

(Pages : 3)

R – 1515

Reg. No. :

Name :

Sixth Semester B.Sc. Degree Examination, April 2023

Career Related First Degree Programme under CBCSS

Physics with Computer Applications

Core Course

PC 1641 : SOLID STATE PHYSICS

(2014 Admission Onwards)

Time : 3 Hours

Max. Marks : 80

SECTION – A

Answer **all** questions. Each carries **1** mark.

1. What is meant by Wigner-Seitz unit cell?
2. Mention the total number of symmetry elements on a cube.
3. State Matthiessen's rule for electrical resistivity.
4. State the equation for Hall Coefficient.
5. Write down the conservation laws for a three phonon process.
6. What is meant by band gap?
7. What is Curie-Weiss law?
8. Define zero resistance.
9. What is meant by SQUID?
10. Draw the current-voltage characteristic of a Josephson junction.

(10 × 1 = 10 Marks)

P.T.O.

SECTION – B

Answer any **eight** questions. Each carries **2** marks.

11. Name any two crystal systems and give their unit cell characteristics.
12. Explain reciprocal lattice.
13. What are ferromagnetic domains?
14. Explain the term Fermi surface.
15. Explain the properties of diamagnetic materials.
16. Explain the concept behind neutron diffraction.
17. Derive the relationship between dielectric constant and polarizability.
18. Distinguish between ferro and ferrimagnetism.
19. Explain perfect diamagnetism.
20. Explain phonon density of states.
21. Explain critical field for super conductors.
22. What are the effects of Fermi surface?

(8 × 2 = 16 Marks)

SECTION – C

Answer any **six** questions. Each carries **4** marks.

23. Evaluate the number of atoms per unit cell for rock-salt crystal (Given $a = 5.63 \text{ \AA}$, Molecular Weight of NaCl = 58.5 and the density is 2180 kg/m^3).
24. Find the interplanar spacing for the lattice planes of miller indices (3 2 1) and (2 1 0) for a cubic lattice with $a = 5.62 \text{ \AA}$.

25. Calculate the potential energy of the system of Na^+ and Cl^- ions when they are 2 \AA apart.
26. Show that the reciprocal lattice for a simple cubic structure is also simple cubic.
27. Obtain the Hall co-efficient of sodium based on free electron model. Sodium has bcc structure and the side of the cube is 4.28 \AA .
28. Diamond (atomic weight of carbon=12) has Young's modulus of 10^{12} N/m^2 and a density of 3500 kg/m^3 . Compute the Debye temperature for diamond.
29. For copper the specific heat at low temperature has the behavior of $C_v = 4.6 \times 10^{-2} T^3 \text{ Jkmol}^{-1} \text{ K}^{-1}$. Estimate the Debye temperature for copper.
30. A magnetic field of 10^6 A/m is applied to copper. If the magnetic susceptibility of copper is -0.8×10^{-5} . Calculate the flux density and the magnetisation in copper.
31. Evaluate the glancing angle on the plane (1 1 0) for a cubic crystal ($a = 2.81 \text{ \AA}$) corresponding to second order diffraction maximum for X-rays of wavelength 0.71 \AA .

(6 × 4 = 24 Marks)

SECTION – D

Answer any **two** questions. **Each** carries **15** marks.

32. Discuss the Kronig-Penny model for a linear lattice. How does it lead to the formation of energy bands?
33. Discuss the Langevin theory of Paramagnetism.
34. Derive an expression for the electronic specific heat of conduction electrons. Also derive an expression for the thermal conductivity of solids.
35. What are superconductors? Explain the difference between Type I and Type II superconductors. Give a brief description of BCS theory.

(2 × 15 = 30 Marks)

(Pages : 4)

R – 1518

Reg. No. :

Name :

Sixth Semester B.Sc. Degree Examination, April 2023
Career Related First Degree Programme Under CBCSS
Physics With Computer Applications

Core Course

PC 1642 : STATISTICAL MECHANICS AND QUANTUM MECHANICS
(2015 Admission Onwards)

Time : 3 Hours

Max. Marks : 80

SECTION – A

Answer **all** questions. Answer should not exceed **two** sentences. Each question carries **1** mark.

1. Define statistical probability.
2. Write the relation between entropy and thermodynamic probability.
3. Write two examples of bosons.
4. How many particles can be accommodated in a single energy state of fermions? Why?
5. Define Planck's law.
6. Define matter wave.
7. What is uncertainty principle?

P.T.O.

8. Define the energy of the ground state of a quantum mechanical harmonic oscillator?
9. Write the time independent Schrödinger equation
10. Write any two properties of a wave function

(10 × 1 = 10 Marks)

SECTION – B

Answer any **eight** questions in a paragraph. Each question carries **2** marks.

