KNT/KW/16/5110

Bachelor of Science (B.Sc.) Semester–III (C.B.S.) Examination

PHYSICS (Sound Waves, Applied Acoustic, Ultrasonic & Power Supply)

Paper–I (301)

Time : Three Hours] [Maximum Marks : 50

N.B. :— (1) **All** questions are compulsory.
(2) Draw neat diagrams wherever necessary.

EITHER

1. (A) Derive the equation of stationary waves and show that all harmonics are present in a stretched string. 5

(B) (i) Show that all harmonics are present in a pipe open at both ends. 3

(ii) A pipe open at both ends has a length of 20 cm. Calculate the frequency of first two harmonics for resonating air column. Velocity of sound in air is 340 m/s. 2

OR

(C) Write a note on Sitar. 2½

(D) Write a note on limit of human audibility and response of a ear. 2½

(E) What do you mean by diatonic scale ? State its defects. 2½

(F) A string of length 1 m and mass 1 gm is stretched by a force of 10 N. Calculate the velocity of waves produced on it. 2½

EITHER

2. (A) Discuss the variable density method of recording of sound on cine film. 5

(B) (i) Derive Sabine's formula for reverberation time. 3

(ii) A drama hall of volume 2500 m^3 has a total absorbing surface of 250 Sabine. Find the reverberation time. 2

OR

(C) Explain the working of a crystal microphone. 2½

(D) Explain construction and working of moving coil loudspeaker. 2½

(E) What are the requirements for good acoustics of an auditorium ? 2½

(F) A class room has dimensions of $20 \times 15 \times 5$ m^3. The reverberation time is 3.5 sec. Calculate the total absorption of its surface and the average absorption coefficient if the surface area is 950 m^2. 2½

EITHER

3. (A) Explain magnetostriction effect. Discuss construction and working of magnetostriction oscillator. 5

(B) (i) Discuss how ultrasonic waves are used to determine the depth of the sea. 3

(ii) Find the depth of the sea if ultrasonic wave sent from the water surface return after 2 sec. Velocity of ultrasonic wave is 1800 m/sec. Also find the wavelength of the wave if its frequency is 50 kHz. 2

OR

(C) Describe a method for the production of ultrasonic waves using piezo electric generator. 2½

(D) Explain medical applications of ultrasonic waves. 2½

(E) What is acoustic grating ? How is it used for determination of velocity of ultrasonic waves ? 2½

(F) Calculate the thickness of a crystal used for the production of ultrasonic wave of frequency 2.75 MHz if Young's modulus and density of the crystal are 8×10^{11} dyne/cm^2 and 2.65 gm/cm^3 respectively. 2½

EITHER

4. (A) What is a rectifier ? Explain the working of full wave rectifier using two diodes with a neat circuit diagram. 5

(B) (i) Show that average d.c. current Id.c = $2I_m/\pi$ and r.m.s. value of current $I_{rms} = I_m/\sqrt{2}$ for full wave rectifier. 3

(ii) In a centre tap full wave rectifier the output is obtained across the load resistance of 2KΩ. The dynamic resistance of each diode is 10 Ω. If the voltage across half of the secondary coil is 210 sin 100 πt, calculate the dc value of currrent. 2

OR

(C) Show that efficiency of half wave rectifier is 40.6%. 2½

(D) Discuss the working of π-section filter. 2½

(E) What is zener diode ? Explain its characteristics. 2½

(F) A 15 V zener diode which can dissipate maximum power of 0.5 watt, is connected in series with resistor R across 40 V supply. Find the minimum value of R_S that prevents the diode to damage. 2½

5. Attempt any **ten** :

(i) Define phase velocity.

(ii) Distinguish between Nodes and Anti-nodes.

(iii) Find the difference in loudness (in db) for two sound intensities 0.2 W/m^2 and 20 W/m^2.

(iv) Name different types of microphones.

(v) What is a live room and a dead room ?

(vi) What should be the total absorption in a hall of volume 7500 m^3 and reverberation time 1.5 sec ?

(vii) What is SONAR ?

(viii) What is X-cut crystal ?

(ix) State any two advantages of piezoelectric oscillator.

(x) What is the need of regulated power supply ?

(xi) An ac power of 100 watt is applied as input to half wave rectifier and 40 watt output power is obtained, calculate the rectification efficiency.

(xii) Draw pin diagram of IC LM 317. 1×10=10