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**M – 1828**

Reg. No. : .....

Name : .....

**Fifth Semester B.Sc. Degree Examination, December 2021**

**Career Related First Degree Programme Under CBCSS**

**Group 2(b) — Physics and Computer Applications**

**Core Course VII**

**PC 1541 — ELECTRONICS**

**(2018 and 2019 Admission)**

Time : 3 Hours

Max. Marks : 80

**SECTION – A**

Answer all questions. Each carries 1 mark.

1. What is a rectifier circuit?
2. Which is the most widely used method of biasing a transistor?
3. Give an application for class C amplifier.
4. In which power amplifier does crossover distortion occur?
5. What is the feedback usually employed in oscillators?
6. What is the disadvantage of negative feedback?
7. What is amplitude modulation?
8. What is CMRR?
9. What do you mean by input offset voltage?
10. Why NAND gate is called a universal gate?

**(10 × 1 = 10 Marks)**

P.T.O.

## SECTION – B

Answer any eight, each carries 2 marks.

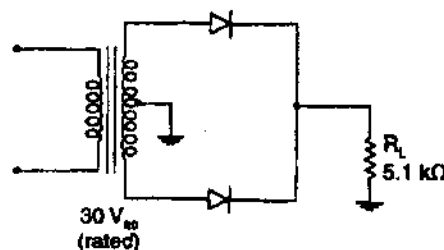
11. What is DC resistance of a diode?
12. What are the advantages of bridge-rectifier over centre-tapped full wave rectifier?
13. What is ac load line?
14. What are the different methods of biasing a transistor?
15. What is phase distortion?
16. What are the disadvantages of class B push pull amplifier?
17. What is the advantage of expressing gain of an amplifier in dB?
18. What is an emitter follower?
19. How is  $360^\circ$  phase shift achieved in RC phase shift oscillator?
20. Explain an inverting amplifier using op-amp.
21. List the properties of an op-amp.
22. What is the need for negative feedback in op-amps.
23. What do you mean by frequency response of an op-amp?
24. Why SSB transmission is more power efficient?
25. Which are the basic laws of Boolean algebra?
26. What is master slave JK flip-flop?

(8 × 2 = 16 Marks)

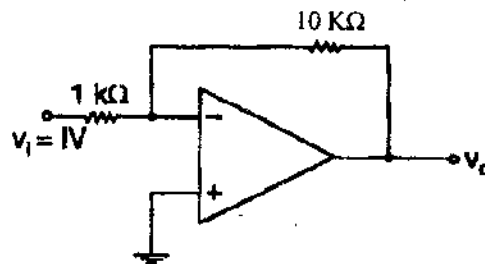
## SECTION – C

Answer any six, each carries 4 marks.

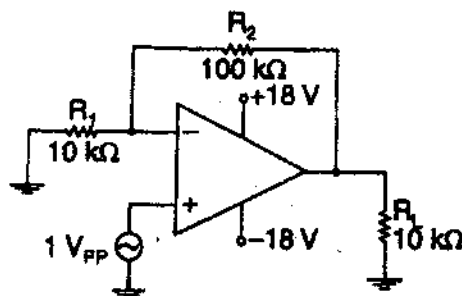
27. For the center-tapped full wave rectifier shown below find the average or d.c. load current.



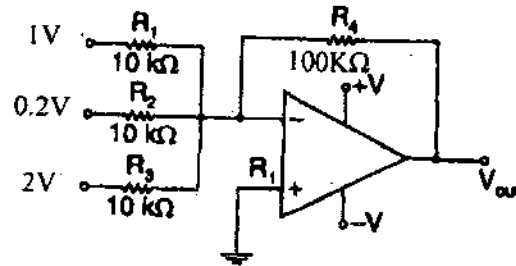
28. What is the value of load regulation for a zener diode voltage regulator, given  $V_{NL} = 8V$ ,  $V_{FL} = 7.995V$ , change in current  $\Delta I_L = 40 \text{ mA}$ ?
29. The common base d.c. gain ( $\alpha$ ) of a transistor is 0.987. If  $I_E$  is 10 mA, determine the value of collector and base currents?
30. The voltage gain of an amplifier without feedback is 400. If the feedback ratio ( $\beta$ ) is equal to 0.1. Find the voltage gain of the amplifier with negative feedback.
31. Two stages of a multi-stage amplifier have gains of 50dB and 20dB. What is the overall gain for the amplifier?
32. A transistorized RC phase shift oscillator has the following values  $R_1 = R_2 = R_3 = 2.2 \text{ M}\Omega$  and  $C_1 = C_2 = C_3 = 47 \text{ pF}$ . At what frequency will the circuit oscillate?
33. The total power content of an AM wave is 1500W. For a 100% modulation determine the power transmitted by the carrier.
34. Figure shows an inverting amplifier with an input voltage of 1 V. Find the value of output voltage.



