

1B5N21189

(Pages : 2)

Reg. No:.....

Name:

FAROOK COLLEGE (AUTONOMOUS), KOZHIKODE

Fifth Semester B.Sc Physics Degree Examination, November 2021

BPH5B06 – Computational Physics

(2019 Admission onwards)

Time: 2 hours

Max. Marks: 60

SECTION A

Short answer type.

(Answer all questions in two or three sentences, each correct answer carries a maximum of 2 marks)

1. What do you mean by a high level language? Give any two examples.
2. Write any two advantages of Python in comparison to other languages.
3. How will you define dictionaries in Python. Give an example.
4. Give the lines of code for creating a new file and write to it.(Use any example)
5. Write any two difference between a tuple and a list
6. Write the line of codes used for plotting the relation “ $y=2x$ ” with axis labeling.
7. What is meant by curve fitting?
8. Write the formula for integral in Trapezoidal rule and Simpson’s 1/3 rule.
9. Write any two advantages of numerical methods over analytical method
10. Explain how truncation error and round off error varies with step size
11. Write a python program to find the real roots of a quadratic equation.
12. Write the forward difference table for the set of values given below

x	1.1	1.2	1.3	1.4
y	3.54	4.87	6.98	8.04

(Ceiling-20 marks)

SECTION B

Paragraph/Problem type

(Answer all questions in a paragraph of about half a page to one page,
each correct answer carries a maximum of 5 marks)

13. Fit a straight line to the following set of data points using least square curve fitting.

x	1	2	3	4	5	6	7	8
y	6.7	7.8	8.9	10.0	11.1	12.2	13.3	14.4

14. Discuss any five list operations with one example for each.
15. Evaluate the integral $\int_0^1 3x^3 dx$ using Simpson's 1/3 rule.(Use step size=0.2)
16. Write a Python program for simulating fall of a body in a viscous medium
17. How will you define user defined functions? Write Python programs for defining
(1) square and (2)square roots of a number as a function.
18. Given that $\frac{dy}{dx} = x + y$ with initial condition $y(0)=1$.Evaluate $y(0.5)$ using second order Euler method.Use step size as 0.1
19. Find the positive root of the equation $x^4 - x = 10$ correct to three decimal places.Given that root lies between 1 and 2.

(Ceiling-30 marks)

SECTION C: Essay type

(Answer in about two pages, any one question. Answer carries 10 marks)

20. (A) Explain how conditional statements(if, elif,else) are executed in Python with suitable examples.
(B)Explain the use of "for" and "while" statements with two examples for each.
21. (A)Explain how Runge-Kutta method(second order) is used to find the solution of a differential equation.
(B) Write a Python program to plot the trajectory of a projectile (Use Euler's method).

(1 x 10 = 10 Marks)

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(Pages : 2)

Reg. No:.....

Name:

FAROOK COLLEGE (AUTONOMOUS), KOZHIKODE

Fifth Semester B.Sc Physics Degree Examination, November 2021

BPH5B07 – Quantum Mechanics

(2019 Admission onwards)

Time: 2 hours

Max. Marks: 60

Section A – Short Answer type

(Answer all questions in two or three sentences, each correct answer carries
a maximum of 2 marks)

1. What is ultraviolet catastrophe of classical physics ?
2. Explain the term cutoff frequency in photoelectric effect.
3. 'Compton wavelength is not a true wavelength but it is a change of wavelength'.
Explain.
4. What is 'Bremsstrahlung' emission ?
5. Wave particle duality can be explained if you use photographic film instead of screen in Young's double slit experiment. Explain.
6. What do you mean by Probability Amplitude ?
7. Describe any two basic properties of atom.
8. Write down Rutherford scattering formula and list the symbols.
9. Draw the experimental arrangement of Franck- Hertz apparatus and explain the parts in it.
10. State and explain 'Correspondence principle'.
11. What is meant by normalisation of wave functions.
12. What is the working principles of a tunnel diode ?

(Ceiling 20)

Section B – Paragraph / Problem type

(Answer all questions in a paragraph of about half a page to one page. Each correct answer carries a maximum of 5 marks)

13. How does the photoelectric effect support quantum theory of light?
14. Obtain the expression of ground state energy and plot the energy level diagram of a quantum mechanical simple harmonic oscillator.
15. Discuss the quantum numbers used to explain 3D hydrogen atom.
16. Explain the 'Normal Zeeman effect'. Derive the expression for the 'Bohr Magneton'.
17. The Andromeda nebula at a distance of 2×10^{22} m from earth radiates 8×10^{27} W in the spectral line frequency 1420 MHz. What is the number photons received/second when the nebula is observed by a 100 m^2 radio telescope?
18. A hydrogen atom is 5.3×10^{-11} m in radius. Use uncertainty principle to estimate the minimum energy an electron can have in this atom.
19. Normalize the wave-function $\psi = Ae^{-ax}$ for $x > 0$
and $\psi = Ae^{ax}$ for $x < 0$
where a is a positive constant.

