

FAROOK COLLEGE (AUTONOMOUS), KOZHIKODE

Fifth Semester B.Sc Physics Degree Examination, November 2017

PH5B06 – Electrodynamics - II

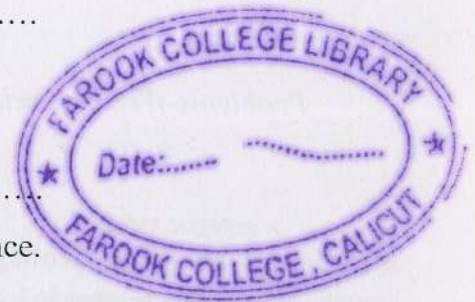
(2015 Admission onwards)

Max. Time: 3 hours

Max. Marks: 80

*The symbols used in the question paper have their usual meanings.***Section A***Answer in a word or a phrase.**Answer **all** questions.**Each question carries **1** mark.*

1. The direction of the induced e.m.f. is given by.....
2. The unit of Mutual Inductance is.....
3. The time constant of LR circuit is.....
4. The condition for resonance in LCR series circuit is.....
5. A constant voltage source has internal resistance.

**State whether true or false (6-10):**

6. Self Induction of a coil is determined by Anderson Bridge
7. The direction of propagation of electromagnetic waves is given by EXB
8. Blue light has the shortest wavelength in electromagnetic spectrum.
9. A passive network contains no source of e.m.f. in it.
10. Source conversion technique can be applied to all circuits.

(10 x 1 = 10 marks)**Section B***Answer in one or two sentences.**Answer **all** questions.**Each question carries **2** marks.*

11. Explain Kirchhoff's IInd law.
12. What is resonance in AC circuits?
13. What is an ideal current source?
14. What is the relation between velocity of light, permeability and permittivity?
15. What is Pointing vector?
16. How Maxwell modified Amperes' law?
17. What is figure of merit of a galvanometer?

(7 x 2 = 14 marks)

Section C

Answer in a *paragraph* of about half to one page.

Answer *any five* questions.

Each question carries **4marks**.

18. Derive Neumann's formula.
19. What is magnetic charge?
20. What is logarithmic decrement?
21. Derive an expression for energy and momentum of electromagnetic waves.
22. What is sharpness at resonance?
23. Show that the electric vector E and magnetic vector B in electromagnetic waves are perpendicular to each other.
24. State and prove power transfer theorem.

(5 x 4 = 20 marks)

Section D

Problems-Write all relevant formulas, all important steps carry *separate* marks.

Answer *any four* questions.

Each question carries **4 marks**.

25. A sinusoidal voltage $=100\sin 100t$ is applied across a pure inductance of 0.16H. Determine the instantaneous current, instantaneous power and average power.
26. A steady potential of 20 V is applied to a series circuit containing a 5Ω ohm resistance and inductance of 1H. Calculate the current after 0.2 s.
27. Two resistance 5Ω and 10Ω are connected in series to a source 100V. Two series resistance 10Ω and 4Ω are in series across the 10Ω . Find out the current through 4Ω .
28. An electric lamp 40V, consumes 10 A current, when connected to an A.C source 100V, 50Hz. Calculate the inductance of coil.
29. A conductor of length 1.2 m moving at an angle 60° with a uniform magnetic field 1.5 wb/m^2 . If the velocity of the conductor is 20m/s calculate the induced current.
30. In a LCR circuit a coil has inductance of 0.2H, Resistance 100Ω and capacitance 0.22. Check whether the circuit is oscillatory. If oscillatory find out frequency.
31. The magnetic field induction in a material placed in a magnetising field of 2000 Am^{-1} is $1.0 \text{ NA}^{-1} \text{ m}^{-1}$. Calculate permeability of the material, relative permeability, magnetic susceptibility, and magnetisation.

(4 x 4 = 16 marks)

Section E

Answer in two *or* three pages.

Answer *any two* questions.

Each question carries **10 marks**.

32. What is the theory of B.G. How the ballistic constant of a B.G is determined?
33. Describe the theory and working of Anderson Bridge.
34. Derive Maxwell's equations inside polarised matter.
35. When electromagnetic waves passes from one medium to another show that the sum of reflection coefficient and transmission coefficient is unity.

(2 x 10 = 20 marks)

FAROOK COLLEGE (AUTONOMOUS), KOZHIKODE
Fifth Semester B.Sc Physics Degree Examination, November 2017
PH5B07 – Quantum Mechanics
(2015 Admission onwards)

Max. Time: 3 hours

Max. Marks: 80

Section A

Answer all questions in a word or phrase.

Each question carries 1 mark.

