PGIIIS-O-841 B-19

M.Sc. III Semester (CBCS) Degree Examination

PHYSICS

Electronics and Instrumentation

Paper : HCT 3.1

(Old)

Time : 3 Hours   **Maximum Marks : 80**

Instructions to Candidates:

Answer all questions of 15 marks each and any two questions of 10 marks each.

1. a) What are the characteristics of an ideal op-amp?

   b) Explain with circuit diagram how op-amp can be used as adder and subtractor circuits.

                                                                        (5+10)

(OR)

2. a) Explain the RC phase shift oscillator using op-amp and deduce the expression for frequency and gain of the circuit.

   b) Describe with circuit diagram how op-amp can be used as current to voltage convertor.

                                                                        (9+6)

3. a) What are the Demultiplexers and Multiplexers? Explain operation of a 1:4 line Demultiplexer circuit with its truth table.

   b) What do you mean by encoder and decoder? Explain with example.   **(10+5)**

(OR)

4. a) Describe the construction and working of master slave JK flip-flop with its circuit diagram and verify the truth table.

   b) What are shift Registers? Describe the in series and parallel out shift Register circuit.

                                                                        (8+7)

5. a) Write down the classifications of transducers based on the principles and mechanisms.

   b) Explain the piezo-electric transducer and obtain the voltage sensitivity of the crystal.

                                                                        (8+7)

(OR)

6. a) Explain the principle and working of photo conductive transducer and discuss its characteristic spectral response.

    b) What is thermoelectric transducer? Explain the signal amplification and method of instrumentation. (7+8)

7. Explain the method of production and measurement of high vacuum. (15)

(OR)

8. Describe the principle and working of TGA with neat diagram and explain how this is useful in analyzing the thermal properties and mention its applications. (15)

9. Explain the integrator and differentiator circuits of an Op-amp. (10)

10. Write a note on architecture and operations of microprocessor. (10)

11. Write a note on LVDT. (10)

12. Explain the construction and working of SEM. (10)

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M.Sc. III Semester (CBCS) Degree Examination
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(New)

Time : 3 Hours   Maximum Marks : 80

Instructions to Candidates:

Answer all the questions of **15** marks each and any **two** questions of **10** marks each.

1. a) Write down the characteristics of an ideal Op-amp.

    b) Explain with circuit diagram how op-amp can be used as summing and subtracting circuits.   (5+10)

(OR)

2. a) Explain the RC phase shift oscillator using op-amp and deduce the expression for frequency and gain of the circuit.

    b) Describe with circuit diagram how op-amp can be used as voltage to current convertor.   (9+6)

3. a) What are the multiplexers and Demultiplexers? Explain operation of a 1:8 line demultiplexer circuit with its truth table.

    b) What do you mean by coder, encoder and decoder? Explain with example.   (10+5)

(OR)

4. a) Describe the construction and working of JK Flip-Flop with its circuit diagram and verify the truth table.

    b) What are shift registers? Describe the parallel in and series out shift register circuit.   (8+7)

5. a) What are transducers? Classify the transducers based on the principles and mechanisms.

    b) Describe the piezo-electric transducer and obtain the voltage sensitivity of the crystal.   (8+7)

6. a) Explain the principle and working of photo conductive transducer and discuss its characteristic spectral response.

    b) What is thermoelectric transducer? Explain the signal conditioning, amplification and method of instrumentation. (7+8)

7. Explain the method of production and measurement of high vacuum. (15)

(OR)

8. Describe the principle and working of TGA with neat diagram and explain how this is useful in analyzing the thermal properties and mention its applications. (15)

9. Describe the integrator and differentiator circuits of an Op-amp. (10)

10. Write a note on microprocessor. (10)

11. Describe the principle and working of LVDT. (10)

12. Explain the construction and working of SEM. (10)

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PGIIIS-N-842 B-19
M.Sc. III Semester(CBCS) Degree Examination
PHYSICS
Mathematical Physics - II
Paper : HCT 3.2
(New)

Time : 3 Hours   Maximum Marks : 80

Instructions to Candidates:

   *Answer **All** questions of 15 marks and any **Two** questions of 10 marks.*

1. a)   State and prove the convolution theorem. What is it's physical significance?

    b)   Find Fourier series representing a periodic function $f(x)=|\sin(x)|, 0<x<2\pi$. **(10+5)**

                                     (OR)

2. a)   Find Fourier transform for $f(t)=A\exp(-at)\cos(\omega t)$, where A and a are constants.

    b)   Show that Fourier transform of a Gaussian function is a Gaussian.   **(10+5)**

3. a)   Show that Voltaire integral equations $\int\limits_{a}^{x} k(x,t)y(t)dt + a(x)y(x) = f(x)$ where,

         $k(x,t), y(t), y(x)$ and $a(t)$ and $f(x)$ are functions.

    b)   Solve the equation $y = 2x(1+y)$ if $y(0)=0$ for a boundary value problem. **(10+5)**

                                     (OR)

4. a)   Explain the Green's function method of solving boundary value problems in physics
         with one physical example.

    b)   Find the Green's function for the boundary value problem $u'' - 2xu' = f(x)$, $0 < x < 1$;
         $u(0) = u'(1) = 0$ if it exists. If it does not exist give reasons.   **(10+5)**

5. a)   Explain Runge-Kutta method of solving a differential equation numerically.

    b)   Find the solution of equation $x^3 - x - 1 = 0$, correct to 4 decimal places; using the
         Newton Raphson method.   **(10+5)**

                                     (OR)

6. a)   Explain the method of numerical integration using Trapezoidal rule.

    b)   Using Trapezoidal rule evaluate the integral $\int_0^6 e^{-x^2}$ with number of subintervals $n=6$.

