I Semester
PHYSICS-I
Mechanics, Oscillations and Waves

Time: 3 Hrs Max. Marks:60

Instruction: Answer should be written completely either in Kannada or in English.

ವಿಭಾಗ-ಎ

PART-A

ಯಾವುದಾರೂ ಐದು ಪ್ರಶ್ನೆಗಳಿಗೆ ಉತ್ತರಿಸಿ. ಪ್ರತಿಪ್ರಶ್ನೆಗೆ ಆರು ಅಂಕಗಳು.

Answer any five questions. Each question carries six marks.

1. ಈ ಕೆಳಗಿನ ಸಮೀಕರಣಗಳನ್ನು ವ್ಯುತ್ಪತ್ತಿಸಿ:

i) v=voe-kt

ii) x=vok (1-e-kt)

Derive the above equations with usual notations. 6

2. ಜಡ ಮತ್ತು ಅಪಜಡ ಚೌಕಟ್ಟುಗಳೆಂದರೇನು? ಸಾಪೇಕ್ಷವೇಗದಲ್ಲಿ ಚಲಿಸುತ್ತಿರುವ ಎರಡು ಚೌಕಟ್ಟುಗಳಲ್ಲಿರುವ ವೀಕ್ಷಕರಿಗೆ ಒಂದು ಕಣದ ವೇಗೋತ್ಕರ್ಷವು ಸಮನಾಗಿರುತ್ತದೆ ಎಂದು ತೋರಿಸಿ.

What are inertial and non-inertial frames of reference?

Show that two observers moving with uniform relative velocity observe same acceleration for a particle. (2+4)

3. ಕೊರಿಯಾಲಿಸ್ ಬಲವೆಂದರೇನು? ಕೊರಿಯಾಲಿಸ್ ಬಲಕ್ಕೆ ಒಂದು ಗಣಿತೋಕ್ತಿಯನ್ನು ಬರೆಯಿರಿ. ವಾಣಿಜ್ಯ ಮಾರುತ ಮತ್ತು ಚಂಡಮಾರುತಗಳ ಮೇಲೆ ಕೊರಿಯಾಲಿಸ್ ಬಲ ಬೀರುವ ಪ್ರಭಾವವನ್ನು ವಿವರಿಸಿ.

What is Cariolis force? Write expression for Carioles force. Explain its application to trade winds and cyclones. (1+1+4)

4. ಕೆಲಸ-ಶಕ್ತಿಯ ಪ್ರಮೇಯವನ್ನು ನಿರೂಪಿಸಿ ಮತ್ತು ವಿವರಿಸಿ. ಬದಲಾಗುತ್ತಿರುವ ಬಲದಿಂದ ಬರುವ ಶಕ್ತಿಯ ಗಣಿತೋಕ್ತಿಯನ್ನು ಪಡೆಯಿರಿ.

State and explain work-energy theorem. Hence deduce an expression for work done by a variable force. (2+4)

5. ರಕ್ಷ ಮತ್ತು ಅರಕ್ಷ ಬಲಗಳು ಎಂದರೇನು? ಎರಡಕ್ಕೂ ಒಂದೊಂದು ಉದಾಹರಣೆ ನೀಡಿರಿ. ಗುರುತ್ವ ವಿಭವಶಕ್ತಿಯು ಎತ್ತರ ಹೆಚ್ಚಿದಂತೆ ಹೆಚ್ಚುತ್ತದೆ ಎಂದು ತೋರಿಸಿ.

What are conservative and non-conservative forces? Give one example for each. Show that the gravitational potential energy increases linearly with altitude. (3+3)

6. ಕಣಗಳ ಒಂದು ತಂಡದ ರೇಖೀಯ ಸಂವೇಗ ನಿತ್ಯತ್ವ ನಿಯಮವನ್ನು ನಿರೂಪಿಸಿ. ಕಣಗಳ ಒಂದು ತಂಡದ ರೇಖೀಯ ಸಂವೇಗ ನಿತ್ಯತ್ವವು ದ್ರವ್ಯರಾಶಿ ಕೇಂದ್ರದ ರೇಖೀಯ ಸಂವೇಗ ನಿತ್ಯತ್ವಕ್ಕೆ ಸಮ ಎಂದು ತೋರಿಸಿ.

State the law of conservation of linear momentum for a system of particles.

Show that the linear momentum of a system of particles is equal to the linear momentum of the centre of mass. (2+4)

7. ಒಂದು ಸಮತಲ ತಟ್ಟೆಯ ಭ್ರಮಣ ಜಡತ್ವದ ಲಂಬಾಕ್ಷ ಸಿದ್ಧಾಂತವನ್ನು ವ್ಯಾಖ್ಯೆಕೊಟ್ಟು ಸಾಧಿಸಿ.

State and prove the theorem of perpendicular axis of moment of inertia of a plane lamina.

8. ಸರಳ ಸಂಗತ ಚಲನೆಯ ವ್ಯಾಖ್ಯೆ ನೀಡಿ. ಸರಳ ಸಂಗತ ಚಲನೆಯಲ್ಲಿರುವ ಒಂದು ಕಣದ ಶಕ್ತಿಗೆ ಗಣಿತೋಕ್ತಿಯನ್ನು ಪಡೆಯಿರಿ.

Define simple harmonic motion. Derive an expression for the energy of a particle executing SHM. (2+4)

ವಿಭಾಗ-ಬಿ

PART-B

ಯಾವುದಾರೂ ನಾಲ್ಕು ಪ್ರಶ್ನೆಗಳನ್ನು ಉತ್ತರಿಸಿ. ಪ್ರತಿ ಪ್ರಶ್ನೆಗೆ ಐದು ಅಂಕಗಳು.

Answer any four of the following questions. Each question carries five marks.

9. 120 ಓ ಬಲವು ಒಂದು ವಸ್ತುವಿನ ಮೇಲೆ 3 ಸೆಕೆಂಡುಗಳು ಪ್ರಯೋಗಿಸಿದಾಗ ಅದರ ವೇಗವು 30 ಛ-1 ಆಗಿರುತ್ತದೆ. ಅದರ ದ್ರವ್ಯರಾಶಿಯನ್ನು ಕಂಡುಹಿಡಿಯಿರಿ ಮತ್ತು 3 ಸೆಕೆಂಡುಗಳು ನಂತರ ಅದರ ಸಂವೇಗವನ್ನು ಕಂಡು ಹಿಡಿಯಿರಿ.

5

10. A force of 120N acting on a body for 3 sec. imparts it a velocity of 30m/s. What is the mass of the body? What is the momentum of the body at the end of 3 sec?

0.28 ಎಂ ಅಂತರದಲ್ಲಿರುವ 19ಕೆಜಿ ಮತ್ತು 150ಕೆಜಿ ದ್ರವ್ಯರಾಶಿವುಳ್ಳ ಎರಡು ಗೋಳಗಳ ನಡುವಿನ ಆಕರ್ಷಣ ಬಲವು 0.25 ಎಂ.ಜಿ ತೂಕಕ್ಕೆ ಸಮನಾಗಿರುತ್ತದೆ. ಗುರುತ್ವ ನಿಯತಾಂಕವನ್ನು ಕಂಡುಹಿಡಿಯಿರಿ. ಗೋಳಗಳ ಮಧ್ಯೆ ಇರುವ ಅಂತರವು ಅರ್ಧಕ್ಕಿಳಿದರೆ ಅವುಗಳ ಮಧ್ಯೆ ಇರುವ ಆಕರ್ಷಣ ಬಲವನ್ನು ಕಂಡು ಹಿಡಿಯಿರಿ. ಠ=9.8ಟ್ಛ/2 5

11. A sphere of mass 19 kg is attracted by another sphere of mass 150kg when their centres of separated by distance of 0.28 m with a force equal to the weight of 0.25 mg. Calculate the gravitational constant. If the distance is halved, what would be the force? Given g=9.8m/s2.

5 ಓ ಸಮತಲ ಬಲವನ್ನು ಉಪಯೋಗಿಸಿ 0.1ಕೆಜಿ ದ್ರವ್ಯರಾಶಿವುಳ್ಳ ಒಂದು ಅಚ್ಚನ್ನು ಗೋಡೆಗೆ ಒತ್ತಿಹಿಡಿಯಲಾಗಿದೆ. ಗೋಡೆ ಮತ್ತು ಅಚ್ಚಿನ ನಡುವಿನ ಘರ್ಷಣ ನಿತಾಂಕವು 0.4 ಆಗಿದ್ದರೆ, ಅವುಗಳ ಮಧ್ಯೆ ಇರು ಘರ್ಷಣಾ ಬಲವನ್ನು ಕಂಡುಹಿಡಿಯಿರಿ ಠ=9.8 ಛ-2.