35. What is the value of output voltage for the non-inverting op-amp shown below?



36. For the summing amplifier given below find the value of output voltage.



37. State and prove De Morgan's theorem.  
38. Implement NOT and OR gates using NOR gates.

(6 × 4 = 24 Marks)

#### SECTION – D

Answer any **two**, each carries **15** marks.

39. Explain the working of a zener diode voltage regulator.  
40. Explain the steps to be followed to design a transistor biasing and stabilization circuits.  
41. What are the different distortions seen in amplifiers?  
42. Explain the principle of feedback amplifiers.  
43. Sketch the block diagram of a super heterodyne AM receiver and explain.  
44. Explain the working of a full-subtractor.

(2 × 15 = 30 Marks)

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**Fifth Semester B.Sc. Degree Examination, December 2021**

**Career Related First Degree Programme Under CBCSS**

**Group 2 (a) – Physics and Computer Applications**

**Core Course VIII**

**PC 1542 – ATOMIC AND NUCLEAR PHYSICS**

**(2018 & 2019 Admn)**

Time : 3 Hours

Max. Marks : 80

**SECTION – A**

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

1. What is spatial quantization?
2. What is anomalous Zeeman effect?
3. Define hyperfine structure.
4. HCl molecules shows a rotational spectral line but it is not shown by an H<sub>2</sub> molecule. Why?
5. Distinguish between hadrons and leptons.
6. The neutrons and protons could not be subdivided. Justify the statement.
7. What is nuclear fusion?
8. What are isotopes?

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9. An alpha particle is emitted from a nucleus. What will happen to its atomic number and mass number?
10. What do you mean by mean life of a nucleus?

**(10 × 1 = 10 Marks)**

**SECTION – B**

Answer all eight questions. Each question carries 2 marks.

11. Distinguish between L-S coupling and JJ coupling.
12. Explain the postulates of vector atom model.
13. Define Bohr magnetron, What its value?
14. What are the spectra associated with a diatomic molecule? Write the wavelength region where these spectra are observed.
15. Explain Pauli's exclusion principle.
16. What is a rigid rotator?
17. Write the properties of beta particles.
18. State the proton-electron hypothesis.
19. Very briefly explain the shell model of nucleus.
20. What is packing fraction of a nucleus?
21. Explain half-life of a nucleus.
22. What are the radioactive series?
23. Explain the principle of an atom bomb.
24. What is a magnetic bottle?
25. Write a short note on properties of gamma rays.
26. Write the structure of neutron and proton using quark model.

**(8 × 2 = 16 Marks)**

## SECTION – C

Answer any six questions. Each question carries 4 marks.

Avogadro number  $N = 6.023 \times 10^{23}$ ,  $1 \text{ amu} = 1.67 \times 10^{-27} \text{ kg}$  Energy of 1 amu = 931 MeV, Bohr magneton  $\mu_B = 9.27 \times 10^{-24} \text{ J T}^{-1}$ .

27. A hydrogen atom is placed in a magnetic field of 2 T, Calculate the energy difference between  $m_l = +1$  and  $m_l = -1$  component in the 2 p state. Given that the Bohr magneton  $\mu_B = 9.27 \times 10^{-24} \text{ J T}^{-1}$ .
28. Find the values of L and S for the ground state of nitrogen.
29. Draw the Zeeman splitting of the ground state level  $3^2S_{1/2}$  and the excited state levels  $3^2P_{1/2}$  and  $3^2P_{3/2}$  of sodium. Draw the transitions allowed by selection rules.
30. Calculate the energy corresponding to 542 nm in joule, electron volt and in wavenumber.
31. The HCl molecule gives the vibrational spectral line of wavelength  $3.465 \times 10^{-6} \text{ m}$ . Calculate the force constant of the HCl bond. Given that atomic masses of  $^1H = 1.0087 \text{ amu}$ ,  $^{35}Cl = 35.453 \text{ amu}$  and  $1 \text{ amu} = 1.67 \times 10^{-27} \text{ kg}$ .
32. Assume that the  $1 \text{ amu} = 931 \text{ MeV}$ , Calculate the mass of C-12 isotope.
33. Estimate the binding energy of  $^{15}P_{31}$  Mass of  $^{15}P_{31} = 30.973763 \text{ amu}$ . Mass of proton = 1.001825 amu and mass of neutron = 1.008665 amu.
34. The disintegration constant of a radioactive substance is  $9.435 \times 10^{-8}$ , calculate its half-life period.
35. Calculate the time required for disintegrating 20% of  $^{238}\text{U}$ , which has a half-life of 4.5 billion years.

