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1B5N24211 (Pages : 2) Reg. No:.....

Name: .....

FAROOK COLLEGE (AUTONOMOUS), KOZHIKODE

Fifth Semester B.Sc Physics Degree Examination, November 2024

BPH5B06– Computational Physics

(2022 Admission onwards)

Time: 2 hours Max. Marks : 60

SECTION A
Answer the following questions
Each carries 2 marks

1. Write any two advantages of Python in comparison to other languages.
2. How will you define 'sets' in Python? Give an example.
3. Write any two differences between a tuple and a list.
4. Give the lines of code for creating a new file and write to it.(Use any example)
5. How arrays are created in python ?
6. Write the line of codes used for plotting the relation " y=4x" with axis labeling.
7. Explain how polar plots can be created in Python.
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. Mention any two applications of Euler's method.
12. Write the forward difference table for the set of values given below

x	1.1	1.2	1.3	1.4
y	4.87	6.98	8.04	10.12

(Ceiling-20 marks)

SECTION B
Answer the following questions.
Each carries 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	6.8	7.9	8.9	10.1	11.1	12.4	13.5	14.8

14. Discuss how 'for' and 'while' loops are used in Python.
15. Write a Python program to multiply two matrices.

16. Evaluate the integral $\int_0^1 4x^3 dx$ using Simpson's 1/3 rule.(Use step size=0.2)

17. Write the Python program for plotting the position time graph of a freely falling body.

18. Write a Python program for simulating 'fall of a body in a viscous medium'.

19. Write a Python program to list the position and time of a projectile

(Ceiling-30 marks)

SECTION C
Answer any one question

20. (A) Explain how conditional statements (**if,elif,else**) are executed in Python with suitable examples

    (B) Explain the operations "**append,remove,sort,reverse,max & min**" on a list with suitable examples

21. (A)Explain how Runge-Kuttamethod (second order) is used to find the solution of a differential equation.

    (B) Explain Euler's method to find the solution of a differential equation.

(1 x 10=10 marks)

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1B5N24212 (Pages : 2) Reg. No:.....
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FAROOK COLLEGE (AUTONOMOUS), KOZHIKODE

Fifth Semester B.Sc Physics Degree Examination, November 2024

BPH5B07 – Quantum Mechanics

(2022 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. What is the significance of the threshold wavelength in photoelectric effect ?
2. Differentiate between absorption and emission spectra
3. Draw the intensity vs frequency graph of blackbody radiation
4. Write the equation for energy of electron in third quantum state of Hydrogen atom
5. Differentiate between phase velocity and group velocity of dispersive wave
6. Mention any two characteristics of De Broglie wave
7. State Heisenberg's uncertainty principle for momentum and position of a particle
8. Write down the general equation for energy of the particle in *1D* infinite potential well
9. What you mean by degeneracy of eigenstates ?
10. Explain the correspondence principle
11. Define Bohr magneton.
12. Write down the possible l values and m_l values for $n=8$.

(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. Find the shortest and longest wavelengths of spectral lines called Balmer series of Hydrogen atom.
14. With the help of diagram, explain Frank-Hertz experiment.

15. A particle is trapped in an infinite potential well of width L. If the particle is in the ground state, evaluate the probability to find it between $x = 0$ and $x=L/2$

16. Show that the most likely distance of an electron from the nucleus is $4a_0$, where a_0 is the Bohr radius and radial probability $P(r) = \frac{r^4}{24a_0^5} e^{\frac{-r}{a_0}}$

17. Explain Davisson-Germer experiment to prove that particles show wave-particle duality.

18. In a simultaneous determination of the position and momentum of an electron of kinetic energy *7 Mev*, the position is determined by an accuracy of *3 nm*. Calculate the percentage of uncertainty in the momentum of the electron.