5

A block of mass 0.1kg is held against a wall by applying a horizontal force of 5 N on the block. If the coefficient of frictions between the wall and the block is 0.4 what is the magnitude of frictional force on the block? g=9.8 ms-2. 5

12. 10 ಕೆಜಿ ದ್ರವ್ಯರಾಶಿಯುಳ್ಳ ಒಂದು ಮರಳಿನ ಚೀಲವನ್ನು 3 ಟ ಉದ್ದದ ದಾರದ ಸಹಾಯದಿಂದ ತೂಗೂ ಹಾಕಲಾಗಿದೆ. 0.2 ಕೆಜಿ ದ್ರವ್ಯರಾಶಿವುಳ್ಳ ಒಂದು ಗುಂಡನ್ನು 20 ಟ್ಛ/ ವೇಗದಲ್ಲಿ ಮರಳಿನ ಚೀಲಕ್ಕೆ ಹಾರಿಸಲಾಗಿದೆ.

ಅ)ಮರಳಿನ ಚೀಲ ಗಳಿಸಿದ ವೇಗವನ್ನು ಕಂಡುಹಿಡಿಯಿರಿ.

ಆ) ಇವುಗಳ ಘರ್ಷಣೆಯಲ್ಲಿ ಪರಿವರ್ತಿತವಾದ ಶಕ್ತಿಯ ಉಷ್ಣತೆಯನ್ನು ಕಂಡುಹಿಡಿಯಿರಿ.

A sand bag of mass 10kg is suspended with a 3 m long string. A bullet of mass 0.2 kg is fired with a speed 20 m/s into the bag and stays in the bag. Calculate.

i) the speed acquired by the bag.

ii) the energy converted into heat in the collision. 5

13. ಒಂದು ಕಣವು 0=3ಣ3/20 ಣ2/3, ಸಮೀಕರಣದಂತೆ ತಿರುಗುತ್ತಿರುತ್ತದೆ. 5 ಸೆಕೆಂಡುಗಳ ನಂತರ ಕಣದ ಕೋನೀಯ ವೇಗ ಮತ್ತು ಕೋನೀಯ ವೇಗೋತ್ಕರ್ಷವನ್ನು ಕಂಡುಹಿಡಿಯಿರಿ.

A particle starts rotating from rest according to the realation

0=3t3/20 – t2/3, calculate the angular velocity and angular acceleration at the end of 5seconds. 5

14. ಒಂದು ಎಳೆದ ದಾರದ ಮೇಲೆ ಇರುವ ತರಂಗದ ಸ್ಥಳಾಂತರವನ್ನು ಈ ಸಮೀಕರಣದಲ್ಲಿ ಸೂಚಿಸಿದೆ.

ಡಿ=5,ುಟಿ 2 {ಣ 0.03 ಥ 600 ಥ ಮತ್ತು ಡಿ (ಮೀ)ಮತ್ತು (ಸೆಕೆಂಡು)ನಲ್ಲಿ ಇವೆ. ತರಂಗಾತರ, ತರಂಗಪಾರ ಮತ್ತು ಕಂಪನ ಸಂಖ್ಯೆ ಇವುಗಳನ್ನು ಲೆಕ್ಕಿಸಿ.

The equation of wave on a stretched string is given by y=5 sin 2 {t 0.03 – x 600. Where x and y are in meters and t is in second. Find wave length, amplitude and frequency. 5

ವಿಭಾಗ-ಸಿ

PART-C

ಯಾವುದಾದರೂ ಐದು ಪ್ರಶ್ನೆಗಳನ್ನು ಉತ್ತರಿಸಿ. ಪ್ರತಿ ಪ್ರಶ್ನೆಗೆ ಎರಡು ಅಂಕಗಳು.

Answer any five of the following questions Each question carries two marks.

15. ಚಿ) ಬಾಂಬು ಸಿಡಿದಾಗ ತುಣುಕುಗಳು ಎಲ್ಲಾ ದಿಕ್ಕುಗಳಲ್ಲಿ ಪ್ರಸರಿಸುತ್ತವೆ. ಈ ಪ್ರಕ್ರಿಯೆಯಲ್ಲಿ ಯಾವ ಅಂಶವು ಸ್ಥಿರವಾಗಿರುತ್ತದೆ? (2)

When a bomb explodes, the fragments go in all directions. What remains constant for entire system?

ಛ) ಭ್ರಮಣ ನಿರತ ಚೌಕಟ್ಟಿಗೆ ನ್ಯೂಟನ್‌ಗೆ ಎರಡನೆಯ ನಿಯಮವು ಅನ್ವಯವಾಗುತ್ತದೆಯೇ? ವಿವರಿಸಿ. (2)

In Newton’s second law of motion valid in the rotating frame of reference? Explain.

ಛಿ) ಕೋನೀಯ ವೇಗವು ಋಣಾತ್ಮಕವಾಗಿರಲು ಸಾಧ್ಯವೇ? ವಿವರಿಸಿ. (2)

Can angular velocity be negative? Explain.

ಜ) ಯಾವುದೇ ತೂಗಾಟದ ಚಲನೆಯು ಸರಳ ಸಂಗತ ಚಲನೆಯಾಗಿರುತ್ತದೆಯೇ? ವಿವರಿಸಿ. (2)

Can we call any to and fro motion as simple harmonic? Explain.

ಜ) ಘರ್ಷಣೆ ಅವಶ್ಯವಾದ ಒಂದು ಪಿಡುಗು, ವಿವರಿಸಿ.

Friction is a necessary evil Explain. (2)

ಜಿ) ವರ್ತುಲಾಕಾರದಲ್ಲಿ ಸ್ಥಿರವೇಗದಲ್ಲಿ ಚಲಿಸುತ್ತಿರುವ ಕಣ ವೇಗೋತ್ಕರ್ಷ ಹೊಂದಿರುತ್ತದೆಯೇ? ವಿವರಿಸಿ.

Does a particle moving along a circular path with uniform speed possess acceleration? Explain. (2)

ಠ) ಹ್ಯಾಮಿಲ್ಟೋನಿಯಲ್ ಯಾವ ಸಂದರ್ಭದಲ್ಲಿ ವ್ಯವಸ್ಥೆಯೊಂದರ ಒಟ್ಟು ಶಕ್ತಿಗೆ ಸಮನಾಗಿರುತ್ತದೆ.?

When is the Hamiltonian equal to the total energy of a system/ (2)

ು) ಅಡ್ಡ ತರಂಗಗಳು ದ್ರವ ಅಥವಾ ಅನಿಲಗಳ ಮೂಲಕ ಚಲಿಸಲು ಸಾಧ್ಯವಿಲ್ಲ. ವಿವರಿಸಿ.

Transverse waves cannot propagate through fluids. Explain. (2)

II Semester

PHYSICS-II

Properties of Matter, Heat and Thermodynamics

Time: 3 Hours Max. Marks: 60

ಖಟಿಣಡಿಣಛಿಣುಠಟಿ: ಂಟಿತಿಜಡಿ ˛ುಠಣಟಜ ಛಜ ತಿಡುಣಣಜಟಿ ಛಿಂಟರಿಟಜಣಜಟಙ ಜುಣುಜಡಿ ುಟಿ ಏಚಿಟಟಿಚಿಜಚಿ ಠಡಿ ಇಟಿರಟ್ಝು.

ವಿಭಾಗ-ಎ

PART-A

ಕೆಳಗಿನ ಪ್ರಶ್ನೆಗಳಲ್ಲಿ ಯಾವುದಾದರೂ ಐದು ಪ್ರಶ್ನೆಗಳನ್ನು ಉತ್ತರಿಸಿ. ಪ್ರತಿ ಪ್ರಶ್ನೆಗೆ ಆರು ಅಂಕಗಳು.

Answer any five of the following questions. Each question carries six marks. (5x6=30)

1. ಚಿ) ಪಾಯಿಸಾನ್ ಕೋಷ್ಟಕವನ್ನು ನಿರೂಪಿಸಿ ಮತ್ತು ಅದರ ಇತಿಮಿತಿ ತಿಳಿಸಿ.
   ಛ) ಒಂದು ತಂತಿಯ ಏಕಮಾನ ತಿರುಚಣೆಯ ಬಲಯುಗ್ಮಕ್ಕೆ ಗಣಿತೋಕ್ತಿಯನ್ನು ಪಡೆಯಿರಿ.

   a) Define Poisson's ration and mention its limits.
   b) Derive an expression for the couple per unit twist of a wire under torsion. (2+4)

2. ಪ್ರವಹಿಸುವ ದ್ರವದ ರೇಖಾಗತಿ ಎಂದರೇನು? ಒಂದು ಸಂಕುಚಿತ ನಾಳದಲ್ಲಿ ಪ್ರವಹಿಸುತ್ತಿರುವ ದಟ್ಟವಾದ ದ್ರವಕ್ಕೆ ಪೋಯ್‌ಸಲಿ ಸೂತ್ರವನ್ನು ವ್ಯುತ್ಪತ್ತಿಸಿ.