11. Define phase space in statistical mechanics
12. What is a statistical ensemble?
13. What are identical particles?
14. Differentiate between bosons and fermions
15. What is blackbody?
16. Explain the laws of photoelectric effect
17. Explain the drawbacks of Rutherford's atomic model
18. What is correspondence principle?
19. Explain normalization of a wave function
20. Write the relation between a wave function and its probability interpretation.
21. Explain stationary states.
22. Explain the energy eigenvalues of a harmonic oscillator

(8 × 2 = 16 Marks)

SECTION – C

Answer **any six** questions in a sentence or two, each question carries **4** marks.

23. A card is drawn from a well shuffled pack of 52 cards. Calculate the probability for this card to be either a king or a queen.
24. Distinguish between a microstate and a macrostate.
25. Calculate the value of root mean square speed of molecules of hydrogen at 300K. The Boltzmann constant is $1.38 \times 10^{-23} \text{ JK}^{-1}$ and Avogadro number is 6.6×10^{23} ?
26. Calculate the fermi temperature of an electron if it's the Fermi energy is 3.2 eV.
27. Calculate the maximum energy of a photoelectron emitted from a metallic surface of work function 1.1 eV, if the wavelength of the incident radiation is 400 nm. Given that Planck's constant is $6.602 \times 10^{-34} \text{ Js}$ and charge on an electron is $1.6 \times 10^{-19} \text{ C}$.
28. Compare the de Broglie wavelengths of an electron when it is moving at a speed of 10 m/s and 10000 m/s. mass of electron is $9.1 \times 10^{-31} \text{ kg}$.
29. In a hydrogen atom obtain the wavelength of light emitted due to the transition from $n=4$ state to $n=3$ state.
30. The average life time of an excited atomic state is 10^{-9} s . The spectral line associated with the decay of the state is 600nm. Estimate the uncertainty in measuring the wavelength of the width of the line. Planck's constant is $6.602 \times 10^{-34} \text{ Js}$.
31. Find the expression for probability of a particle trapped in a box of width L . The particle can be found between x_1 and x_2 .

(6 × 4 = 24 Marks)

SECTION – D

Answer **any two** questions, **Each** question carries **15** marks.

32. Explain the properties of micro canonical, canonical and grand canonical ensembles.
33. Compare the salient features of Maxwell-Boltzmann, Fermi-Dirac and Bose-Einstein statistical distributions.
34. Explain the theory of blackbody radiation. What is ultraviolet catastrophe, and how it was resolved by Planck's theory?
35. Discuss the theory of a quantum mechanical harmonic oscillator.

(2 × 15 = 30 Marks)

(Pages : 3)

R – 1524

Reg. No. :

Name :

Sixth Semester B.Sc. Degree Examination, April 2023
Career Related First Degree Programme under CBCSS
Physics with Computer Applications
Elective Course
PC 1661.1 : ASTRONOMY AND ASTROPHYSICS
(2013 Admission onwards)

Time : 3 Hours

Max. Marks : 80

SECTION – A

Very short answer type questions. (Answer all questions of 1 mark each)

1. Discuss the importance of Astronomy.
2. Define Parsec.
3. What happen to mass of a particle, when temperature increases?
4. Name the planet which is also called morning star.
5. During the earliest Gamowian, the four forces of nature were part of _____.
6. $1.4M_0$ is known as _____.
7. Name the process by which energy is produced in stars.
8. Name one natural satellite of Earth.
9. What is the speed with which, the Earth rotate in its axis?
10. What is a pulsar?

(10 × 1 = 10 Marks)

P.T.O.

SECTION – B

Short answer type questions. (Answer any **eight** questions of **2** marks each)

11. Define Astrophysics.
12. What is the scope of Astronomy?
13. What are dark matters?
14. Mention any two key changes of medieval astronomy with that of ancient astronomy.
15. Explain solar wind.
16. Discuss the features of the visible universe.
17. How does stars shine?
18. Differentiate between star and planet.
19. What is a Light year?
20. What are Meteorites?
21. State Stefan-Boltzmann law.
22. Discuss the significance of Schwarzschild radius.

(8 × 2 = 16 Marks)

SECTION – C

Answer any **six** questions. Each question carries **4** marks.

23. How did the universe begin?
24. Briefly discuss the key features of black holes.
25. Define
 - (a) Neutron stars,
 - (b) supernovae

26. Give a note on The Sun.
27. Discuss Celestial coordinate system.
28. Differentiate between Planets and Satellites.
29. Discuss Kepler's laws of planetary motion.
30. Define
 - (a) Comets
 - (b) Asteroids
31. Explain the standard model. What are its limitations?

(6 × 4 = 24 Marks)

SECTION – D

Answer any **two** questions. Each question carries **15** marks.

32. What is Astronomy and Astrophysics? Discuss the methods of Astronomy and Astrophysics.
33. How stars are formed? With the help of HR diagram, discuss different types of stars.
34. Briefly discuss the evolution of astronomy from Ancient astronomy to modern astronomy.
35. (a) Give a note on the evolution of calendar.
(b) "The inclination of the Earth cause seasons". Comment on the statement.