19. Explain the space quantization of angular momentum.

(Ceiling:30 marks)

SECTION C – Essay type

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

20. A) Define the probability density (2 marks)

B) Write the Schrodinger equation for quantum mechanical Harmonic oscillator and derive the expression for energy in n^{th} quantum state (8 marks)

OR

21. A) Explain the pair production and pair annihilation ? Why the pair production does not occur in empty space. (5marks)

B) Derive the expression for change in the wavelength occurred during the Compton scattering process (5 marks)

(1 × 10 = 10 marks)

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Name: .....

FAROOK COLLEGE (AUTONOMOUS), KOZHIKODE

Fifth Semester B.Sc Physics Degree Examination, November 2024

BPH5B08 – Optics

(2022 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. Explain the phenomenon of colour of thin films.
3. Derive an expression for the fringe width in a wedge shaped film.
4. What is the function of a compensating plate in Michelson's interferometer?
5. What are missing orders? Find out the condition for missing order in double slit diffraction pattern.
6. Define resolving power. What is Rayleigh's criterion for resolution?
7. Derive an expression for the dispersive power of grating?
8. What is a zone plate? What are the two types of it?
9. What are positive and negative crystals ? Give two examples for each.
10. Explain how circularly polarized light can be produced.
11. What are the advantages of a hologram over an ordinary photograph?
12. What is meant by pulse dispersion in optical fibre communication?

(Ceiling-20)

Section-B

Paragraph/ Problem type

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

13. Using Fermat's principle, prove the laws of reflection.
14. A biprism is placed at a distance of 5cm in front of a narrow slit, illuminated by Sodium light (λ=5890 A^o) and the distance between virtual sources is found tobe 0.05 cm. Find the width of the fringes observed in an eyepiece at a distance of 75 cm from the biprism.

15. A parallel beam of Sodium light (λ=5890A°)strikes a film of oil floating on water. When viewed at an angle of 30° from the normal the 8thdark band is seen. Determine the thickness of the film. Given μ=1.5.
16. What is a grating? With diffraction grating arranged for normal incidence it's found that spectral line of 600 nm in second order overlaps a spectral line in third order. Find the wavelength of the latter.
17. A parallel beam of monochromatic light is allowed to incident normally on a plane transmission grating having 5000 lines/cm and the third order spectral line is found to be diffracted at an angle 45°. Calculate the wavelength of light.
18. Calculate the least thickness of a sapphire plate which would convert plane polarized light into circularly polarized light. Given μ_o= 1.768, μ_e=1.760 and wavelength of light is 590nm.
19. What is meant by acceptance angle for an optical fibre. Derive an expression for the acceptance angle and numerical aperture of a step index fibre in terms of refractive index of core and cladding.

(Ceiling -30)

Section-C: Essay type
(Answer any one question, carries 10 marks)

20. Explain the formation of Newton's rings. Why are the rings circular? How can this be used to determine the wavelength of monochromatic light?
21. Discuss the theory of holography by obtaining intensity distribution on hologram and reproduction wave.

(1 x 10 = 10 Marks)

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FAROOK COLLEGE (AUTONOMOUS), KOZHIKODE

Fifth Semester B.Sc Physics Degree Examination, November 2024

BPH5B09 – Electronics

(2022 Admission onwards)

Time: 2hours 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. Why filters are used in electronic circuit? Explain action of capacitor filter.
2. With neat circuit explain working of a voltage doubler.
3. An amplifier is normally employed negative feedback. Explain why?
4. Sketch the static output characteristics of common-emitter transistor and indicate the active, saturation and cut-off regions
5. What are the basic characteristics of an ideal OPAMP?
6. Sketch the circuit of an OPAMP differentiator. Write the expression for its output.
7. What is the purpose of emitter bypass capacitor in CE amplifier?
8. Explain phase reversal in CE amplifier.
9. Construct AND gate using NOR gate.
10. Draw a half adder circuit. What is the Boolean equation for CARRY and SUM in a half adder ?
11. What are different leakage currents in common base and common emitter configuration. Obtain the relation connecting them.
12. Convert the following decimal numbers into its binary equivalents.
    (a) 15.825 (b) 127