What is meant by streamline flow of a fluid? Derive Poiseuille's formula for the flow of a viscous fluid through a narrow tube. 6

3. ಎರಡು ದ್ರವಗಳ ಮಧ್ಯೆ ಇರುವ ಆಂತರಿಕ ಮೇಲಮ್ಮೈ ಸೆಳೆತವನ್ನು ಹನಿ-ತೂಕ ಅಳತೆಯ ಪ್ರಯೋಗದ ಪದ್ಧತಿಯಿಂದ ನಿರ್ಣಯಿಸುವ ಬಗ್ಗೆ ಗಣಿತ ತರ್ಕದ ಸಮೇತ ವಿವರಿಸಿ.

Describe with necessary theory, how the interfacial tension between any two liquids is determined by drop-weight method. 6

4. ಒಂದು ಅನಿಲದ ಅಣುವಿನ ಸರಾಸರಿ ಮುಕ್ತಪಥವನ್ನು ನಿರೂಪಿಸಿ ಮತ್ತು ಅದಕ್ಕೆ ಗಣಿತೋಕ್ತಿಯನ್ನು ಪಡೆಯಿರಿ. ಅಣುವಿನ ಸರಾಸರಿ ಮುಕ್ತಪಥದ ಪ್ರಮಾಣವು ಯಾವ ಯಾವ ಅಂಶಗಳನ್ನು ಅವಲಂಬಿಸುತ್ತದೆ, ಚರ್ಚಿಸಿ.

Define mean free path of a molecule in a gas and obtain an expression for the same. Discuss the factors that affect the mean free path of a molecule. 6

5. ಚಿ) ಸ್ಥಿರ ತಾಪ ಮತ್ತು ಸ್ಥಿರೋಷ್ಣ ಪದ್ಧತಿಗಳಲ್ಲಿನ ವ್ಯತ್ಯಾಸವನ್ನು ತಿಳಿಸಿ.

ಛ) ಸ್ಥಿರೋಷ್ಣ ಬದಲಾವಣೆಯಲ್ಲಿ ಉಂಟಾಗುವ ಕೆಲಸದ ಪ್ರಮಾಣಕ್ಕೆ ಗಣಿತೋಕ್ತಿಯನ್ನು ಪಡೆಯಿರಿ.

a) Distinguish between isothermal and adiabatic processes.
b) Derive an expression for the work done during an adiabatic change. (2+4)

6. ಚಿ) ಉಷ್ಣ ಪ್ರಚಲನದ ಎರಡನೆಯ ನಿಯಮವನ್ನು ತಿಳಿಸಿ ಮತ್ತು ಒಂದು ರೆಫ್ರಿಜಿರೇಟರ್ನ ಕಾರ್ಯನಿರ್ವಹಣೆಯು ಎರಡನೆಯ ನಿಯಮವನ್ನು ಏಕೆ ಉಲ್ಲಂಘಿಸುವುದಿಲ್ಲ. ವಿವರಿಸಿ.

ಛ) ಕಾರ್ನಾಟ್ ಆವರ್ತವನ್ನು ಉಷ್ಣತೆ-ಎಂಟ್ರೋಪಿ ರೇಖಾಚಿತ್ರದ ಮೂಲಕ ವ್ಯಕ್ತಪಡಿಸಿ ಮತ್ತು ಅದರ ವಿಸ್ತೀರ್ಣವು ಪ್ರಯೋಜನಕರ ಶಕ್ತಿಯನ್ನು ವ್ಯಕ್ತ ಪಡಿಸುತ್ತದೆ ಎಂದು ಸಾಧಿಸಿ.

a) State the second law of thermodynamics and explain why the working of a refrigerator does not violate the second law.

b) Represent carnot cycle on a temperature-entropy diagram and prove that its area represents available energy. (3+3)

7. ಮಾಕ್ಸವೇಲ್ ಉಷ್ಣಪ್ರಚಲನದ ಸಂಬಂಧಗಳನ್ನು, ನಾಲ್ಕು ಉಷ್ಣಪ್ರಚಲನ ವಿಭವಗಳಿಂದ ವ್ಯುತ್ಪತ್ತಿಸಿ.

From four thermodynamic potentials. Derive Maxwell's thermodynamic relations. 6

8. ಲಿಂಡ್‌ನ ಗಾಳಿ ದ್ರವೀಕರಿಸುವ ಸಾಧನದ ಮೂಲತತ್ವ ಮತ್ತು ಕಾರ್ಯ ನಿರ್ವಹಣೆಯನ್ನು ಅಚ್ಚುಕಟ್ಟಾದ ಚಿತ್ರದ ಸಮೇತ ವರ್ಣಿಸಿ, ಅದರ ಲಾಭಗಳನ್ನು ತಿಳಿಸಿ.

With a neat diagram, describe the principle and working of Linde's air liquefier. Mention its advantages. 6

ವಿಭಾಗ-ಬಿ

PART-B

ಯಾವುದಾದರೂ ನಾಲ್ಕು ಪ್ರಶ್ನೆಗಳನ್ನು ಉತ್ತರಿಸಿ. ಪ್ರತಿ ಪ್ರಶ್ನೆಗೆ ಐದು ಅಂಕಗಳು.

ಒಟ್ಠಿತಿಜಡಿ ಚಿಟಿಧಿ ಜಿಂಣಾಡಿ ಡಣಾಭಜಣುರಂಟಿ. ಇಚಿಛಿ ಡಣಾಭಜಣುರಂಟ ಛಿಚಿಡಿಡುಜ ಜಿತಜ ಟಚಿಡಿಞ.
(4ಥ5=20)

9. 0.5 m. GzÀÝ ªÀÄvÀÄÛ 1 m m wæªÀåªÀÅ¼Àî GQÌ£À vÀAwAiÉÆAzÀ£ÀÄß 2 kg vÀÆPÀ¢AzÀ J¼ÉAiÀÄ®ànÖzÉ vÀAwAiÀÄ°è ±ÉÃRj¹zÀ ±ÀQÛAiÀÄ£ÀÄß ¯ÉPÀÌ ªÀiÁr q=20x10 10 Nm–^{2}.

A steel wire of radius 1 mm and length 0.5 m is extended by a constant weight of 2 kg. Calculate the energy stored in the wire. q=20x10 10 Nm–^{2}.

10. ªÁAiÀÄÄªÀÄAqÀ®zÀ MvÀÛqÀQÌAvÀ 980 Nm–^{2} ºÉZÀÄÑ MvÀÛr«gÀÄªÀ MAzÀÄ ¤Ãj£À mÁåAQ£À gÀAzsÀæ¢AzÀ ºÉÆgÀ¸ÀÆ¸ÀÄªÀ ¥ÀæªÁºÀzÀ ªÉÃUÀzÀ ¥ÀæªÀiÁtªÀ£ÀÄß ¯ÉPÀÌ ªÀiÁr. ¤Ãj£À ¸ÁAzÀævÉ=1000 kgm–^{3}, g=9.8 ms–^{2}.

Calculate the velocity of efflux of water from a tank in which the pressure at the orifice is 980 Nm-2 above the atmospheric pressure. Density of water=1000 kgm-3, g=9.8ms-2.

11. ¸Á§Æ¤£À UÀÄ¼ÉîAiÀÄ°ègÀÄªÀ ºÉaÑ£À MvÀÛqÀªÀÅ, 800 kgm–^{3} ¸ÁAzÀævÉAiÀÄÄ¼Àî 0.2 m JvÀÛgÀzÀ JuÉÚ¸ÀÛA¨sÀzÀ MvÀÛqÀPÉÌ ¸ÀªÀÄªÁVzÉ. ¸Á§Æ¤£À zÁæªÀPÀzÀ ªÉÄÃ¯ÉäöÊ ¸É¼ÉvÀªÀÅ 0.075 Nm–^{1} EzÀÝ°è, ¸Á§Æ¤£À UÀÄ¼ÉîAiÀÄ wædåªÀ£ÀÄß PÀAqÀÄ»r¬Äj g=9.8 ms–^{2}

The excess pressure inside a soap bubble is equal to the pressure of 0.2 m height of an oil column of density 800 kgm–^{3}. If the surface tension of soap solution is 0.075 Nm–^{1}, find the radius of the soap bubble. g=9.8 ms–^{2} .