1. Slope of kinetic energy of photo electron vs frequency of incident light graph is (e is the charge of electron and h is the Plank's constant):

a. e	c. h/e
b. h	d. e/h
2. Photo electric phenomenon was first explained by:

a. Bohr	c. Einstein
b. Millikan	d. Planck.
3. The existence of matter waves is confirmed by:
 - a. Sten- Gerlach experiment
 - b. Frank –Hertz experiment
 - c. Millikan's oil drop experiment
 - d. Davison and Germer Experiment.
4. The waves associated with electrons are called:

a. Light waves	c. Matter waves
b. Sound waves	d. Transverse waves
5. Lyman series of hydrogen spectra is in the _____ region of electromagnetic spectrum.
6. The energy operator is:

a. $\frac{\hbar}{i} \frac{\partial}{\partial t}$	c. $\frac{\hbar}{i} \nabla$
b. $i\hbar \frac{\partial}{\partial t}$	d. $i\hbar \nabla$
7. What is the lowest value of the energy possessed by harmonic oscillator?
8. What is the expectation value of the position of a particle trapped in a box L wide in the ground state?
9. Which quantum number is related to the Quantization of angular-momentum direction?
10. The magnetic moment of an electron in a Bohr orbit of radius r is proportional to

a. r	b. r^3	c. r^2	d. \sqrt{r}
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(10 x 1 = 10 Marks)

Section B

Answer all questions in two or three sentences.

Each question carries 2 marks.

11. Write the expression for the de Broglie wavelength of a moving object. Why the wave properties of macroscopic objects are not significant?
12. State and explain correspondence principle.
13. List the properties of a well behaved wave function.
14. What do you mean by the linearity property of Schrödinger's equation?
15. Define expectation value of an operator.
16. Using uncertainty principle, explain why only one component of angular momentum is quantized?
17. State and explain Pauli's exclusion principle.

(7 x 2 = 14 Marks)

Section C

*Answer any five questions in a paragraph of about half a page to one page
Each question carries 4 marks.*

18. Obtain the expression for fractional change in frequency of a photon when it falls in gravitational field.
19. Define phase velocity and group velocity. Show that the group velocity of a moving particle is equal to particle velocity.
20. Derive the expression for electron energy levels of Hydrogen atom.
21. Briefly explain Frank-Hertz experiment.
22. State the postulates of quantum mechanics.
23. Derive time dependent Schrödinger's equation.
24. Explain the normal Zeeman effect.

(5 x 4 = 20 Marks)

Section D

*Answer any four questions.
Each question carries 4 marks*

25. An electron and a positron are moving side by side in the $+x$ direction at $0.500c$ when they annihilate each other. Two photons are produced that move along the x axis.
(a) Do both photons move in the $+x$ direction? (b) What is the energy of each photon?
26. A typical atomic nucleus is about 5.0×10^{-15} m in radius. Use the uncertainty principle to place a lower limit on the energy an electron must have if it is to be part of a nucleus.
27. Find the longest wavelength present in the Balmer series of hydrogen, corresponding to the H_{α} line.
28. An Eigen function of the operator $\frac{d^2}{dx^2}$ is $\Psi = e^{2x}$. Find the corresponding Eigen value.
29. Electrons with energies of 1.0 eV and 2.0 eV are incident on a barrier 10.0 eV high and 0.50 nm wide. Find their respective transmission probabilities.
30. A sample of a certain element is placed in a 0.300 T magnetic field and suitably excited. How far apart are the Zeeman components of the 450 nm spectral line of this element?
31. Find the equatorial velocity of an electron under the assumption that it is a uniform sphere of radius $r = 5.00 \times 10^{-17}$ m that is rotating about an axis through its center.

(4 x 4 = 16 Marks)

Section E (Essays)

*Answer any two questions in about two pages
Each question carries 10 marks.*

32. Explain Compton Effect. Obtain an expression for the change in wavelength of a Compton scattered photon.
33. State de Broglie hypothesis. Explain Davison – Germer Experiment.
34. Set up Schrödinger's equation for the harmonic oscillator. Obtain the energy levels of harmonic oscillator. Show that the energy levels are evenly spaced.
35. Explain the quantum numbers associated with hydrogen atom. What are their values? Explain the significance of the quantum numbers.

(2 x 10 = 20 Marks)

FAROOK COLLEGE (AUTONOMOUS), KOZHIKODE

Fifth Semester B.Sc Physics Degree Examination, November 2017

PH5B08 – Physical Optics & Modern Optics

(2015 Admission onwards)

Max. Time: 3 hours

Max. Marks: 80

The symbols used in the question paper have their usual meanings.

Section A

Answer in a word or a phrase.

*Answer **all** questions.*

*Each question carries **1 mark**.*

1. Two lenses of power +2D and -1.5D are kept in contact with each other. The focal length of the combination is.....
2. Two interfering waves have amplitude in the ratio 5:1, the ratio of the maximum intensity to minimum is.....
3. A soap film occurs multi-coloured in white light due to.....
4. Sunlight filtering through the leaves of tree often makes circular patches on the ground, because of.....
5. For a zone plate the phase difference between the waves reaching the image point from two successive zones is.....