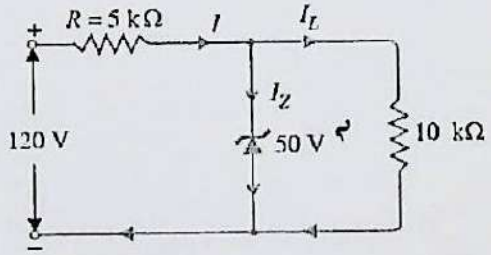
(Ceiling -20 Marks)

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. An amplifier has a voltage gain of 2×10^5 without feedback. Determine the gain if negative series voltage feedback is applied with feedback factor is is0.02. Express the gain in dB.
14. Design an inverting amplifier with a gain of 15. What is the output voltage if the input voltage is 125 mV?
15. With a neat sketch explain construction and working of a transformer coupled amplifier. Mention one application.
16. Express power gain and voltage gain in decibels. Explain how band width of an amplifier is estimated using frequency response curve.
17. For a single stage CE transistor amplifier biased with voltage divider method with following circuit elements R_1 = 16 kΩ, R_2= 4 kΩ, R_C = 2.2 kΩ, R_E = 1.3 kΩ, V_{CC} =20 V (i) Draw d.c. load line (ii) Determine the operating point. Assume V_{BE} = 0.7 V .
18. Simplify the Boolean expression
    (a) $Y = A.\overline{B}.C + \overline{A}.\overline{B}.C + \overline{A}.\overline{B}.\overline{C} + A.\overline{B}.\overline{C}$
    (b) $Y = A.C + A.D + A.\overline{C}.\overline{D} + A.B$
19. For the circuit shown in Fig.1 (i), find : (i) the output voltage (ii) the voltage drop across series resistance (iii) the current through zener diode.



(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. With the help of diagrams and truth table explain the working of RS and JK Flipflop.
21. State the Barkhausen criteria for sine wave oscillator and explain why they must be fulfilled to sustain oscillation. Draw the circuit diagram of a phase shift oscillator and explain circuit operation. Write the expression for frequency. What are the advantages RC Oscillator over LC Oscillators?

(1 ×10 =10 Marks)

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1B5N24215 (Pages : 2) Reg. No:.....

Name: .....

FAROOK COLLEGE (AUTONOMOUS), KOZHIKODE

Fifth Semester B.Sc Physics Degree Examination, November 2024

(Open Course)

BPH5D01 – Non Conventional Energy sources

(2022 Admission onwards)

Time: 2 hours Max. Marks : 60

Section A
Short Answer type
(Answer in two or three sentences Each correct carries a maximum of 2 marks)

1. Define supplementary sources of energy.
2. What is O T E C?
3. Define biomass.
4. Define primary energy sources. Give any two examples for primary energy source.
5. Define power coefficient in the case of wind energy.
6. Define geothermal sources.
7. Define secondary fuels. Give an example for secondary fuels.
8. What is aero generator?
9. What are the causes of wind?
10. What are the main advantages and disadvantages of biomass energy?
11. What are the possible sources of geothermal pollution? How these are avoided?
10. What are the advantages and disadvantages of conventional & non-conventional energy sources?
11. What is diffuse radiation?
12. What is fuel?

(Ceiling 20)

Section B
Paragraph/problem type
(Answer in a paragraph of about half a page to one page Each correct answer carries a maximum of 5 marks)

13. Explain the principle of conversion of solar energy in to heat.
14. Write down any four advantages wind energy.
15. What are the advantages of renewable energy?
16. With help of a diagram explain briefly the green house effect.
17. What are the obstacles to the implementation of renewable energy systems?
18. With the help of a diagram, explain the operation of wave energy conversion
19. What are the difficulties in tidal power development?

(Ceiling 30)

Section C- Essay type

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

20. What are the basic instruments used for the measurement of solar radiation?

21. Explain the construction and working of a fixed dome type biogas plant.

(1 × 10 = 10 marks)