12. 27 C £À°ègÀÄªÀ ¤¢ðµÀÖ ¥ÀæªÀiÁtzÀ vÉÃªÀ«®èzÀ UÁ½AiÀÄ£ÀÄß ªÀÄÆ®UÁvÀæzÀQÌAvÀ 1/5 gÀµÀÄÖ UÁvÀæPÉÌ ¸ÀAPÀÄavÀUÉÆ½¸À¯ÁVzÉ. EzÀgÀ ¥ÀjuÁªÀÄ¢AzÀ GAmÁUÀÄªÀ GµÀÚvÉ ªÀÄvÀÄÛ C¤®zÀ ªÉÄÃ¯É J¸ÀVzÀ PÁAiÀÄðªÀ£ÀÄß ¯ÉPÀÌªÀiÁr. r=1.4 R=8.31 JK-1 mole-1.

A certain quantity of dry air at 27C is compressed adiabatically to 1/5th of its original volume. Calculate the resulting temperature and work done on the gas. r=1.4 R=8.31 JK-1 mole-1.

13. MAzÀÄ GµÀÚAiÀÄAvÀæªÀÅ ¥Àæw DªÀvÀð£ÀzÀ°è 200 J GµÀÚ±ÀQÛAiÀÄ£ÀÄß ªÀÄÆ®¢AzÀ »Ãj, 120 J GµÀÚ±ÀQÛAiÀÄ£ÀÄß PÀÆ¥ÀPÉÌ vÀ½îºÁPÀÄvÀÛzÉ. CzÀgÀ ¸ÁªÀÄxÀåðªÀ£ÀÄß ¯ÉPÀÌªÀiÁr. ªÀÄÆ®zÀ GµÀÚvÉAiÀÄ 600 K DVzÀÝ°è, AiÀÄAvÀæzÀ ¸ÁªÀÄxÀåðªÀÅ 0.6 DUÀ®Ä, PÀÆ¥ÀzÀ GµÀÚvÉAiÀÄ£ÀÄß JµÀÄÖ vÀVÎ¸À¨ÉÃPÀÄ?

A heat engine absorbs 200 J of heat from the source and rejects 120 J of heat to the sink in a cycle. Calculate its efficiency. If the temperature of the source is 600 K, by how much should the temperature of the sink be reduced so as to increase its efficiency to 0.6.

14. d®d£ÀPÀzÀ C¤®ªÀÅ-100 GµÀÚvÉAiÀÄ°è O¯ï-xÁªÀÄ¸À£ï»UÀÄÎ«PÉAiÀÄ£ÀÄß ºÉÆA¢zÁUÀ GAmÁUÀÄªÀ GµÀÚvÉAiÀÄ §zÀ¯ÁªÀuÉAiÀÄ£ÀÄß ¯ÉPÀÌ ªÀiÁr. ©gÀqÉAiÀÄ JgÀqÀÄ ¥Á±ÀéðUÀ¼À ªÀÄzsÉå EgÀÄªÀ MvÀÛqÀzÀ ªÀåvÁå¸À 50

d®d£ÀPÀ C¤®zÀ ªÁåAqÀgïªÁ¯ï ¹ÜgÀUÀ¼ÀÄ =0.0247 Nm4 mole-2, b=2.6 x 10-5 m3 mole-1, R=8.31 JK-1 mole-1 C¤®ªÀÅ GµÀÚvÉAiÀÄ°è ºÉZÀÑ¼À CxÀªÁ vÀUÀÄÎ«PÉ vÉÆÃj¸ÀÄvÀÛzÉAiÉÄÃ? 1 atm=1.012 x 105 Nm-2.

Calculate the change in temperature when hydrogen gas suffers Joule-Thomson expansion at -100C; the pressure difference on both sides of the plug being 50 atm. The Vander Waal's constants for hydrogen are a=0.0247 Nm4 mole-2, b=2.6 x 10-5 m3 mole-1, R=8.31 JK-1 mole-1 atm=1.012 x 105 Nm-2. Does the gas exhibit heating or cooling effect?

«¨sÁUÀ-¹

PART-C

AiÀiÁªÀÅzÁzÀgÀÆ LzÀÄ ¥Àæ±ÉßUÀ¼À£ÀÄß GvÀÛj¹. ¥Àæw ¥Àæ±ÉßUÉ JgÀqÀÄ CAPÀUÀ¼ÀÄ.

Answer any five questions. Each question carries two marks.
(5x2=10)

15. a) DAiÀÄvÁPÁgÀzÀ CqÀØ¨sÁUÀªÀÅ¼Àî MAzÀÄ GQÌ£À vÉÆ¯ÉAiÀÄ°è GzÀÝ«gÀÄªÀ ¥Á±ÀéðªÀÅ D¼ÀzÀAvÉ §¼À¸À¯ÁUÀÄvÀÛzÉ «ªÀj¹.

b) gÉÊ¥sÀ¯ï£À UÀÄAqÀÄ PÉÆ¼ÀªÉ DPÁgÀzÀ°ègÀÄvÀÛzÉ, UÉÆÃ¼ÀPÁgÀªÁVgÀÄªÀÅ¢®è. KPÉ?

c) ¨sÀÆ«ÄAiÀÄ£ÀÄß G¼ÀÄªÀÅzÀjAzÀ vÉÃªÁA±À »r¢nÖgÀÄvÀÛzÉ. KPÉ/

d) MAzÉÃ GµÀÚvÉ ªÀÄvÀÄÛ zÀæªÀågÁ² EgÀÄªÀ KPÁtÄ ªÀÄvÀÄÛ ¢éªÁtÄ C¤®UÀ½UÉ ¸ÀªÀÄªÁV GµÀÚªÀ£ÀÄß ºÀAazÁUÀ, AiÀiÁªÀ C¤®ªÀÅ ºÉaÑ£À GµÀÚvÉAiÀÄ£ÀÄß ¥ÀqÉAiÀÄÄvÀÛzÉ ªÀÄvÀÄÛ KPÉ?

e) mÉÊgÉÆAzÀÄ MqÉzÀÄºÉÆÃzÁUÀ CzÀjAzÀ ºÉÆgÀ§gÀÄªÀ UÁ½AiÀÄ GµÀÚvÉAiÀÄÄ ¸ÀÄvÀÛªÀÄÄvÀÛ°£À UÁ½AiÀÄ GµÀÚvÉVAvÀ PÀrªÉÄ DVgÀÄvÀÛzÉ. «ªÀj¹.

f))«±ÀézÀ JAmÉÆæÃ¦AiÀÄÄ AiÀiÁªÁUÀ®Æ ºÉZÀÄÑvÀÛ¯ÉÃ EgÀÄvÀÛzÉ. «ªÀj¹.

g) d®d£ÀPÀ ªÀÄvÀÄÛ »Ã°AiÀÄA C¤®UÀ¼ÀÄ PÉÆoÀrAiÀÄ GµÀÚvÉAiÀÄ£ÀÄß O¯ï-xÁªÀÄ¸À£ï »UÀÄÎ«PÉAiÀÄ£ÀÄß M¼ÀUÉÆAqÁUÀ GµÀÚzÀ ¥ÀjuÁªÀÄªÀ£ÀÄß ¥ÀæzÀ²ð¸ÀÄvÀÛzÉ «ªÀj¹.

h)AiÀiÁªÀ GµÀÚ¥ÀæZÀ®£ÀzÀ ¸ÀÆZÀPÁAPÀ C)¹ÜgÉÆÃµÀÚ »UÀÄÎ«PÉ D) O¯ï-xÁªÀÄ¸À£ï ¥ÀjuÁªÀÄUÀ¼À°èM §zÀ¯ÁUÀÄªÀÅ¢®è w½¹.

a) In a girder of rectangular cross-section, the longer side is used as depth. Explain.
b) Why is a rifle bullet made cylindrical and not spherical?
c) Ploughing of field retains moisture in them Why?
d) Equal masses of monatomic and diatomic gases at the same temperature are given equal quantities of heat. Which gas will undergo a larger temperature rise and why?

e) When a type bursts, the air coming out is cooler than the surrounding air. Explain.
f) Entropy of the universe always increases. Explain.
g) Hydrogen and Helium gases exhibit heating effect while undergoing Joule-Thomson expansion at room temperature. Explain.
h) Name the thermodynamic function that remains constant in (i) an adiabatic expansion (ii) Joule-Thomson effect.

III Semester

PHYSICS-III

Electricity, Magnetism and Radiation

Time: 3 Hours Max. Marks: 60

Instruction: Answers should be written completely either in Kannada or English.