36. Calculate the energy released by the fission of 1 kg of U235 in KWh, given that the energy released per fission is 200 MeV,  $1 \text{ MeV} = 1.6 \times 10^{13} \text{ J}$ ,  $1 \text{ KWh} = 3.6 \times 10^6 \text{ J}$ .
37. Explain thermonuclear reactions, and explain the proton-proton chain reaction. Nuclear fusion -1 mark- pp- reaction 3 marks.
38. Write a note on elementary particle quantum numbers.

**(6 × 4 = 24 Marks)**

#### SECTION – D

Answer any two questions. Each question carries 15 marks.

39. Explain the Stern and Gerlach experiment and its inference. What do you mean by electron spin and gyromagnetic ratio?
40. Write a note on the change in spectrum of an atom, viz; Na when its is placed in a weak, moderate and strong magnetic fields. Explain, how Paschen-Back effect is occurring and write its theory.
41. Classify the molecules based on their moment of inertia, with the help of examples. Discuss the rotational spectra of a diatomic molecule in detail.
42. Explain the liquid drop model and the semi-empirical mass formula and explain the existence magic numbers.
43. Explain alpha decay and derive the KE associated with an alpha particle. Explain the theory of alpha decay.
44. Explain the process of release of energy by nuclear fission chain reaction. Explain the working of a nuclear reactor.

**(2 × 15 = 30 Marks)**



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**Fifth Semester B.Sc. Degree Examination, December 2021**

**Career Related First Degree Programme under CBCSS**

**Group 2(a) : PHYSICS AND COMPUTER APPLICATIONS**

**Core Course**

**PC 1571 : DATABASE MANAGEMENT SYSTEM**

**(2018 and 2019 Admission)**

Time : 3 Hours

Max. Marks : 80

**SECTION – A**

**(Very Short Answer)**

**(One word to maximum of 2 sentences. Answer all questions. Each question carries 1 mark.)**

1. Define key in a database.
2. What do you mean by one to one relationship?
3. Define trivial FD.
4. What is a derived attribute? Give an example.
5. Which is the keyword used in conjunction with SELECT statement to eliminate all the duplicate records and fetching only unique records?
6. What is a strong entity?

P.T.O.

7. Write down various DDL commands.
8. What is a physical database schema?
9. What is the purpose of the keyword DESC in an SQL statement?
10. What is the purpose of normalization?

**(10 × 1 = 10 Marks)**

### SECTION – B

(Short Answer)

(Not to exceed one paragraph, answer any eight questions. Each question carries 2 marks.)

11. What do you mean by insertion anomaly?
12. Mention the aggregate functions in SQL and its purpose.
13. What is a composite attribute? Give an example.
14. Explain view in a database.
15. What is physical data independence?
16. Mention any four DML commands in SQL.
17. List out different types of JOIN in SQL operations.
18. What do you mean by domain constraints? Give example.
19. Explain UPDATE command with syntax and example.
20. What is tuple relational calculus?
21. Give an SQL query to illustrate the usage of (a) BETWEEN (b) LIKE.

22. What is the use of GROUP BY and HAVING clause in SQL?
23. What do you mean by partial participation? How it can be represented in an ER diagram?
24. Differentiate the DELETE and DROP commands in SQL.
25. Explain the following (a) Super key (b) Candidate key.
26. Explain the use of (a) NOT NULL (b) DEFAULT.

**(8 × 2 = 16 Marks)**

### SECTION – C

(Short Essay)

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

27. Write a note on domain relational calculus.
28. Explain nested queries in SQL with syntax and example.
29. Explain the concept of primary key and foreign key with examples.
30. Differentiate database approach versus file processing approach.
31. Explain functional dependency with an example.
32. Explain different schemas in a DBMS.
33. What is generalization? Explain with example.
34. Explain aggregate functions in SQL.
35. Explain set difference in SQL with an example.
36. What is a weak entity? Explain with an example.
37. Explain specialization in ER model.
38. Explain Boyce Codd normal form with an example.

**(6 × 4 = 24 Marks)**

SECTION – D

(Long Essay)

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

39. With a neat diagram explain the components of a DBMS.
40. Explain the symbols used in ER model. Draw an ER diagram for a Hotel Management System.
41. Explain in detail, the relational algebra operations with examples.
42. Explain 1NF, 2NF and 3NF in detail.
43. Consider the following schema and write down the SQL for the following. Assume the table is created with necessary constraints and values inserted.

Sailors(sid:integer,sname:string,rating:integer,age:integer)

Boats(bid:integer,bname:string,color:string)

Reserves(sid:integer,bid:integer,day:date)

- (a) Find the names of sailors who have reserved boat 103.
  - (b) Find the color of the boat reserved by Lubber.
  - (c) Find the names of sailors who have reserved a red boat or a green boat.
  - (d) Count the number of sailors.
  - (e) For each red boat, find the number of reservations for this boat.
44. Explain lossy join and loseless join decompositions with examples.

(2 × 15 = 30 Marks)