Reg. No.										

MANIPAL ACADEMY OF HIGHER EDUCATION

SEVENTH SEMESTER B. ARCH. DEGREE EXAMINATION – JAN/FEB 2019

SUBJECT: ARC-14-409.2 - ADVANCED ACOUSTICS AND ILLUMINATION

(2014 SCHEME)

Saturday, February 02, 2019

Time: 10:00 – 13:00 Hrs. Max. Marks: 50

- **Answer any FOUR full questions. Question No. 4 is a mandatory question.**
- **Assume suitable data wherever necessary, but mention that explicitly.**

1. What is Noise Reduction Coefficient? What are the frequencies in the Octave Band? What is the relation between Absorption Coefficient and Noise Reduction Coefficient?

(4+2+4 = 10 marks)

2. **Write short notes on:**

2A. Daylight Factor
2B. Absorption Coefficient
2C. Sound Transmission Class
2D. Sound Reinforcement System
2E. Reverberation Time

(2 marks × 5 = 10 marks)

3. Consider an Architecture Studio of dimensions 15m (width – blackboard is on this wall) * 18m (length) * 4.5m (height). Now based upon the attached table in this question paper, write the logical decision-making process or algorithm to decide the final finishing material for each of the inside component of the space if the noise to be considered is at 1000 Hz. Permissible range of Reverberation time is 1 to 2 seconds. Assume any data which you feel is missing but mention your assumptions **explicitly**.

(10 marks)

4. Design and detail out the luminaire for a room having the dimensions 3.25 m (width) * 3.25 m (length) * 3 m (height). Desired average illuminance on working plane is 14500 lux. An experimental setup was arranged with 30 LEDs kept inside a test box of 0.0025 sq. m. area and it was figured out that illuminance on the surface of the test box is 11000 CD/sq.m. Now if the same LED is supposed to be used, then calculate the number of LEDs required in the luminaire. Assume engineering safety factor of 25%. [Given Data, Coefficient of utilization – 0.6; Ballast Factor – 1.0; Lamp Lumen Depreciation – 0.95; Lamp Burn Out – 1.0; Luminaire Dirt Depreciation – 0.94; Room Surface Dirt Depreciation – 0.96]

(10+10 = 20 marks)

5. What is Sound Transmission Class? What are the two conditions for determining the Sound Transmission Class of a given specimen?

(4+3+3 = 10 marks)

Sound Absorption Coefficients of General Building Materials Table							
	Octave Band Center Frequencies, Hz						
Materials	125	250	500	1000	2000	4000	NRC
Brick							
Unglazed	.03	.03	.03	.04	.05	.07	.05
Unglazed, Painted	.01	.01	.02	.02	.02	.03	.00
Carpet							
1/8" Pile height	.05	.05	.10	.20	.30	.40	.15
1/4" Pile height	.05	.10	.15	.30	.50	.55	.25
3/16" Combined pile and foam	.05	.10	.10	.30	.40	.50	.25
5/16" Combined pile and foam	.05	.15	.30	.40	.50	.60	.35
Ceilings							
1/4" Mineral Board Ceiling	.31	.29	.51	.70	.71	.71	.55
5/8" Film Faced Fiberglass Ceiling	.66	.76	.60	.80	.89	.80	.75
1 1/2" Glass Cloth Faced Fiberglass Ceiling	.80	.96	.88	1.04	1.05	1.06	1.00
Concrete Block							
Unpainted	.36	.44	.31	.29	.29	.25	.35
Painted	.10	.05	.06	.07	.09	.08	.05
Fabrics							
Light velour, 10 oz. per sq. yd., hung straight in contact with wall	.03	.04	.11	.17	.24	.35	.15
Medium velour, 14 oz per sq. yd., draped to half area	.07	.31	.49	.75	.70	.60	.55
Heavy velour, 18 oz. per sq. yd., draped to half area	.14	.35	.55	.72	.70	.65	.60
Floors							
Concrete or terrazzo	.01	.01	.01	.02	.02	.02	.00
Linoleum, asphalt, rubber or cork tile on concrete	.02	.03	.03	.03	.03	.02	.05
Wood	.11	.10	.07	.06	.07	.10	
Wood parquet in asphalt on concrete	.04	.04	.07	.06	.06	.07	.0
Glass							
1/4" sealed, large panes	.05	.03	.02	.02	.03	.02	.05
24 oz. operable window (in closed position)	.10	.05	.04	.03	.03	.03	.05
Gypsum Board							
1/2" nailed to 2x4 studs, 16: o.c.,	.10	.08	.05	.03	.03	.03	.05
Marble or Glazed Tile	.01	.01	.01	.01	.02	.02	.00
Plaster, Gypsum or Lime							
Rough finish on lath	.02	.03	.04	.05	.04	.03	.05
Smooth finish on lath	.02	.02	.03	.04	.04	.03	.05
Hardwood Plywood Paneling							
1/4" thick, wood frame	.58	.22	.07	.04	.03	.07	.10
Wall Panels							
Fiberglass Wall Panels	.05	.30	.80	1.00	1.02	.95	.80
Water Surface							
As in swimming pool	.01	.01	.01	.01	.02	.03	.00
Wood Rough Decking							
Tongue-and-groove cedar	.24	.19	.14	.08	.13	.10	.15