PART-A

¨sÁUÀ-J

Answer any five of the following questions. Each question carries six marks. (5x6=30)

PÉ¼ÀV£À ¥Àæ±ÉßUÀ¼À°è AiÀiÁªÀÅzÁzÀgÀÆ LzÀÄ ¥Àæ±ÉßUÀ¼À£ÀÄß GvÀÛj¹. ¥Àæw ¥Àæ±ÉßUÉ DgÀÄ CAPÀUÀ¼ÀÄ.

1. State and prove maximum power transfer theorem and show that emf of source

E= 4Rth P max. (4+2)

UÀjµÀ× ±ÀQÛ ªÀUÁðªÀuÉ ¥ÀæªÉÄÃAiÀÄªÀ£ÀÄß ªÁåTå¹ ºÁUÀÆ ¸Á¢ü¹. E=4Rth P max.JA§ UÀtÂvÉÆÃQÛAiÀÄ£ÀÄß ¤gÀÆ¦¹.

2. State Biot-Savart’s law. Obtain an expression for the magnetic field on the axis of a current carrying solenoid. (1+5)

§AiÉÆÖÃ-¸ÀªÀmïð ¤AiÀÄªÀÄªÀ£ÀÄß ¤gÀÆ¦¹. «zÀÄåvï ºÀjAiÀÄÄwÛgÀÄªÀ ¸Á°£ÁAiÀÄqï£À CPÀëzÀ ªÉÄÃ¯É AiÀiÁªÀÅzÉÃ ©AzÀÄ«£À°è£À PÁAvÀPÉëÃvÀæPÉÌ UÀtÂvÉÆÃQÛAiÀÄ£ÀÄß ¥ÀqÉ¬Äj.

3. State Faraday’s Laws of electromagnetic Induction. Obtain expression for Induced emf.

(2+4)

¥sÁågÀqÉAiÀÄ «zÀÄåzÀAiÀÄ¸ÁÌAwÃAiÀÄ ¥ÉæÃgÀuÁ ¤AiÀÄªÀÄUÀ¼À£ÀÄß w½¹. ¥ÉæÃgÀuÁ«zÀÄåZÁÑ®PÀ §®PÉÌ UÀtÂvÉÆÃQÛAiÀÄ£ÀÄß ªÀÅåvÀàwÛ¹.

4. Derive the Maxwell’s Field equations: (3+3)

.D=p and .B=0

.D=p ªÀÄvÀÄÛ .B=0 JA§ ªÀiÁåPïìªÉ¯ï£À PÉëÃvÀæ ¸À«ÄÃPÀgÀtUÀ¼À ¤µÀàwÛAiÀÄ£ÀÄß §gÉ¬Äj.

5. Obtain an expression for decay of current in a LR circuit applied with d.c. emf, represent graphically. Define time constant of LR circuit.. (4+1+1)

LR «zÀÄå£ÀäAqÀ®PÉÌ £ÉÃgÀ «zÀÄåZÁÑ®PÀ §®ªÀ£ÀÄß C£Àé¬Ä¹zÁUÀ QëÃtÂ¸ÀÄªÀ «zÀÄåwÛUÉ UÀtÂvÉÆÃQÛAiÀÄ£ÀÄß ¥ÀqÉ¬Äj, UÀtÂvÉÆÃQÛAiÀÄ£ÀÄß D¯ÉÃRzÀ ªÀÄÆ®PÀ ¥Àæw¤¢ü¹. LR «zÀÄå£ÀäAqÀ®zÀ ‘PÁ® ¤AiÀÄvÁAPÀ; JAzÀgÉÃ£ÀÄ?

6. Obtain an expression for impedance and current for a.c. circuit containing LCR in series. Bring out the concept of Resonsance. (4+2)

¸ÀgÀtÂ LCR «zÀÄå£ÀäAqÀ®zÀ°è ¥ÀAiÀiÁðAiÀÄ «zÀÄåvïUÉ ªÀÄvÀÄÛ ¥ÀæwgÉÆÃzsÀPÉÌ UÀtÂvÉÆÃQÛUÀ¼À£ÀÄß ¥ÀqÉ¬Äj.

C£ÀÄgÀt¤ÃAiÀÄ PÀ®à£ÉAiÀÄ£ÀÄß «ªÀj¹.

7. Define Peltier and Thomson coefficients. Describe an experiment to determine Peltier coefficient. (2+4)

¥É°ÖAiÀiï ªÀÄvÀÄÛ xÁA¸À£ï ¤AiÀÄvÁAPÀUÀ¼À ¸ÀàµÀÖ ¤gÀÆ¥ÀuÉ ¤Ãr. ¥É°ÖAiÀÄgï ¤AiÀÄvÁAPÀªÀ£ÀÄß ¥ÁæAiÉÆÃVPÀªÁV PÀAqÀÄ »rAiÀÄÄªÀ «zsÁ£ÀªÀ£ÀÄß «ªÀj¹.

8. Define Solar constant, Describe an experiment to determine it using a pyrheliometer.

(2+4)

¸ËgÀ ¤AiÀÄvÁAPÀ JAzÀgÉÃ£ÀÄ? ¸ÀÆAiÉÆÃðµÀÚ ªÀiÁ¥ÀPÀzÀ ¸À°ÁAiÀÄ¢AzÀ ¸ËgÀ¤AiÀÄvÁAPÀªÀ£ÀÄß PÀAqÀÄ »rAiÀÄÄªÀ §UÉAiÀÄ£ÀÄß «ªÀj¹.

PART-B

¨sÁUÀ-©

Answer any four questions. Each carries five marks.

AiÀiÁªÀÅzÁzÀgÀÆ £Á®ÌÀ ¥Àæ±ÉßUÀ¼À£ÀÄß GvÀÛj¹. ¥Àæw ¥Àæ±ÉßUÉ LzÀÄ CAPÀUÀ¼ÀÄ.

9. Find the current through 8 resistance using superposition theorem in the circuit given below.

ªÉÄÃ®ÌAqÀ «zÀÄåeÁé®zÀ°è 8 gÉÆÃzsÀzÀ ªÀÄÆ®PÀ ºÀjAiÀÄÄwÛgÀÄªÀ «zÀÄåwÛ£À ¥ÀæªÀiÁtªÀ£ÀÄß, CzsÁågÉÆÃ¥Àt ¥ÀæªÉÄÃAiÀÄªÀ£ÀÄß G¥ÀAiÉÆÃV¹ PÀAqÀÄ »r¬Äj.

10. A Helmholtz Galvonometer has coils of circumference 0.49 m each and number of truns. 50. Calculate the current through the coils which produces a deflection of 45.

Given: BH=0.32x10-4 T and 0= 4x10-7 Hm-1.

MAzÀÄ ºÉ¯ïäºÉÆÃ¯ïÖ÷ì UÁå®é£ÉÆÃ«ÄÃlgï£À°è G¥ÀAiÉÆÃVÀÄªÀ ¸ÀÄgÀÄ½AiÀÄ ¸ÀÄvÀÛ¼ÀvÉ 0.49 EzÉ ºÁUÀÆ CzÀgÀ°è 50 ¸ÀÄvÀÄÛUÀ½ªÉ. ºÁVzÀÝgÉ, 45 «±ÉèÃµÀuÉ §gÀ®Ä ¨ÉÃPÁzÀ «zÀÄåwÛ£À ¥ÀæªÀiÁt JµÀÄÖ?

(BH=0.32x10-4 T and 0= 4x10-7 Hm-1)

11. A capacitor of capacitance 2 f is discharged through a high resistance. The time taken for one third the charge of the capacitor to leak is 12 S.Find the value of High resistance.

2 f zsÁgÀPÀvÉAiÀÄÄ¼Àî ¸ÀAzsÁjvÀæªÀ£ÀÄß, MAzÀÄ C¢üPÀgÉÆÃzsÀzÀ ªÀÄÆ®PÀ «¸Àfð¸À¯ÁVzÉ. ¸ÀAzsÁjvÀæzÀ ªÉÄÃ°gÀÄªÀ «zÀÄåzÀA±ÀzÀ ªÀÄÆgÀ£ÉÃ MAzÀÄ ¨sÁUÀzÀµÀÄÖ ¸ÉÆÃgÀ®Ä 12 ¸ÉPÉAqï ¨ÉÃPÁzÀgÉ gÉÆÃzsÀzÀ ¨É¯É JµÀÄÖ?

12. A condenser of capacity 1 f is allowed to discharge through Inductance of 1 m H and resistance of 20 in series. Calculate the frequency of oscillatory discharge.

