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S – 1952

Reg. No. : ....

Name : ....

Fifth Semester B.Sc. Degree Examination, December 2023

Career Related First Degree Programme Under CBCSS

Group 2(a) – Physics and Computer Applications

Core Course VII

PC 1541 — ELECTRONICS

(2014 Admission Onwards)

Time : 3 Hours

Max. Marks : 80

SECTION – A

Answer **all** questions in **one** or **two** sentences. Each question carries **1** mark.

1. The ripple factor of a half wave rectifier.

2. Give the schematic symbol of a PNP transistor.

3. Sketch V-I characteristics of Zener diode under reverse bias.

4. Expression for voltage gain in dB is —————————.

5. Write down any one advantage of FM over AM.

6. Draw schematic symbol of an OP amp. Mark inverting, non -inverting and output terminals.

7. Convert 6.75 to binary number.

P.T.O.

State True or False

8. An oscillator employs positive feedback.

9. The reverse current in a junction diode is due to minority charge carriers.

10. In a transistor, collector is heavily doped.

(10 × 1 = 10 Marks)

SECTION – B

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

11. Why is CE configuration preferred for amplifying action compared to other transistor configuration?

12. Using NOR gate construct AND gate and OR gate.

13. Obtain the relation between current gain in a common base and common emitter configuration.

14. What is an oscillator? Explain Barkhausen criterion for sustained oscillation.

15. Draw the waveforms of the diode current and the load voltage for a sinusoidal input voltage applied to (a) Half-wave rectifier (b) Full-wave rectifier.

16. Explain construction of a Half Adder with its truth table.

17. Explain different breakdown mechanism observed in a junction diode.

18. Sketch the schematic symbol and truth table of D flipflop.

19. Sketch the static input and output characteristics of a common base transistor.

20. Explain the terms virtual ground and CMRR of an OPAMP.

21. Explain super heterodyne AM receivers.

22. Explain cross over distortion in amplifier.

(8 × 2 = 16 Marks)

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SECTION – C

Short Essay questions (not to exceed **120** words) Answer any **six** questions. Each carries **4** marks.

23. A 6.2 V Zener is used to regulate an input voltage which fluctuates between 9 V and 12 V. It is connected across a load of 1 kΩ and a series resistor of 330 Ω. Calculate the maximum and minimum values of Zener current.

24. A diode, whose internal resistance is 30 Ω is to supply power to a 990 Ω load from a 110 V (rms) source of supply. Calculate (a) the peak load current. (b) the dc load current. (c) the ac load current, (d) the dc diode voltage, (e) the total input power to the circuit.

25. For the common emitter transistor amplifier biased with a voltage divider method has following components. R_1 = 10 kΩ, R_2 = 5 kΩ, R_C = 1 kΩ, R_E = 2 kΩ, R_1 = kΩ, V_{CC} = 15 V and V_{BE} = 0.7 V (i) Draw de load line (ii) Find Operating point.

26. In a particular BJT, the base current is 7.5 μA and the collector current is 940 μA. Find β and α for the device.

27. When negative feedback is applied to an amplifier of gain 200, the overall gain becomes 50. (a) Calculate the feedback factor. (b) If feedback factor remains same, calculate the value of amplifier gain, so that the overall gain becomes 30.

28. Sketch the construction of a RC phase shift oscillator and it explain its working.

29. An AM radio station broadcasts audio signals in the range 1 KHz to 5 KHz. It uses a carrier wave of frequency 1000 KHz. Calculate the (a) maximum and minimum frequencies of side bands and (b) its channel width.

30. What is the output voltage V_O of the figure?
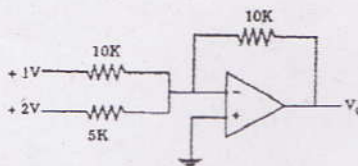
31. Simplify the Boolean Expression (a) $\overline{A}(A+B)+(B+A)(A+\overline{B})$ (b) $\overline{AB}(\overline{A}+B)(\overline{B}+B)$.

(6 × 4 = 24 Marks)

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SECTION – D

(Long Essay questions) Answer any **two** questions. Each carries **15** marks.

32. With a neat sketch explain construction and working of a Full wave rectifier. Calculate its efficiency and ripple factor.

33. Explain transistor biasing. With neat sketch explain voltage divider bias. Hoy its operating points are calculated. Obtain expression for stability factor?

34. What are the characteristics of an OPAMP? Explains its differential amplifier. Construct inverting and non-inverting amplifier. Obtain its expression for gain.

35. Explain Master Slave operation in JK flip-flop using necessary sketches. What is the advantage of over J-K flipflop?

(2 × 15 = 30 Marks)

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Fifth Semester B.Sc. Degree Examination, December 2023

Career Related First Degree Programme Under CBCSS

Group 2(a) : Physics and Computer Applications

Core Course VIII

PC 1542 — ATOMIC AND NUCLEAR PHYSICS

(2013 Admission Onwards)

Time : 3 Hours

Max. Marks : 80

SECTION – A

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

1. In heavier atoms, generally $j - j$ coupling exists. Why?

2. Define Zeeman effect.

3. Give the selection rule for alkali spectra.

4. In which region of electromagnetic spectrum do most of the pure rotational spectra of molecules falls?

5. What are relative values of the three principal moments of inertia of a spherical to molecule?

6. What is meant by mass defect in a nucleus?

7. Define curie (Ci), a unit of radioactivity.

8. What is tokamak?

9. What are leptons?

10. What are resonance particles?

SECTION – B

Short answer type questions. Answer any **eight** questions. **Each** question carries 2 marks.