(Ceiling 30 Marks)

Section C – Essay type

(Answer in about two pages, any one question. Answer carries 10 marks)

20. Obtain time independent Schrodinger's equation for one –dimensional motion hence discuss the eight steps involved in the *Schrodinger's recipe*.
21. Explain the Bohr concept of the atomic structure and derive an expression for the total energy of the hydrogen atom.

(Marks 10 = 10 x 1)

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Reg. No:.....

Name:

FAROOK COLLEGE (AUTONOMOUS), KOZHIKODE

Fifth Semester B.Sc Physics Degree Examination, November 2021

BPH5B08 – Optics

(2019 Admission onwards)

Time: 2 hours

Max. Marks: 60

The symbols used in this question paper have their usual meanings

Section A - Short Answer type.

(Answer all questions in two or three sentences, each correct answer carries a maximum of 2 marks)

1. State and explain Fermat's principle of least time.
2. What are coherent sources? Give 2 examples.
3. Draw the intensity distribution curve of interference pattern.
4. Explain the phenomenon of colours of thin films
5. Give two uses of Michelson's interferometer.
6. Define the resolving power of a grating. Write down an expression for it.
7. Write down the condition for obtaining intensity minima & maxima in Fraunhofer single slit diffraction pattern and explain the symbols.
8. Compare a zone plate and a convex lens.
9. State and explain Brewster's law.
10. What are negative and positive crystals? Give two examples for each.
11. Distinguish between photography and holography.
12. What is the difference between step index fibre and graded index fibre?

(Ceiling - 20)

Section B - Paragraph / Problem type

(Answer all questions in a paragraph of about half a page to one page, each correct answer carries a maximum of 5 marks)

13. Derive the first law of refraction from Fermat's principle.
14. Fresnel's biprism of refractive index 1.5 has an angle of 1° . If the biprism is kept at a distance of 0.3m from the slit illuminated by a monochromatic light of wavelength 6000 \AA . Find the fringe width. $D = 8\text{m}$
15. A parallel beam of sodium light ($\lambda = 5890 \text{ \AA}$) strikes a film of oil floating on water. When viewed at an angle of 30° from the normal, 8th dark band is seen. Determine the thickness of the film (μ of oil = 1.5)
16. A parallel beam of monochromatic light is allowed to be incident normally on a plane transmission grating having 5000 lines / cm and the third order spectral line is found to be diffracted through 45° . Calculate the wavelength of light.
17. A narrow slit is illuminated by a light of wavelength $6.4 \times 10^{-7} \text{ m}$ is placed at a distance of 3m from a straight edge. If the distance between the straight edge and the screen is 6m, calculate the distance between the first and the fourth dark bands.
18. Calculate the thickness of (i) a quarter wave plate and (ii) a half wave plate. Given that $\mu_o = 1.973$, $\mu_e = 2.656$, $\lambda = 590 \text{ nm}$
19. Derive the expression for acceptance angle of an optical fibre.
In an optical fibre, the core has a refractive index of 1.6 and the cladding has a refractive index of 1.3. Find the values of critical angle and acceptance angle for the fibre.

(Ceiling - 30)

Section C - Essay type

(Answer in about two pages, any one question. Answer carries 10 marks)

20. Describe the experiment to determine the wavelength of light using Newton's ring arrangement.
21. Explain with theory the production of circularly polarised and elliptically polarised light waves.

(1x10 = 10 marks)

FAROOK COLLEGE (AUTONOMOUS), KOZHIKODE
Fifth Semester B.Sc Physics Degree Examination, November 2021
BPH5B09 – Electronics (Analog & Digital)
(2019 Admission onwards)

Time: 2 hours

Max. Marks: 60

The Symbols used in this question paper have their usual meaning

Section A- Short Answer Type

(Answer all question in two or three sentences. Each correct question carries a maximum of 2 Marks)

1. Explain construction and working of π filter.
2. Define current gain in a common base and common emitter configuration.
3. Sketch the direct coupled multistage amplifier. Mention one of its applications.
4. An amplifier is normally employed negative feedback. Explain why?
5. State and explain Demorgan's theorem.
6. Convert 31.5_{10} in to Binary and HexaDecimal number system.
7. Using 1's complement subtracts 101110 from 111011.
8. Explain construction of a Half Adder with its truth table.
9. What is an oscillator? Explain Barkhausen criterion for sustained oscillation.
10. Explain how Zener diode can be used a voltage regulator.
11. Briefly explain (a) gain-band width product (b) frequency response curve.
12. Draw DC and AC equivalent circuit for a single stage transistor amplifier.