    (10+5)

7. a)   Explain data types used in C language with examples for each type.

    b)   Write a C- program to solve $sin(x) - e^x = 0$ by fixed point iteration method.   (10+5)

(OR)

8. a)   Explain input and output statements used in C language with example.

    b)   Line of C-code.

    c)   Write a C-program to perform linear least square fit on a set of data points.   (10+5)

9.   Find the Laplace transform of $sin(\sqrt{t})$ and Laplace transform of first order derivative of $sin(\sqrt{t})$.   (10)

10. Find the Green's function for the boundary value problem $y''(x) + y(x) = f(x)$, $y(0) = 0$, $y'(1) = 0$. Give one physical situation which follows a similar differential equation model.

    (10)

11. Explain Newton's methods of interpolation for polynomials.   (10)

12. Write a generic program in C to find the eigen values of 2×2 matrix.   (10)

PGIIIS-N-845 B-19
M.Sc. III Semester (CBCS) Degree Examination
PHYSICS
Nuclear Physics-I
Paper : SCT 3.2
(New)

Time : 3 Hours   Maximum Marks : 80

Instructions to Candidates:

Answer **all** the questions of **15** marks and any **two** questions of **10** marks each.

1. a) Explain ground state properties of deuteron.

    b) Discuss the neutron-proton scattering at low energy. Explain the spin dependence of nuclear forces on the basis of low energy n-p scattering.   (5+10)

(OR)

2. a) What is a coherent scattering? Explain.

    b) Derive an expression for scattering cross section of ortho and para hydrogen.(3+12)

3. a) Show that shell model with infinite square well potential that includes spin-orbit interaction can generate all magic numbers.

    b) Predict the spin and parity $\frac{3}{2}He$ and $\frac{27}{13}Al$ (12+3)

(OR)

4. a) Give a brief account of the collective model of nucleus.

    b) How does it help in understanding the nuclear fission.   (10+5)

5. a) What are fundamental interactions? Explain.

    b) Discuss the classification of elementary particles based on their fundamental interaction and conservation laws.   (5+10)

(OR)

6. a) Discuss lepton and baryon numbers.

    b) Discuss the experimental evidences for the non-conservation of parity in weak interactions.   (7+8)

7. a) What are quarks? Give the quark model of Hadrons.

    b) Determine whether the following reactions are allowed or forbidden.

        i) $P + P \rightarrow K^1 + \sum^1$

        ii) $P + P \rightarrow P + P + P + \bar{P}$ (10+5)

                               (OR)

8. a) Discuss the eight-fold way quark model of Baryon multiplets.

    b) Explain the Gellmann-Okubo mass formula.   (10+5)

9. Explain tensor character of nuclear forces.   (10)

10. Write a note on Fermi gas model.   (10)

11. Explain CP violation.   (10)

12. Write a note on super symmetry.   (10)

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PGIIIS-O-846 B-19

M.Sc. III Semester (CBCS) Degree Examination

PHYSICS

Energy Physics-I

Paper : SCT 3.2

(Old)

Time : 3 Hours   Maximum Marks : 80

Instructions to Candidates:

Answer **All** the questions of **15** marks each and any **Two** questions of **10** marks each.

1. a)   Distinguish between conventional and non-conventional energy sources.

    b)   Take stock of non-renewable sources of energy and hence make out a case for renewable sources of energy.   **(5+10)**

(OR)

2. a)   Briefly discuss latitude, altitude and hour angle.

    b)   Discuss the effect of atmosphere on solar insolation.   **(5+10)**

3. a)   Distinguish between heat transport processes.

    b)   With the help of P-V diagram discuss Otto cycle.   **(5+10)**

(OR)

4. a)   What is a Compressor? Explain.

    b)   Explain how electric power can be produced from heat.   **(5+10)**

5. a)   Explain the concept of photo voltaic effect.

    b)   Give the solar cell characteristics, efficiency and spectral response. **(5+10)**

(OR)

6.   Give the fabrication of homo junction solar cell? Discuss the working and mention the factors affecting the efficiency of cells.   **(15)**

7. Derive energy balance equation for liquid Flat plate collector. (15)

(OR)

8. a) Give the advantages of focussing type collectors.

   b) Outline the construction and working of a solar tracking device. (5+10)

9. Discuss the composition of Sun. (10)

10. Compare the efficiencies of different heat cycles. (10)

11. Give an account of hetero Junction solar cells. (10)

12. Write a note on green house effect. (10)