2B5N22193 (Pages : 2) Reg. No:.....

Name: .....

FAROOK COLLEGE (AUTONOMOUS), KOZHIKODE

Fifth Semester B.Sc Physics Degree Examination, November 2022

(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. What is fuel?
2. What is mean by geothermal energy?
3. What is a sunshine recorder?
4. Mention two disadvantages of geothermal energy.
5. What is mean by the solar pond?
6. Write the basic principle of the solar cooker?
7. Define the photovoltaic effect.
8. What do you mean by geopressured system.
9. What is fermentation?
10. What is the difference between waves and tides?
11. What is meant by secondary cells?
12. What are the two routes for solar energy collection?

(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. Explain the working of solar distillation with a neat diagram.
14. Explain the working of a windmill with a neat sketch.
15. Explain the working of the solar cell.
16. Explain the basic theory of batteries.
17. How are WEC systems classified?
18. What is the basic principle of ocean thermal energy conversion (OTEC)? Explain.
19. What are the advantages of batteries for bulk energy storage?

(Ceiling -30)

Section C - Essay type

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

20. Explain how tidal power is used to generate electricity with one tidal energy conversion plant. Give its limitations.

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

(1 ×10 = 10 marks)

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2B5N22189 (Pages : 2) Reg. No:.....

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FAROOK COLLEGE (AUTONOMOUS), KOZHIKODE

Fifth Semester B.Sc Physics Degree Examination, November 2022

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. Distinguish between compilers and interpreters.
2. Write any four examples of High level language.
3. How will you define 'sets' in Python? Give an example.
4. Give the line of code to retrieve data from a file(Use any example)
5. Write a python program to print numbers from 1 to 100
6. Name the module used for plotting graphs in Python. Write the line of codes used for labeling axis and title.
7. Give Newton's forward interpolation formula. Name the symbols.
8. Outline the principle of Newton-Raphson method.
9. Explain how truncation error and round off error varies with step size
10. Write any two disadvantages of numerical methods over analytical methods.
11. Write a Python program " to test whether a year is leap year or not"
12. Write the forward difference table for the set of values given below

X	2.2	3.2	4.2	5.2	6.2
Y	3.456	4.567	5.678	6.789	7.890

(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. Discuss the operations "appending a list, inserting to a list, remove from a list, reversing a list and sorting a list" with one example for each.

14. What do you mean by curve fitting? Fit a straight line to the following set of data points using least square curve fitting.

x	2	3	4	5	6
y	15	20	25	30	35

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

16. Evaluate the integral $\int_1^2 (x^2 + x)dx$ using Simpson's 1/3 rule. Use step size =0.2

17. Given that $\frac{dy}{dx} = x + y$ with initial condition y(0)=1.Evaluate y(0.5) using second order RK method. Use step size as 0.1

18. How will you define user defined functions? Write Python programs for defining (1) factorial and (2) cube root of a number as a function.

19. Find the rate of change of 'y' with respect to 'x' at x=1 from the following table of data

x	0.5	1	1.5	2	2.5	3
y	2.25	1.00	3.37	8.00	1.56	2.20

(Ceiling-30 marks)

SECTION C: Essay type

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

20. (A) Explain Euler method for solving differential equations. Write a Python program for it(Use any differential equation)

    (B)Write the Python program for plotting the position time graph of a freely falling body.

21. (A) Explain how conditional statements(if,elif,else) are executed in Python using "the solution of quadratic equation" as an example.

    (B)Explain the use of "for" and "while" statements with two examples for each.

(1x10=10 marks)

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2B5N22190 (Pages : 2) Reg. No:.....

Name: .....

FAROOK COLLEGE (AUTONOMOUS), KOZHIKODE

Fifth Semester B.Sc Physics Degree Examination, November 2022

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 do you mean by black body radiation?
2. The process of simultaneous emission of photoelectrons from a metal surface disagrees with wave theory. Why?
3. Compton effect is the main reason by which x-rays lose energy when they pass through matter. Why?
4. What is the 'delayed choice experiment'?
5. Is an electron a wave or particle? Justify your answer.
6. What do you mean by the group speed of deBroglie waves?
7. Describe the process of emission and absorption by an atom.
8. Write down Planck's radiation formula and list the symbols.
9. Mention any two drawbacks of Bohr model of atom.
10. How can you identify the distinction between free particle and confined particle?
11. What is the working principle of a tunnel diode ?
12. What do you mean by the 'fine structure' of spectral lines?

(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. Pair production cannot occur in empty space. Why?
14. Prove the non-existence of electron inside the nucleus using the uncertainty principle.
15. Explain the working principle of a Scanning Tunneling Microscope (STM).
16. Find the longest wavelength present in the Balmer series of hydrogen atom.
17. What is the force experienced by a mirror when it reflects all the light from a laser with a power of 10mw?
18. In an experiment of photoelectric effect, it is observed that for light of wavelength500nm, a stopping potential of 0.25 V is required to cut off photoelectrons whereas at a wavelength of 375 nm, a stopping potential of 1.0V required. Calculate the of Planck's constant to electric charge ratio (h/e).
19. Find the value of normalization constant A of the wave function,

$$\Psi = Axe^{-x^2/2}$$

(Ceiling 30)

Section C – Essay type

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

20. Explain Zeeman Effect. Give a description of the behavior of an atom in the external magnetic field and hence find the expression for the Bohr magneton.
21. Explain the wave nature of electron. Establish Davisson-Germer experiment as an evidence to the wave nature of electron.