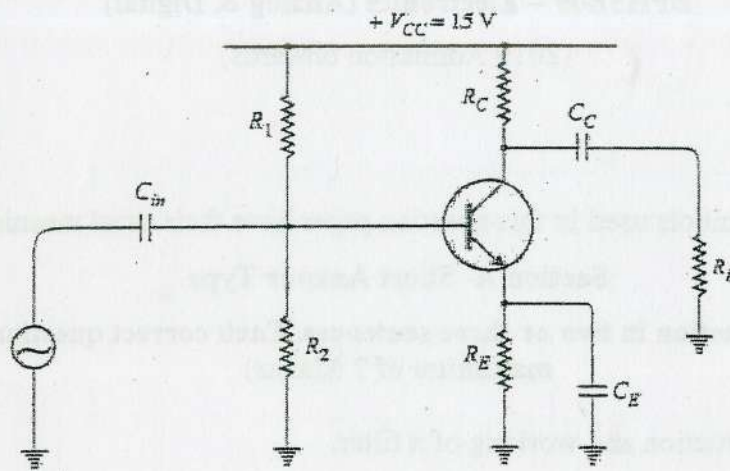
(Ceiling -20 Marks)

Section B- Paragraph/Problem Type

(Answer all question in a paragraph or half page to one page.
Each correct question carries a maximum of 5 Marks)

13. Explain with neat diagram construction and working of OPAMP integrator.
14. Explain construction and working of a voltage tripler circuit.
15. With a neat sketch explain construction and working of a transformer coupled amplifier. Mention one application.

16. For the transistor amplifier shown in Figure $R_1=10\text{ k}\Omega$, $R_2=5\text{ k}\Omega$, $R_C=1\text{ k}\Omega$, $R_E=2\text{ k}\Omega$, $R_L=1\text{ k}\Omega$, $V_{CC}=15\text{ V}$ and $V_{BE}=0.7\text{ V}$ (i) Draw dc load line (ii) Find Operating point (iii) Draw ac load line.



17. In a phase shift oscillator $R_1=R_2=R_3=1\text{ M}\Omega$ and $C_1=C_2=C_3=50\text{ pF}$. At what frequency the circuit will oscillate? What will be the resistance R used to produce frequency of 10 kHz for the same capacitors?
18. For an OPAMP inverting amplifier with $R_1=2.2\text{ k}\Omega$ and $R_F=15\text{ k}\Omega$. (i) Calculate closed loop gain and draw the output wave form if input signal 5 mV is applied across the inverting terminal. (ii) Instead of applying input signal at the inverting terminal, if same signal is applied at the non-inverting terminal what is closed loop gain and sketch the output wave form.
19. An amplifier has a bandwidth of 200 kHz and voltage gain of 80 , what will be the new bandwidth and gain if 5% of negative feedback is introduced? What will be the input and output impedance of the network with feed back if their values without feedback were $20\text{ k}\Omega$ and $1\text{ k}\Omega$ respectively?

(Ceiling -30 Marks)

Section C

(Answer all question in a paragraph or half page to one page.
Each correct question carries a maximum of 10 Marks)

20. Explain transistor biasing. What is need of transistor biasing? With a neat diagram explain voltage divider bias. Obtain Stability factor.
21. With the help of diagrams and truth table explain the working of RS and JK Flipflop.

(1 × 10 = 10 Marks)

1B5N21193

(Pages : 2)

Reg. No:.....

Name:

FAROOK COLLEGE (AUTONOMOUS), KOZHIKODE

Fifth Semester B.Sc Physics Degree Examination, November 2021

(Open Course)

BPH5D01 – Non Conventional Energy Sources

(2019 Admission onwards)

Time: 2 hours

Max. Marks: 60

Section A - Short Answer type.

**(Answer all questions in two or three sentences,
each correct answer carries a maximum of 2 marks)**

1. Give the differences between renewable and non-renewable sources of energy.
2. Define solar constant.
3. Why the sun is called the ultimate source of fossil fuels?
4. Mention two disadvantages of using wood as fuel.
5. A sheet of glass is used in solar heating devices. Why?
6. Write the principle of the windmill?
7. What is anaerobic degradation?
8. What are the different forms of energy obtained from the ocean?
9. What are the raw materials required for a biogas plant?
10. What is the difference between biomass and biogas?
11. Give the difference between primary and secondary cells.
12. What are natural geysers?

(Ceiling -20)

Section B - Paragraph/Problem type.

**(Answer all questions in a paragraph of about half a page
to one page, each correct - carries a maximum of 5 marks)**

13. What is fuel? Give any four characteristics of good fuel.
14. Explain the working of a solar greenhouse with a neat diagram.
15. Discuss the advantages and disadvantages of using solar cells.
16. Explain the working of tidal energy power plant with a neat diagram.
17. Discuss the advantages and disadvantages of the wind energy conversion system.
18. How biomass conversion takes place?
19. What are the main applications of geothermal energy?

(Ceiling -30)

Section C - Essay type

(Essays - Answer in about two pages, any one question. The answer carries ten marks)

20. Describe with a neat sketch the working of a wind energy system (WECS) with main components.
21. Describe the principle of working of solar furnace. What are its main applications?
What are the advantages and limitations of the solar furnace?

(1 × 10 = 10 marks)