1mH¥ÉæÃgÀPÀvÉAiÀÄÄ¼Àî ¥ÉæÃgÀPÀ ªÀÄvÀÄÛ 20 gÉÆÃzsÀPÀvÉAiÀÄÄ¼Àî gÉÆÃzsÀzÀ ªÀÄÆ®PÀ 1 fzsÁgÀPÀvÉAiÀÄÄ¼Àî zsÁgÀPÀªÀ£ÀÄß «¸Àfð¸À¯ÁVzÉ. «¸Àdð£Á DAzÉÆÃ®£ÀzÀ DªÀvÁðAPÀªÀ£ÀÄß PÀAqÀ»r¬Äj.

13. The thermoelectric power of a Thermocouple at 100 C is 9.5 v/C. If the neutral temperature is 350C, find the power at 0.C.

GµÀÚAiÀÄÄÄUÀäzÀ GµÀÚ«zÀÄåvï ¸ÁªÀÄxÀåð 100 C is 9.5 v/C. vÁ¥ÀªÀiÁ£ÀzÀ°è 9.5 v/C.EzÉ. vÀl¸ÀÜ vÁ¥ÀªÀiÁ£À 350C EzÀÝgÉ 0.C vÁ¥ÀªÀiÁ£ÀzÀ°è£À ¸ÁªÀÄxÀåðªÉµÀÄÖ?

14. If the average energy radiated per unit area of the surface of the sun is 7.452x104 kWm-2, estimate the surface temperature of the sun, assuming it to be a black body. Stefans constant is 5.67x10-8 Wm-2 k-4.

¸ÀÆAiÀÄð£À ªÉÄÃ¯ÉäöÊ¬ÄAzÀ ¥Àæ¸ÁgÀªÁUÀÄwÛgÀÄªÀ ¸ÀgÁ¸Àj ±ÀQÛ 7.452x104 kWm-2 ¸ÀÆAiÀÄð, MAzÀÄ ¥Àj¥ÀÆtð PÀÈµÀÚPÁAiÀÄ JAzÀÄ UÀæ»¹, CzÀgÀ ªÉÄÃ¯ÉäöÊ GµÁÚA±ÀªÀ£ÀÄß PÀAqÀÄ »r¬Äj. (¹ÖÃ¥sÀ£ï ¤AiÀÄvÁAPÀ 5.67x10-8 Wm-2 k-4).

PART-C

¨sÁUÀ-¹

Answer any five of the following. Each carries two marks. (5x2=10)

AiÀiÁªÀÅzÁzÀgÀÆ LzÀÄ ¥Àæ±ÉßUÀ¼À£ÀÄß GvÀÛj¹. ¥Àæw ¥Àæ±ÉßUÉ JgÀqÀÄ CAPÀUÀ¼ÀÄ.

15. a) Why the plane of Helmholtz coil must be made parallel to the magnetic meridian?

ºÉ¯ïä ºÉÆÃ¯ïÖ÷ì ¸ÀÄgÀÄ½AiÀÄ ¸ÀªÀÄ®ªÀ£ÀÄß ¨sÀÆ«ÄAiÀÄ PÁAvÀPÉëÃvÀæPÉÌ ¸ÀªÀiÁ£ÁAvÀgÀªÁVqÀ®Ä PÁgÀtªÉÃ£ÀÄ?

b) It is desirable to have a high value of power factor. Explian.

¸ÁªÀÄxÀåð ¤AiÀÄvÁAPÀ ºÉZÁÑVzÀÝµÀÄÖ M¼ÉîAiÀÄzÀÄ. «ªÀj¹.

c) In a power line current is flowing from North to South, what is the direction of magnetic field at a point above the power line?

«zÀÄåvï vÀAwAiÀÄ°è GvÀÛgÀ¢AzÀ zÀQëtPÉÌ «zÀÄåvï ºÀjAiÀÄÄwÛzÉ. vÀAwAiÀÄ ªÉÄ®ÎqÉAiÀÄ MAzÀÄ ©AzÀÄ«£À°è

PÁAvÀPÉëÃvÀæzÀ ¢PÀÌÄ AiÀiÁªÀÅzÀÄ.?

d) When an alternating current is passed through a thermocouple what will be the Peltier effect?

GµÀÚ AiÀÄÄUÀäzÀ ªÀÄÆ®PÀ ¥ÀAiÀiÁðAiÀÄ «zÀÄåvÀÛ£ÀÄß ºÁ¬Ä¹zÁUÀ ¥É°ÖAiÀÄgï ¥ÀjuÁªÀÄ K£ÁUÀÄvÀÛzÉ?

e) If the speed of a charged particle moving normally to a uniform magnetic field is doubled, how does it effect the radius of orbit? Explain.

¸ÀªÀiÁ£À PÁAvÀ PÉëÃvÀæzÀ ¢QÌUÉ ®A§ªÁVgÀÄªÀ ¸ÀªÀÄvÀ®zÀ°è «zÀÄåzÀA±ÀªÉÇAzÀÄ ZÀ°¸ÀÄwÛzÉ. PÁAvÀ PÉëÃvÀæzÀ

wÃPÀëuÉAiÀÄ£ÀÄß zÀÄ¥ÀàlÄÖ ªÀiÁrzÁUÀ PÀPÉëAiÀÄ wædåzÀ ªÉÄÃ¯É DUÀÄªÀ ¥ÀjuÁªÀÄªÉÃ£ÀÄ?

f) A Cloudy night is hotter than a clear night. Why?

¤gÀ¨sÀæ DPÁ±À EzÁÝV£À vÁ¥ÀªÀiÁ£ÀQÌAvÀ ªÉÆÃqÀ PÀ«zÀ ªÁvÁªÀgÀt«zÁÝV£À vÁ¥ÀªÀiÁ£À ºÉZÁÑVgÀ®Ä

PÁgÀtªÉÃ£ÀÄ?

g) Animals curl their body when they feel cold. Why?

¥ÁætÂUÀ¼ÀÄ ZÀ½UÁ®zÀ°è zÉÃºÀªÀ£ÀÄß ªÀÄÄzÀÄjPÉÆ¼ÀÄîvÀÛªÉ KPÉ? «ªÀj¹.

h) If a magnetic monopole exists, how does it effect Maxwell’s equation?

PÁAwÃAiÀÄ KPÀzsÀÈªÀ EgÀÄªÀÅzÉÃ, DzÀgÉ ªÀiÁåPïìªÉ¯ï ¸À«ÄÃPÀgÀtªÀÅ ºÉÃUÉ ªÀiÁ¥ÁðlÄ DUÀÄvÀÛzÉ?

IV Semester

Acoustics, Optics, and Lasers

Max. Marks: 60 Time:3hours

PART-A

Answer any five of the following
5x6=30

1. Derive an expression for the velocity of sound in a rod. Hence give an expression for the velocity of sound in an extended solid.
2. Describe with necessary theory the Foucault's method of determining the velocity of light. Explain how it is in favors of wave theory of light.
3. Obtain the law of refraction of a spherical wave front on a plane surface on the basis of wave theory of light.
4. What are Newton's rings? Give the theory of Newton's rings.
5. Give the construction and theory of a zone plate. Derive the formula for its focal length.
6. Explain the construction and working of a quarter wave plate. How is it used to produce circularly polarized light.
7. Explain Laurent's half shade polar meter to determine the angle of rotation of an optically active solution.
8. Describe the working of Helium-Neon laser with necessary diagrams.

PART-B

Answer any four of the following 4x5=20

9. In a Kundt's Tube experiment, the length of the steel rod is 1.5m and its young's modulus is 20 X 1010 Nm-2. If the length of the rod is reduced to 3/4m and again fixed at the centre, what is the change in the length of a loop of the stationary wave pattern? Assume the room temperature to be 25 C and the velocity of sound at 0 C is 330ms-1. Density of steel is 7800kgm-3
10. A thin plate of glass of refractive index. 1.52 and thickness 6.3mm is introduced in the path of one of the interfering beams. If wave length of light used is 546nm, calculate the shift in the central fringe.
11. An air wedge is formed between two plane glass plates. The distance between the apex and the spacer is 0.02m. The thickness of the space is 0.1mm. If the wedge is illuminated with light of wavelength 589.3nm calculate the fringe width.
12. The width of a grating is 3cm and it contains a total number of 18,000 lines. Calculate the angular separation between the two yellow lines of mercury of wavelength 5770A and 5790A in the first order spectrum.
13. A narrow slit illuminated by light of wave length of 589nm is placed at a distance of 2.5m form a straight edge. If the distance between the straight edge and screen is 5m, calculate the distance between first and forth dark band.
14. What is the ratio of stimulated to spontaneous emission rates for the sodium D line at 200C, Given h=6.62x10-34 J-s, c=3 x 10 8m/s, wavelength of sodium D line=5893A K=1.38 x 10-23 J/k.