(1 x 10 = 10 Marks)

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Name: .....

FAROOK COLLEGE (AUTONOMOUS), KOZHIKODE

Fifth Semester B.Sc Physics Degree Examination, November 2022

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 the conditions for obtaining constructive and destructive interference?
3. How can you use the biprism to find the thickness of a thin sheet of mica?
4. Write the cosine law for interference by division of amplitude.
5. Derive an expression for fringe width in wedge shaped film.
6. Explain the diffraction by a circular aperture.
7. What is Rayleigh's criterion for resolution.
8. What are Fresnel's half period zones? Why are they called so?
9. Explain the phenomenon of polarisation by double refraction.
10. Explain how a circularly polarised light can be produced.
11. Give two advantages of optical fibre communication system over conventional telecommunication system.
12. Briefly explain how image is constructed from a hologram.

(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 laws of reflection from Fermat's principle.
14. The distance between the slit and the biprism and between the biprism and the screen are 50cm each. The angle of biprism is 179^0 and its refractive index is 1.5 on a screen 80cm away from it. If the distance between the successive fringes is 0.0135cm, calculate the wavelength of a light used.
15. In a wedge shaped film, the distance between the successive fringes is measured to be 1.25mm. The angle of the wedge is 40 seconds. Calculate the wavelength of light used $\mu = 1.4$.
16. Calculate the size of the circular opening in an opaque screen which will transmit 10 Fresnel zones to a point 1m away for a wavelength of 600 nm.
17. The critical angle for glass air boundary is 38^0, Calculate the polarising angle and the angle of refraction corresponding to the polarising angle.
18. Calculate the thickness of ice capable of inverting a circularly polarized light $\mu_0 = 1.309$, $\mu_e = 1.313$ and $\lambda = 590$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. Give the theory of plane diffraction grating and explain how it is used to measure the wavelength of a given source of light.
21. Derive expression for the condition of brightness and darkness produced under oblique incidence of light on a plane film producing interference, due to reflected light.

(1x10 = 10 marks)

2B5N22192

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

Name: .....

FAROOK COLLEGE (AUTONOMOUS), KOZHIKODE

Fifth Semester B.Sc Physics Degree Examination, November 2022

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)

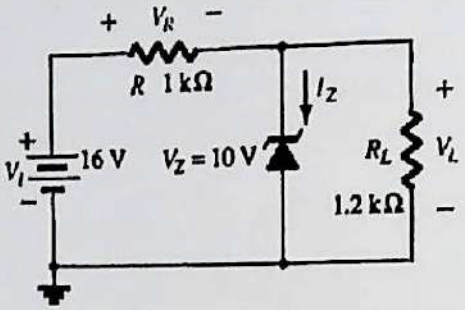
1. Explain working of a choke input filter.
2. Draw the block diagram of a full adder and write down the truth table.
3. Sketch the ac equivalent circuit of single stage transistor amplifier.
4. What are the different current components of a n-p-n transistor when the emitter junction is forward-biased and the collector junction is reverse-biased. What is the source of the leakage current in a transistor?
5. Why are NAND and NOR gates called universal gates? Justify your answer with the help of examples
6. What do you mean by the term load line? Explain its significance.
7. Sketch the static output characteristics of common-emitter transistor and indicate the active, saturation and cut-off regions.
8. Explain the current amplification factors for CB and CE configurations of a n-p-n transistor. Obtain a relation between them.
9. Convert 255_{10} in to Binary, Octal and Hexa Decimal number system.
10. Using 2's complement subtracts 101110 from 111001
11. With the help of circuit symbol and truth table explain how does the XOR gate differ from the OR gate.
12. Sketch out phase shift oscillator.

(Ceiling -20 Marks)

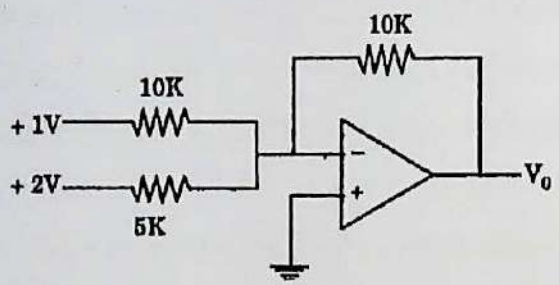
Section B- Paragraph/Problem Type

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

13. Sketch the frequency response curve of two stage RC coupled amplifier. Explain different regions. Mention one application of RC coupled amplifier.
14. Explain construction and working of OPAMP differentiator. A triangular wave input is driving a differentiator. Draw its output wave form.
15. For the Zener diode regulator, (a) Determine V_L, V_R, I_Z and P_Z (b) If the load is changed to $R_L = 3\ k\Omega$, repeat the above problem.



16. Explain fixed bias method.
17. What is the output voltage V_o of the figure?



18. With the help of diagrams explain the working of J-K flip flop.
19. Simplify the given equations and implement the results with logic gates

(i) $\bar{A} + \bar{A}B + AB\bar{C}$

(ii) $A + \bar{A}B + AB\bar{C} + \overline{AB}$

(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 with a neat sketch working of full wave bridge rectifier. Obtain the expression for efficiency, ripple factor and peak inverse voltage of the rectifier.
21. What are different types of feedback employed? Obtain the expression for gain with feedback for negative and positive feedback circuit. Mention advantages of negative feedback employed in amplifier.

(1 ×10 =10 Marks)