12. (a) What is coupled vibration ? Derive the general equation of motion of coupled vibration. 4

    (b) How this equation will change according to pluck string and struck string ? 3

13. (a) Calculate the velocity of sound through gas from Newton Formula and its correction by Laplace's formula. 4

    (b) Discuss the effect of pressure, temperature, density, moisture and wind in the velocity of sound. 3

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Ex/UG/SC/CORE/PHY/TH/03/2019

BACHELOR OF SCIENCE EXAMINATION, 2019

(1st Year, 2nd Semester)

PHYSICS (HONOURS)

Paper : CORE - 3

Time : Two hours Full Marks : 50

Use a separate Answer Script for each group.

GROUP - A (25 marks)

(Heat and Thermodynamics)

Answer ***q.no. 1*** and any ***three*** from the rest.

1. (a) Calculate the work done by an ideal gas in a isobaric condition.

   (b) Draw Carnot's cycle in TS-diagram and hence find out its efficiency.

   (c) For an ideal gas show that

   $S = C_v \ln T + R \ln V + S_o$ (constant),

   where the symbols have their usual meanings.

   (d) What is Gibb's free energy (G) ?

   Show that G remains constant for isothermal isobaric process. 2.5x4=10

2. (a) What is adiabatic wall ?

   (b) Write down the conditions for thermodynamic equilibrium. 1+4

3. What are the similarities between work done and heat energy ? 5

4. (a) Define C_v.

   (b) Calculate the change in internal energy when 0.004 kg of air is heated from 0°C to 2°C. The specific heat at constant volume being 0.172 K Cal/kg °C. 1+4

5. (a) Calculate the work done in case of two adiabatic processes in a Carnot engine.

   (b) Write down the two different statements of 2nd law of Thermodynamics. 3+2

6. (a) What is black body radiation ?

   (b) State and prove Wien's displacement law of radiation. 1+4

GROUP - B (25 marks)

(Vibrations, Waves and Acoustics)

Answer any ***one*** from 7 and 8.

7. Calculate the acoustic pressure of longitudinal wave. Explain with diagram the relation between acoustic pressure and phase difference. 2+2

8. Derive the equation of motion of a longitudinal wave. How it will change in various mediums like solid, liquid and gas. 3+1

Answer any ***three*** from 9 to 13

9. (a) What is transducer ? Describe various types of transducer used for ultrasonic. 1+2

   (b) What is magnetostriction ? Describe magnetostriction ultrasonic oscillator and explain its activity. 4

10. (a) Define absorption coefficient and total absorption of a hall. 1

    (b) How can absorption be measured for reverberation time ? How reverberation time varies with pitch and intensity. 2

    (c) A broadcasting studio measuring 70x40x25 ft has a reverberation time of 0.09 sec. when empty. What will be the reverberation time when it will be filled with 400 seats (a=0.3) and 250 audience ? 4

11. (a) Explain amplitude resonance and velocity resonance and state the difference between these two types of resonance. 4

    (b) Distinguish between mechanical quantity and electric analog. 3