PART-C

Answer any five of the following. 5x2=10

15. a) Sound loses so little in intensity when it travels through a pipe or speaking tubes explain.
    b) Sound waves cannot be polarized explain.

    c) When light travels from a rarer medium to a denser medium it losses speed. Does this imply a loss in energy of the wave? Explain.
    d) Mention two methods by which coherent sources can be obtained by division of wave front.
    e) The centre of the shadow of a small disc is bright, explain.
    f) What changes in diffraction pattern of a single slit will you observe when monochromatic light is replaced by white light?
    g) Can we produce polarized light using only a half wave plate? Explain.
    h) Mention four application of Polaroid's.

IV Semester

Acoustics, Optics, and Lasers

Max. Marks: 60 Time:3 hours

PART-A

Answer any five of the following
5x6=30

1. Describe with necessary theory Kundt's tube experiment to determine the velocity of sound in a solid
2. State Fermat's principle of extremism time and prove Snell's law of refraction from Fermat's principle.
3. What is a biprism? Give the theory of biprism.
4. What is an interferometer? Describe the construction and working of a Michelson interferometer
5. Give the theory of plane transmission grating. Explain how would you use it to find the wavelength.
6. Explain diffraction at straight edge. Give a clear account of the distribution of intensity with a diagram.
7. Explain how one can produce and detect (a) plane polarized light (b) circularly polarized light (c) Elliptically polarized light.
8. Obtain the relationship between Einstein's coefficients of spontaneous and stimulated emission.

PART-B

Answer any five of the following
4x5=20

9. A brass rod of length 3 m is clamped at the centre. It emits a note of frequency 600Hz when it vibrates longitudinally. If the density of brass is 8300kgm-3, calculate the young's modulus of brass.
10. A train is approaching a tunnel surmounted by a cliff and the driver sends a short whistle when 1.6km away. The echo reaches him 9seconds later. Find the speed of the train. Velocity of sound =340m/s.
11. Newton's rings are formed with light of wavelength 600nm and using a lens whose surface has a radius of 2m in contact with a plane glass surface. Find the radius of the 10th dark ring.
12. The centre circle of a zone plate has a radius of 0.07cm, light of wavelength 5000A coming from (i)an object at infinite (ii) an object at 1.47m away from the zone plate falls on the plate. Find the position of the principal image in each case.
13. Calculate the minimum number of lines on a grating required to resolve the spectral lines of wavelength 5770A and 5791A in the second order spectrum.
14. Calculated the thickness of quartz plate for sodium light of wave length 5893A given _=1.5533.

PART-C

Answer any five of the following
5x2=10

(a) When does sound wave undergo a phase change of _ on reflection while traveling from one medium of certain acoustic impedance to another?
(b) When do we have only transmission of sound waves without reflection?
(c) A wave undergoes reflection at a denser medium. Does its phase change? Explain.
(d) Bubbles of colorless soap solution appear colored in sunlight. Why?
(e) If the number of rulings in a grating is increased what is its effect on the resolving power of the grating.
(f) Can a naked eye detect polarized light? If not how is polarized light deterred.
(g) Why can't we use gas lasers for recording images of moving objects in holography? Explain,

V Sem Physics Paper-VI

MODEL PAPER-II

Time: 3 hours Max Marks:60

Part-A

Answer any five of the following
6x5=30

1) Explain how classical physics fails and quantum theory helps in explaining (i) Black body radiation (ii) Specific heat of solids. 3+3
2) With relevant theory, explain G.P. Thomson's experiment of electron diffraction 6
3) Obtain Schrödinger's time-independent equation for a free particle. 6
4) (a) Explain Max Born's interpretation of wave function (b) Write an expression for eigen functions and eigen values for one dimensional harmonic oscillator and represent graphically the first two states. 2+4
5) Describe Frank-Hertz experiment for determination of critical potentials What are its limitation? 5+1
6) (a) Mention the different quantum numbers associated with atom model.
   (b) State and explain Pauli's exclusion principle.

   (c)Obtain an expression for the maximum number of electrons in a shell 2+2+2

7) (a) Write a note on Paschen-Back effect and Stark effect.
   (b) Distinguish between Rayleigh and Raman scattering. 3+3

8) Give the Quantum theory of Raman effect. 6

Part-B

Answer any five of the following
4x5=20

9) Calculate the wavelength of thermal neutron at temperature 300K and 400K.
10) A pi meson has an average life of 26ns. If we have to measure the rest energy of the meason in this interval, what is the uncertainty in the energy measured?
11) An electron is confined to move between two rigid walls separated by 10 A. Find the Debroglie wavelength representing the first two allowed energy state of the electron and the corresponding energies.
12) The Rydberg constant for hydrogen is 1.09678 x 10 7m-1. The ration of proton mass to electron mass for ionized helium is 1869. Calculate the Rydberg constant for ionized helium.
13) Calculate the Zeeman shift produced in the normal Zeenman effect when spectral line of wavelength 590nm is subjected to a magnetic field of 0.8T. Given e/m=1.76 x 10 11 Ckg-1
14) If the wave number difference between successive rotation lines of HF molecule is 4050m-1, Calculate the inter atomic distance.

a) **Part-C**

Answer any five of the following 2x5=10

15) a) Do the Debroglie wavelength produce dispersion in vacuum?
   b) Can one eigen value have many eigne function? Explain.
   c) Why Normal Zeeman Effect occurs only in atoms with an even number of electrons.
   d) The colour of the setting sun is red. Give reason.
   e) What is the significance of negative sign the expression for energy of an electron?
   f) In rotational spectra energy levels are not equally spaced but frequencies are equally spaced. Explain.

Model Question Papers

ELECTRONICS-II

Electronic Circuits

Time: 3 Hours Max.Marks:60

Instruction: Answer any five questions in Part A, any four questions in part B and any five sub-divisions in part C.

PART-A

Answer any five questions: (5x6=30)

1. Draw the circuit diagram of a half-wave rectifier and explain its operation, Derive an expression for its rectification efficiency. 6
2. What are clipping and clamping circuits? Explain the action of a positive clamper circuit for a sinusoidal input. 6
3. a) In which biasing conditions:
   i) Photo-diode and
   ii) LED are normally operated?

   b) Why is Tunnel diode called so? Draw its equivalent circuit and explain its V-I characteristics. (2+4)

4. a) Explain the different sizes, levels of doping and the nature of majority carriers in the three regions of an NPN transistor.
   b) Define current gains of a transistor in CB and CE configurations. Mention the Relation connecting them. (3+3)

5. What is transistor biasing ? Draw the circuit diagram of a Potential divider bias and obtain the expression for its operating point. 6
6. a) Give classification of amplifiers based on:
   i) Transistor configuration.

   ii) Selection of Q-point.

iii) Frequency response.

iv) Coupling methods.

b) Draw the frequency response curve and indicate different regions for a CE amplifier.

(4+2)

7. a) Draw the ac equivalent circuit of a two stage RC coupled amplifier. Obtain expression for its overall voltage gain.
b) What is harmonic distortion? Write the expression for total harmonic distortion in a class B power amplifier.

8. With a circuit diagram and frequency response curve. Explain the operation of a double tuned voltage amplifier. What is its advantage over single tuned amplifier.
6

Answer any four questions: (4x5=20)

9. Find the input voltage variation range for the given circuit to act as a voltage regulator.
5

10. Draw the output waveforms for the circuit, when input is:
a) a sine wave of Vpp=10V, V1=2V, V2=3V.

b) a triangular wave of Vpp=8V, V1=3V, V2=0V. (3+2)

11. For the given circuit draw the d.c. load line and mark Q-point on it. 5
12. Calculate the voltage gain of the amplifier with and without emitter by pass capacitor for the circuit shown. 5
13. A transistor has hie=11000 hre=2.5x104, hfe=50 and hoe=25us. Find voltage gain, current and input impedance when the transistor is used as a small signal amplifier with Rs=800 and RL=2 k. 5
14. In a class A power amplifier, Vcc=20 V, zero signal collector current is 400 mA. If the load impedance is 16 and signal variation is from 50 mA to 850 mA. Find efficiency of the amplifier. 5

PART-C

Answer any five sub-division: (5x2=10)

15. a) For the given circuit, draw the output waveforms when

i) the capacitor is open. Ii) the diode D2 is open. 2

b) An open circuited power supply has 20 V output voltage, when connected to a load of 150 , output drops to 16 V. Calculate the value of voltage regulation. 2

c) Mention the characteristic features of a CC amplifier which make it a useful circuit. 2

d) Arrange the following in the ascending order of their input impedance: 2

1) Darlington amplifier 3) CC amplifier

2) CE amplifier 4) CB amplifier

e) Why is the transistor called Bipolar? 2

f) What is thermal run away? 2

g) Why does the gain of an amplifier decrease at high frequencies? 2

h) Can a small signal amplifier be used as a power amplifier? Justify. 2

ELECTRONICS/INSTRUMENTATION (Paper-III)

Linear ICs and Applications

Time: 3Hours Max.Marks:60

PART-A

Answer all questions: (5x6=30)

1. a) Explain the basic construction and working of depletion type MOSFET in depletion mode.