11. Define gyromagnetic ratio. Give its expression in the case of orbital motion of electron.

12. What is Larmor precession? Give the expression for Larmor frequency for the orbital magnetic moment of a single electron.

13. Write a note on anomalous Zeeman effect.

14. What is meant by Born-Oppenheimer approximation in molecular spectroscopy?

15. What are the condition for a pure vibration of a molecule to be infrared active?

16. Explain nuclear quadrupole moment.

17. Explain Yukawa's meson theory.

18. Derive the radioactive decay law.

19. Give any two applications of radioisotopes in medicine.

20. What is the function of moderator in a nuclear reactor? Give two examples for moderators.

21. Explain inertial confinement in fusion reactors.

22. Write a short note on strange particles.

SECTION – C

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

23. The term symbol of first excited state of sodium is $3^2P_{1/2}$. List the possible quantum numbers n, l, j and m_j of the outer electron.

24. A magnetic dipole moment μ is places in a magnetic field **B**. Show that interaction energy between dipole moment and magnetic field is $U = -\mu.\mathbf{B}$.

25. The calcium line of wavelength $\lambda = 4226.73\,A^0 (P \rightarrow S)$ exhibits normal Zeeman splitting when placed in a magnetic field of 3 T. Calculate the wavelength separation between original and modified lines ($e = 1.6 \times 10^{-19}$ C, $m = 9.1 \times 10^{-31}$ kg., $c = 3 \times 10^8$ m/s).

26. The average spacing between adjacent rotational lines of CO molecule 3.8626 cm^{-1}. Calculate the length of CO bond ($h = 6.626 \times 10^{-34}$ JS, $c = 3 \times 10^8$ m/s, mass of C = 1.992×10^{-26} kg, mass of O = 2.656×10^{-26} kg).

27. What is the average period of rotation of an HCl molecule when it is in the $l = 1$ state? Given the moment of inertia of HCl molecule is 2.64×10^{-47} kg ($h = 1.054 \times 10^{-34}$ JS).

28. Calculate the binding energy per nucleon in $^{12}_{6}C$. Masses of hydrogen atom and neutron are 1.0078 u and 1.0087 u respectively. Atomic mass of $^{12}_{6}C = 12u$.

29. The half-life of ^{90}Sr is 28.8 years. Find the activity of 1 g of $Sr - 90$ if its atomic weight is 89.91 g/mol. Give Avogadro number $N_A = 6.02 \times 10^{23}$ atoms/mol.

30. Calculate the energy released when 1 kg of nuclear fuel is consumed if the fusion reaction $^2_1H + ^2_1H \rightarrow ^4_2He$ is possible. (Mass of $^{2H}_1 = 2.0141u$, mass $^4_2He = 4.0026u$).

31. Based on the law of conservation of baryon number, which of the following reactions can occur?

    (a) $\pi^- + p \rightarrow \pi^0 + n + \pi^- + \pi^+$ (b) $p + \bar{p} \rightarrow p + p + \bar{p}$

(6 × 4 = 24 Marks)

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SECTION – D

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

32. Explain the vector atom model and various quantum numbers associated with it.

33. Explain the rotational spectra of a rigid diatomic molecule, Give the applications of rotational spectrum.

34. Explain the essential features of shell model of a nucleus. What are magic numbers? Give any four evidences for the existence of magic number?

35. Explain the origin of line and continuous beta ray spectrum and hence discuss the neutrino theory of beta decay.

(2 × 15 = 30 Marks)

Reg. No. : ....

Name : ....

Fifth Semester B.Sc. Degree Examination, December 2023

Career Related First Degree Programme under CBCSS

Group 2 (a) – Physics and Computer Applications

Vocational Course

PC 1571 : DATABASE MANAGEMENT SYSTEM

(2021 Admission)

Time : 3 Hours   Max. Marks : 80

SECTION – A (Very Short Answer Type)

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

1.   Define database.

2.   Hierarchical model follows ───────── data structure.

3.   Age can be an example of derived key: State whether True/False.

4.   Define Entity.

5.   What do you mean by simple attribute?

6.   BCNF stands for ───────.

7.   Write the query to delete STUDENT table.

8. Define subquerry.

9. What do you mean by transaction?

10. Define Timestamp.

<div align="right">(10 × 1 = 10 Marks)</div>

SECTION – B (Short Answer)

Not to exceed one paragraph. Answer any **eight** questions. **Each** question carries **2** marks.

11. What are the disadvantages of DBMS?

12. Write a note on 'view' of data.

13. Define database schema.

14. What is entity set? Write in short.

15. Write the condition for 1NF.

16. Write a short note on DTL queries.

17. Define the term cardinality.

18. What is functional decomposition?

19. Describe the term serializability.

20. Write the need of security for database.

21. Define predicate reads.

22. What are the purposes of database systems?

<div align="right">(8 × 2 = 16 Marks)</div>

SECTION – C (Short Essay)

Not to exceed **120** words, answer any **six** questions. Each question carries **4** marks.

23. Explain in detail about relational data model.

24. Write a note on ER model design process.

25. Describe primary key in detail.

26. Write a detailed note on functional dependency.

27. Discuss in detail about any four Aggregate functions.

28. Write a detailed note on inner join.

29. Describe integrity constraints.

30. Explain the terms Consistency and Durability with an example.

31. List and explain database maintenance issues in detail.

(6 × 4 = 24 Marks)

SECTION – D (Long Essay)

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

32. Discuss various operations in relational algebra in detail.

33. Write a note on ER data model.

34. Explain different types of integrity constraints in SQL. Explain in detail.

35. Describe Lock based protocol in detail.

(2 × 15 = 30 Marks)

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