KATHMANDU UNIVERSITY
End Semester Examination
June/July, 2023

Marks Scored:

Level : B. Arch.
Year : I
Course : ARCH 101
Semester : I

Exam Roll No:
Time: 30 mins.
F. M. : 20

Registration No.:
Date : 25 JUN 2023

SECTION "A"
[20Q × 1 = 20 marks]

Encircle the most appropriate option.

1. A particle is performing a SHM. If its mass is doubled keeping the amplitude and force constant the same, total energy will become how many times the initial value?
   a. 2 b. 1 c. 4 d. ½

2. Ultrasonic waves is produced at _____ using piezo electric oscillator.
   a. constant temperature b. resonance
   c. constant pressure d. constant voltage

3. When two waves of same amplitude add constructively, the intensity becomes _____.
   a. Double b. Half c. Four Times d. One-Fourth

4. While both light and sound show wave character, diffraction is much harder to observe in light. This is because of _____
   a. $1 + (N^2\text{-}1)\sin^2\beta$ b. $1/[1 + (N^2\text{-}1)\sin^2\beta]$
   c. $(N^2\text{-}1)\sin^2\beta$ d. $N^2\sin^2\beta$

5. Unpolarized light is incident on a plane glass surface. What should be the angle of incidence such that the reflected and refracted rays are perpendicular to each other?
   a. 90° b. 49° c. 57° d. 65°

6. What is the need to achieve population inversion?
   a. To excite most of the atoms
   b. To bring most of the atoms to ground state
   c. To achieve stable condition
   d. To reduce the time of production of laser

7. The unit of illumination is _____.
   a. lux b. candela c. radian d. steradian

8. Due point occurs when a mass of air has relative humidity of _____.
   a. 50% b. 75% c. 85% d. 100%

9. The amount of visible light in the solar spectrum at the earth's surface consists of _____.
   a. 47% b. 51% c. 48% d. 5%

10. Ventilation helps to remove
    a. oxygen from room b. Pollens, dust and other irritants
    c. fresh air from room d. people from room

11. Where cannot sound propagate?
a. Air b. Liquid c. Solid bodies d. Vacuum

12. Which of the following is an objective of architectural acoustics?
a. To control noise outside building
b. To design proper sound quality inside building
c. To create the direction of sound
d. To control sound from neighbor's party

13. In cinema halls Reverberation Time should be _____
a. sufficient b. long c. short d. desirable

14. The orange light is visible at the wavelength of
a. 6.2 – 7.7 nm b. 5.9 – 6.2 nm
c. 5.7 – 5.9 nm d. 4.9 – 5.7 nm

15. What is not a function of ventilation?
a. Supply fresh air b. Physiological cooling
c. Instant cooling d. Convective cooling

Fill in the blanks with appropriate answer.

16. The surface of the sun has a temperature of approximately 5800 K. To a good approximation we may treat it as a black body. The peak-intensity wavelength is _____.

17. The two ends of a metal rod are maintained at temperature 100°C and 110°C. The rate of heat flow in the rod is found to be 4.0 J/s. If the ends are maintained at temperatures 200°C and 210°C, the rate of heat flow will be _____.

18. Reverberation is the length of time required for sound to decay _____ from its initial level.

19. The vertical openings on walls are known as windows whereas horizontal openings are known as _____.

20. Air change per hour is the volume of air entered into room in one hour with respect to the _____ volume of air.

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Level : B. Arch.
Year : I
Time : 2 hrs and 30 mins.

Course : ARCH 101
Semester : I
F. M. : 55

SECTION "B"
[5Q × 4 = 20 marks]

Attempt *ALL* questions

1. What are the ways in which heat is transferred? On what factors the rate of flow of heat through a conductor depend? Determine the thermal conductivity of a conducting rod whose two ends are maintained at different temperatures.

OR

The radiation emitted by a star is 10,000 times more than that of the sun. If the surface temperature of the sun and the star is 6000 K and 2000 K respectively. Calculate the ratio of the radii of the star and the sun.

2. State and prove Lambert's Cosine Law.

OR

In Young's double slit experiment, the slits are separated by 0.28 mm and the screen is 1.4 m away. The distance between the central bright fringe and the fourth bright fringe is 1.2 cm. Find the frequency of light used. Use the standard value of velocity of light.

3. What is effect of pressure on boiling point? Distinguish between saturated and unsaturated vapour.

OR

Explain clearly (i) Brewster's law of polarization and (ii) Spontaneous and Stimulated emission.

4. How does sound travel in a building? Write in short the common acoustic defects.

5. Describe shortly the different sources of daylight at a point within a room. What will be the illumination inside a classroom on a desk surface in London if the daylight factor is 3% and there are no reflections at all.

OR

What is wind? How can windrose diagram be used to describe wind?

SECTION "C"
[5Q × 7 = 35 marks]

Attempt *ALL* questions.

6. What is magnetostriction effect? Explain how it is used to produce ultrasonic waves. Discuss briefly any two applications of ultrasonic waves?

OR

Define forced harmonic oscillation. Write differential equation for forced harmonic oscillation and solve the equation with special cases.

7. What is condition of diffraction? Discuss the theory of Fraunhofer diffraction pattern due to N-parallel slits.

8. A room of 5m (L) × 3m (B) × 3m (H) is lit uniformly with 40 W fluorescent lamps. Determine the number of lamps required to supplement daylight if illumination is 150 lux on the working plane 0.75 m above floor level and the mounting height is 1.5 m above the working plane. The Utilization factor is 0.5 and maintenance factor is 0.8. Draw plan and section of room with lamps.

9. A classroom of size 20m × 10m × 5m is treated fully with acoustic material. The floor of the room is covered with thin carpet and has a suspended ceiling. Calculate the reverberation time of room at 500 Hz and 1000 Hz when the absorption coefficient of different surfaces is as given below.

Material	500 Hz	1000 Hz
Thin carpet	0.25	0.3
Suspended ceiling	0.70	0.85
Acoustic panels	0.75	0.85

10. What are the factors that affect wind movement in and around a building? How can this knowledge help in protecting a building from cold wind?