KATHMANDU UNIVERSITY
End Semester Examination [C]
July, 2024

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

21 JUL 2024

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

SECTION "B"
[5 Q. × 4 = 20 marks]

Attempt ALL questions.

1. Explain how piezo-electric effect it is used to produce ultrasonic waves.

OR

Define conduction, convection and radiation. Deduce the coefficient of thermal conductivity of a substance.

2. What do you mean by polarization of light? State Brewster's law and prove that, when the reflected light is completely polarized, then the reflected and refracted rays are perpendicular to each other.

3. State and prove Lambert's Cosine Law.

OR

Write notes on: (i) Dew point, and (ii) Relative humidity

4. What is building science? How did it evolve?

5. Define horizontal openings. What are its disadvantages?

OR

What is thermal comfort? What are the factors that influence thermal comfort?

SECTION "C"
[5 Q. × 7 = 35 marks]

6. Define forced harmonic oscillation. Deduce the differential equation for forced harmonic oscillation and solve the equation.

OR

What is diffraction? Discuss the theory of Fraunhoffer's diffraction pattern due to N-parallel slits.

P.T.O.

7. The distance between two coherent sources in Young's double slit experiment is 0.2 mm and the interference pattern is observed on a screen 80 cm from the sources. If the wavelength used is 6000 A°, then
   a. How far is second bright fringe from the central bright fringe?
   b. How far is the second dark fringe from central bright fringe?

8. What is Reverberation time? [2]
A classroom of size 25m x 15m x 5m is treated fully with acoustic material. It has two door made of wooden boards of size 2.1m x 0.9m. The floor of the room is covered with thin carpet and has a suspended ceiling, hung at a depth of 1.2 m from the ceiling. Calculate the reverberation time of room at 500 Hz when the absorption coefficient of different surfaces is as given below.

Material	500 Hz
Thin carpet	0.25
Suspended ceiling	0.70
Acoustic panels	0.75
Wooden board	0.3

9. A room of 5m x 3m x 3m 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.

OR

Describe about different artificial lighting systems.

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?

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Registration No.:

Date : 21

SECTION "A"
[20 Q. ×1 = 20 marks]

Choose and mark [X] in the most appropriate answer. The symbols, unless mentioned otherwise, have their usual meanings.

1. The amplitude of a damped harmonic oscillator
   [ ] decreases linearly [ ] decreases exponentially
   [ ] increases linearly [ ] remains constant

2. While both light and sound show wave character, diffraction is much harder to observe in light. This is because:
   [ ] light does not require a medium. [ ] speed of light is far greater.
   [ ] waves of light are transverse. [ ] wavelength of light is far smaller.

3. When Two waves of same amplitude add constructively, the intensity becomes
   [ ] Double [ ] Half [ ] Four Times [ ] One-Fourth

4. The luminous energy emitted per second in all directions is
   [ ] luminous flux. [ ] illuminance. [ ] luminance. [ ] luminous intensity.

5. 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 λ_m is
   [ ] 580 nm [ ] 500 nm [ ] 500 m [ ] 50 nm

6. What is needed to achieve population inversion?
   [ ] To excite most of the atoms
   [ ] To bring most of the atoms to ground state
   [ ] To achieve stable condition
   [ ] To reduce the time of production of laser

7. The intensity of sound for threshold of hearing is
   [ ] $10^{-12} Wm^{-2}$ [ ] $10^{-10} Wm^{-2}$ [ ] $10^{12} Wm^{-2}$ [ ] $10^{10} Wm^{-2}$

8. 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?
   [ ] 2 [ ] 1 [ ] 4 [ ] ½

9. A hertz (Hz) is a measure of
[ ] frequency [ ] wave-length [ ] wave-cycle [ ] sound

10. When sound is reflected, it is decreased by 6 dB when the distance between reflector and observer is
[ ] same [ ] double [ ] half [ ] quarter

11. The blue light is visible at the wavelength of
[ ] 5.7 – 5.9 nm [ ] 4.9 – 5.7 nm [ ] 4.5 – 4.9 nm [ ] 3.9 – 4.5 nm

12. Horizontal openings allow fairly uniform illumination to a depth of
[ ] 5 m [ ] 15 m [ ] 25 m [ ] 35 m

13. Luminaries are _____ which distributes and filters light given by a lamp.
[ ] fixtures [ ] equipment [ ] machines [ ] apparatus

14. In general lighting system, lighting fixtures are mounted
[ ] directly [ ] semi-directly [ ] indirectly [ ] semi-directional

15. Absorptivity value for a perfect body reflecting light is
[ ] 100 [ ] 75 [ ] 25 [ ] 0

Fill in the blanks with appropriate answer.

16. Sunlight reflected from a smooth ice surface is completely polarized. Determine the angle of incidence. (μ_{ice}= 1.31.) _____

17. A wave travelling from a medium of index of refraction μ_1 toward a medium of index of refraction μ_2 undergoes a 180^0 phase change upon reflection when _____

18. W.C. Sabine was a lecturer in physics in the department of _____ at Harvard University.

19. The complete range of radiation is referred to as _____

20. Exhale air has _____ less O_2 than inhaled air.