State whether true or false:

6. A plane polarised light is allowed to fall on half wave plate then the emergent light is plane polarised.
7. In holography amplitude and intensity of light reflected from the object is recorded.
8. For a negative crystal the refractive index w.r.to extraordinary light is less than that w.r.to ordinary.
9. Cane sugar is a substance with leavo rotation.
10. An optical fibre communication works on the principle of refraction.

(10 x 1 = 10 marks)

Section B

Answer in one or two sentences.

*Answer **all** questions.*

*Each question carries **2 marks**.*

11. What are coherent sources? Give two examples.
12. What is a non-reflecting film? How it can be achieved?
13. Why a thick film cannot produce interference?
14. Distinguish between Fresnel and Fraunhofer diffraction.
15. What are Fresnel's half period zones? Why are they called so?
16. What are the areas of holographic applications?
17. Give the advantages of optical communication systems?

(7 x 2 = 14 marks)

Section C

Answer in a **paragraph** of about half to one page.

Answer **any five** questions.

Each question carries **4 marks**.

18. What are Newton's rings? Why the centre of these rings is dark, for reflected light?
19. Draw the diagram of Fresnel's double mirror arrangement and explain how coherent sources are formed?
20. Define resolving power of grating and obtain an expression for it.
21. Compare zone plate and convex lens.
22. Explain how image is reconstructed from hologram.
23. Explain the difference between graded index fibres and step index fibres.
24. Write a short note on optical fibre sensors.

(5 x 4 = 20 marks)

Section D

Problems-Write all relevant formulas, all important steps carry **separate** marks.

Answer **any four** questions.

Each question carries **4 marks**.

25. A convergent thick lens of curvature 9 cm, having thickness 3cm is placed in air. Obtain the system matrix and hence find the focal length. Refractive index = 1.6
26. In biprism experiment at a certain position of eyepiece the fringe width obtained is 0.2mm. When the eyepiece is moved away by 50 cm the fringe width becomes 0.3mm. If the distance between the two sources is 0.3cm, find the wavelength of light?
27. Michelson interferometer experiment performed with a source which consists of two wavelengths 4882\AA and 4886\AA . Through what distance does the mirror have to be moved between the two positions of disappearance of the fringes?
28. In Fraunhofer diffraction pattern due to a narrow slit, a screen is placed 2m away from the lens. If the slit width is 0.2 mm and the first minima line is 5mm on either side of the central maximum, find the wavelength of light used.
29. What is the longest wavelength that can be observed in 3rd order spectrum of grating with 6000 lines per cm, for normal incidence?
30. Calculate the specific rotation of turpentine, if the plane of polarisation is turned through 64 degrees. The length of tube is 20 cm and the concentration of liquid is 0.87g/cm^3 .
31. A step index fibre has a core of refractive index 1.55 and clad of refractive index 1.5. Determine the numerical aperture and the acceptance angle when light enters the fibre from air.

(4 x 4 = 16 marks)

Section E

Answer in two or three pages.

Answer **any two** questions.

Each question carries **10 marks**.

32. State and explain Fermat's principle. Prove the law of refraction using it.
33. Explain superposition principle and obtain the expression for the resultant intensity of two waves. What are the conditions for maximum and minimum intensity?
34. Discuss the Fraunhofer diffraction due to a double slit in detail.
35. Explain with theory the production of circularly and elliptically polarised light.

(2 x 10 = 20 marks)

FAROOK COLLEGE (AUTONOMOUS), KOZHIKODE

Fifth Semester B.Sc Physics Degree Examination, November 2017

PH5B09 – Electronics (Analog & Digital)

(2015 Admission onwards)

Max. Time: 3 hours

Max. Marks: 80

SECTION A*Answer all questions in a word or a phrase**Each question carries 1 mark*

1. The binary equivalent of a hexadecimal number $E5F_{16}$ is
2. The leakage current is due tocarriers.
3. The maximum efficiency of a full-wave rectifier is.....%.
4. What is the value of β if $\alpha = 0.98$
5. Open-loop voltage gain of an ideal op-amp is.....

Write true or false

6. Two's complement of 10111 is 01001.
7. Input impedance of CE configuration is greater than CB configuration.
8. Amplifiers employ positive feedback.
9. Base is the heavily doped region of an NPN transistor.
10. The input to an NOR gate are 1, 0, 1. then the output will be zero.