OR

a) What is a UJT? Explain its working using the equivalent circuit. Draw the V-I Characteristics.

2. a) Derive the expression for Ic and VCE for Dual input unbalanced output differential amplifier.

OR

b) Explain the effect of temperature on input offset voltage, input offset current and input bias current of operational amplifier.

3. a) Derive the exact and ideal voltage gain expression of Non-inverting operational amplifier.

OR

b) With necessary circuit diagram, derive the expression for output impedance of iverting operational amplifier.

4. a) Explain the working of Integrator. Derive the expression for its output and sketch the output wave form for a square wave input.

OR

b) With necessary circuit and waveforms explain Schmitt trigger using operational amplifier.

5. a) State Barkhausen's criterion for sustained oscillation. Explain the working or Hartley Oscillator.

OR

b) What is a switching regulator? Differentiate between load and line regulation.

PART-B

Answer any five: (5x4=20)

6. For an n-channel JFET I DSS=20*mA*, Vp=_6V and gm=5000 u s. Determine the values of drain current and Tran conductance at VGS=_3V.

7. A half-wave rectifier circuit employing an SCR is adjusted to have current of 1mA. The forward break over voltage of SCR is 100V. If a sinusoidal voltage of 200V peak is applied. Find i) Firing angle ii) Conduction angle iii) Average current.
8. The following specifications are given for the dual input balanced output differential amplifier RC=2.2K RE=4.7 K Rin=50 VCC=VEE=10V, B=100 and VBE=0.75V. Determine the differential voltage gain and input resistance.
9. For a Non-inverting amplifier A=500, ACL=50, lower and upper cut off frequencies are 1 KHZ and 100KHZ respectively. Determine the bank width after feedback.
10. Design a differentiator to differentiate an input signal that varies in frequency from 10Hz to about 1KHz. Assume C=0.1 u F.
11. Construct a first order low pass filter for a gain of 4 and cut off frequency 4 KHz, Assume C=0.01 u F and RF =100 K.
12. Calculate the value of R2 so that oscillator generates 2.2 KHz. Given R1=680 , C1=0.1 u F and C2=0.11 u F.
13. Calculate the frequency of oscillation and duty cycle of the circuit.

PART-C

14. Answer any five subdivision: (5x4=20)
    a) From the structure given below identify the device and write the symbol.
    b) Sketch the integrated circuit fabrication layout for the following circuit.
    c) In the above circuit output measured is 10mV. Why? How it can be made to zero?
    d) Identify the above circuit. What is its voltage gain?
    e) Calculate the output voltage V0 in the above circuit.
    f) For the above circuit sketch the output wave form for a triangular wave input.
    g) From the response curve identify the circuit. Is it possible to obtain such a response practically Justify your answer.
    h) What is the value of V0 in the above circuit. What happens to V0 when 2.2 K resistor is open?

VI Semester B.Sc. Examination, June 2008

(Semester Scheme) ELECTRONICS(Paper-VII)

Communication-II

Time: 3 Hours Max.Marks:60

Instruction: Answer **any five** questions from **Part A, any four** questions from **part B** and **any five** sub-divisions from **part C**.

PART-A

Answer any five questions: (5x6=30)

1. a) What is pulse modulation ? Draw the waveform showing four prominent methods of pulse modulation.

b) Define Amplitude Shift Keying (ASK) Sketch the input and output waveforms. (4+2)

2. Explain the following terms with respect to digital transmission 6

i) Band width requirement.

ii) Cross talk and

iii) Distortion.

3. Explain the principle and working of a Reflex Klystron with Applegate diagram. 6

4. Draw the cross sectional view of an 8-cavity Magnetron and explain its working,

considering mode oscillations. 6

5. a) Explain the function of a C-band satellite transponder with a block diagram.

b) What are the advantages of TDMA over FDMA? (4+2)

6. Derive expressions for the angle of acceptance and the numerical aperture of an optic fiber

in terms of refractive indices. 6

7. Explain the following losses in optical fiber cables 6

i) Absorption losses.

ii) Bending loss and

iii) Radiation loss.

8. Explain the following terms with respect to Cellular communtication

i) Frequency reuse.

ii) Cell splitting and

iii) Hand off process.

PART-B

Answer any four questions: (4x5=20)

1. A 4 KHz channel has a signal to noise ratio of 24 dB. Calculate the maximum information carrying capacity of this channel. Assuming constant transmitting power, calculate the capacity of the channel, if its band width is halved. 5
2. Draw a labeled diagram of Traveling Wave Tube (TWT), Mention its applications. 5
3. Draw the block diagram of a satellite up link system and mention the function of each block.
4. In a satellite communication system, calculate the path losses for:
   a) Signal of frequency 10 GHz at a distance of 40x103 km.
   b) Signal of frequency 6 GHz at a distance of 36x103 km. 5
5. The core of a fiber is clad with a material of refractive index 1.52. The acceptance angle is found to be 20. Calculate the refractive index of the core and numerical aperture of fiber, when launching takes place from air. 5
6. Draw the labeled block diagrams of FAX transmitter and receiver. 5

PART-C

Answer any five questions: (5x2=10)

7. a) Determine the band width and baud for an FSK signal with a mark frequency of 32KHz, a space frequency of 24 Hz and a bit rate of 4 KbPs. 2

b) Is Gunn effect found in p-type semiconductor? Explain. 2

c) How does a geostationary satellite appear stationary? 2

d) Is photo-emissive device forward biased? Explain. 2

e) Draw the Ray diagram showing the path of signal flow, when a mobile subscriber of

a cell is communication with another mobile subscriber of another city. 2

f) What is macro cell and micro cell with respect to cellular communication? 2

g) What is a SIM Card? 2

ELECTRONICS (Paper-VIII)

Signals and Systems

Time: 3 Hours Max.Marks:60

Instruction: Answer any five questions in Part A, any four questions in part B and any five sub-divisions in part C.

PART-A

Answer any five questions: (5x6=30)

1. Explain the following:

a) Odd and even signals.

b) Periodic and non-periodic signals.

c) Continuous and discrete signals. 6

2. Explain Time-invariance, causality and stability of continuous time system 6

3. State and prove commutative and distributive properties of the convolution integral. 6

4. a) Mention elementary operations used in block diagram representation of LII system. 2

b) Draw direct form-I, implementation for the following differential equation.

Dy/dt =a0y=b1 dx/dt +b0x. 4

5. State and prove time-domain convolution in Fourier-series. 6

6. State and prove linearity and time-shifting properties of Fourier transform. 6

7. Find the Fourier transform of pulsed cosine. 6

8. Obtain frequency response function of the system:

PART-B

Answer any four questions: (5x4=20)

9. For the signal x(t), sketch the following:

a) y1 (t)=x (-t)

b) y2(t) =x [0.5 9t-20]

c) y3 (t)=x [-0.5 (t-1)].

10. a) Determine whether signal is periodic. 5

If periodic determine its fundamental period. X(t)=cos [/3t]+sin [/4t].

b) Find the step response of an LTI system whose impulse response is given by

h (t)=e- | t |. 5

11. For the differential equation, find the total response y (t)+5y (t)=u (t), y (0)=2. 5

12. Obtain Fourier co-efficient for the wave form x(t). 5

13. Compute the Fourier transform of the signal x(t)=e-t-1 u(t). 5

14. Find the Fourier transform of the following functions.

i) The unit impulse.

ii) The decaying exponential.

iii) The rect function (over the interval-0.5 to + 0.5). 5

Answer any five sub-questions: (5x2=10)

15. a) Figure (1) shows a stair-case like signal x(t) that may be viewed as super position of four rectangular pulses g(t), shown in figure (2). Starting with rectangular pulse g(t) construct x(t) and express it in terms of g(t).
2

b) Determine the following system is invertible or not. Y (t)=x (t-4). Justify. 2

c) Obtain even and odd components of the signal. X (t)=1+2t+3t2.

d) Identify the function and write the mathematical expression.

e) If x (t) --- x (k) then x (at) --- x (k); a>0 Identify the operation and state the property. 2

f) Write the conditions for a function x (t) to possess a unique Fourier Transform. 2

g) Identify and state the property for the waveforms shown. 2