated double slide	3.2	3.2	—	—
(c) Power operated centre opening	2.8	2.8	3.2	3.2
(d) Collapsible with attendant	2.5	2.5	3	3
(e) Collapsible without attendant	4	4	—	—