(2 × 15 = 30 Marks)

(Pages : 3)

R – 1523

Reg. No. :

Name :

Sixth Semester B.Sc. Degree Examination, April 2023
Career Related First Degree Programme under CBCSS
Group 2 (a)- Physics and Computer Applications
PC 1672 : OPERATING SYSTEM
(2018 Admission Onwards)

Time : 3 Hours

Max. Marks : 80

SECTION – A (Very Short Answer Questions)

Answer all questions

Each question carries 1 mark.

1. What do you mean by multithreading?
2. Define the term operating system.
3. Expand PCB
4. Write any two file attributes.
5. What is a thread?
6. Name an Operating system.
7. What do you mean by deadlock?

P.T.O.

8. What is a logical address?
9. What do you mean by thrashing?
10. What do you mean by page fault?

(10 × 1 = 10 Marks)

SECTION – B (Short Answer Questions)

Answer any **eight** questions.

Each question carries **2** mark.

11. Explain thread life cycle.
12. What do you mean by inter process communication?
13. Write need for protection mechanism in OS
14. What is the use of a monitor?
15. What is a Resource Allocation graph?
16. Short note on directory structure
17. What is an overlay?
18. What do you mean by spooling?
19. Mention few system calls.
20. Explain the concept of address binding
21. What do you mean by fragmentation?
22. What is a Reader writer problem?

(8 × 2 = 16 Marks)

SECTION – C (Short Essay Type Questions)

Answer any **six** questions.

Each question carries **4** marks.

23. Explain functions of an operating system.
24. Explain various operations on process.
25. Explain multithreading model.
26. Explain the concept of semaphore.
27. Short note on disk scheduling.
28. Explain page replacement policies.
29. Write note on segmentation.
30. Short note on Access matrix.
31. Short note on PCB.

(6 × 4 = 24 Marks)

SECTION – D (Long Essays)

Answer any **two** questions.

Each question carries **15** marks.

32. Explain any three process scheduling algorithms.
33. Explain various types of operating system.
34. Explain deadlock prevention methods
35. Explain file system implementation in detail.

(2 × 15 = 30 Marks)

(Pages : 3)

R – 1520

Reg. No. :

Name :

Sixth Semester B.Sc. Degree Examination, April 2023
Career Related First Degree Programme Under CBCSS
Group 2(a) – Physics and Computer Applications
PC 1671 : COMPUTER NETWORKS AND SECURITY
(2018 Admission Onwards)

Time : 3 Hours

Max. Marks : 80

SECTION – A

One word to maximum of one sentence. Answer all questions.

1. Define Computer networks.
2. What is multi-drop or multi point connection?
3. Name the technology behind fiber optic transmission media.
4. What is protocol?
5. What is framing?
6. What is meant by piggy backing?
7. What is burst error?
8. _____ algorithm in network layer decides which output line an incoming packet should be transmitted on.

P.T.O.

9. What is hacking?
10. What is phishing?

(10 × 1 = 10 Marks)

SECTION – B (Short Answer)

Answer **any eight** questions not exceeding one paragraph. Each question carries 2 marks.

11. Briefly explain various networking goals.
12. Explain briefly, various transmission mode in computer networks.
13. What is an IP address? Describe the format of address.
14. Discuss various function of transport layer.
15. What do you mean by NIC?
16. What is datagram? Explain IP datagram.
17. Write short note on control connection and data connection in FTP.
18. List out various type of errors in data communication.
19. Compare and contrast static and dynamic routing.
20. Differentiate between substitution cipher and transposition cipher.
21. What are firewalls?
22. What is MIME in network security?

(8 × 2 = 16 Marks)

SECTION – C (Short essay)

Answer **any six** questions not exceeding 120 words. Each question carries 4 marks.

23. What is topology? Briefly explain various topology in networking.
24. What are three types of wireless transmission media?
25. Highlight the difference between ISO OSI model and TCP/IP Model.

26. Explain in detail Error detection and correction in DLL.
27. Explain any four interfacing devices in communication networks.
28. Explain the classification of routing algorithms.
29. Compare and contrast between TCP and UDP protocols.
30. Explain symmetric key cryptography.
31. Write short note on IP security protocol.

(6 × 4 = 24 Marks)

SECTION – D

Answer any two questions not exceeding 4 pages. Each question carries 15 marks.

32. Explain in detail various switching method in data communication.
33. Explain CSMA protocol with collision detection and avoidance.
34. Explain
 - (a) What is congestion? Explain Leaky bucket algorithm.
 - (b) Explain in detail Secure Sockets Layer (SSL)
35. Explain RSA algorithm with procedure for generate public and private keys. Explain with suitable example.

(2 × 15 = 30 Marks)