(10 x 1 = 10 marks)**SECTION B***Answer all questions in two or three sentences.**Each question carries 2 marks*

11. What is the difference between ordinary semiconductor diode and Zener diode ?
12. Why do you prefer to express the gain in decibel ?
13. Draw basic integrator circuit using op amp.
14. What is the importance of filter circuits?
15. What is LED ? Give 2 applications of LEDs.
16. What are the advantageous of Boolean theorems?
17. In a code of base 6, the digits are 0,1,2,3,4,5. The number 576 is in decimal code.
What is the equivalent in a code of base 6?

(7 x 2 = 14 marks)

*Answer any five questions.
Each question carries 4 marks*

18. Briefly explain a voltage doubler circuit with output waveforms.
19. Draw equivalent circuit and V-I characteristics of a UJT. Mark relevant portions.
20. Why modulation is extremely necessary in communication system?
21. Which transistor configuration is widely used? Why?
22. Discuss the input and output characteristics of CB configuration.
23. Explain the operation of a Full adder.
24. Draw the frequency response of a RC coupled amplifier and explain gain at different frequencies.
25. What is the difference between positive feedback and negative feedback? Derive an expression for voltage gain with positive feedback.

(5 x 4=20 marks)

SECTION D

*Answer any four questions.
Each question carries 4 marks*

26. In a circuit, 50V zener diode is connected across a load resistor of $10k\Omega$ and the input current varies from 80V to 120V. If the value of series resistance is $5k\Omega$, find (i) the maximum and minimum value of zener current
(ii) the output voltage.
27. Derive an expression for efficiency of a full wave bridge rectifier.
28. In a base bias method a transistor with $\beta=200$ is used. Given $R_B=620k\Omega$, $R_C=4k\Omega$ & $V_{CC}=8V$. (i) Draw the dc load line (ii) Determine the operating point and stability factor.
29. In a Colpitt's oscillator $C_1=750pF$, $C_2=2500pF$ and $L=40\mu H$. Determine the operating frequency and feedback fraction.
30. A transmitter radiates a total power of 10kW. The carrier is modulated to a depth of 60%. Calculate (i) the power in the carrier and (ii) power in each sideband.
31. Obtain the simplified Sum Of Product forms of the function
 $F(A,B,C,D)=\sum(2,3,6,7,8,10,11,14)$ using K-map.

(4 x 4=16 marks)

SECTION E

*Answer any two questions.
Each question carries 10 marks*

32. Using neat circuit diagram explain the principle and working of n-channel JFET. What are the parameters of FET?
33. What are the essentials of transistor oscillators? Explain the working of Hartley Oscillator.
34. Discuss the need of biasing in transistor amplifiers. Describe any two biasing methods.
35. What is a flip flop? Describe the working of JK flip flop with suitable diagram and truth table. What do you mean by racing in JK flip flop?

(2 x 10=20 marks)

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(Pages : 2)

Reg. No:.....

Name:

FAROOK COLLEGE (AUTONOMOUS), KOZHIKODE

Fifth Semester B.Sc Physics (Open Course) Degree Examination, November 2017

PH5D01 – Non Conventional/Energy Sources

(2015 Admission onwards)

Max. Time: 2 hours

Max. Marks: 40

Section A (One Word Answer)

Answer all questions

Each question carries 1 mark

1. The rate at which solar energy arrives at the top of the atmosphere is called
2. What is tidal range?
3. In a primary battery chemical reactions are.....
a) Reversible b) Irreversible c) Neutralized
4. Hot molten rock present at depth greater than 25 km on earth is called.....
5. Pyrheliometer is used to measure.....
6. Wind energy is converted to electric energy by connecting the turbine to a

(6 x 1=6 marks)

Section B (Short Answer)

Answer all questions in one or two sentences

Each question carries 2 marks

7. What is the difference between biogas and biomass?
8. What is meant by photovoltaic effect?
9. What do you mean by solar distillation?
10. 'Wind is basically caused by the solar energy irradiating the earth'. Comment
11. Discuss the working principle of battery

(5 x 2=10 marks)

Section C (Paragraph Answer)
Answer any four questions
Each question carries 4 marks

12. What are geopressured resources?
13. What is the basic principal of tidal power generation?
14. List the advantages and disadvantages of geothermal energy over other forms of energy
15. Discuss the working principal of solar furnace
16. With the help of a block diagram explain the basic components and working of wind energy conversion system?
17. Describe the methods used for obtaining energy from biomass

(4 x 4=16 marks)

Section D (Essay)
Answer any one question
The question carries 8 marks

18. What are wind energy collectors? Discuss the principle, working, advantages and disadvantages of horizontal and vertical axis type wind aerogenerators.
19. Discuss the principle and methods of Ocean Thermal Electric Conversion systems. Compare the open and closed cycle OTEC systems with schematic diagrams.
20. Discuss the flat plate collectors and concentrating collectors of solar energy. Compare the merits and demerits of Concentrating collectors over flat plate type collectors

(1 x 8 = 8 marks)