

FAROOK COLLEGE (AUTONOMOUS), KOZHIKODE

Second Semester B.Sc Degree Examination, April 2025

PHY2CJ101 – Electronics – I

(FYUGP 2024 Admission)

Time: 2 hours

Max. Marks : 70

PART – A

All questions can be attended.
Each question carries **Three** mark.

Ceiling -24 Marks

		COs	Knowledge Level(KL)	Marks
1	How a Zener diode is different from ordinary diode. Draw its current voltage characteristics.	CO3	U, E	3
2	Explain the basic working of a light emitting diode	CO2	R, U	3
3	Design a voltage doubler circuit and explain its working	CO3	Ap	3
4	Sketch the output waveform of a full wave and half wave rectifier. Compare its efficiency.	CO3	Ap, An	3
5	What is the need for filters in power supplies. With a neat circuit action of a capacitor filter.	CO3	U, An	3
6	Give the energy band description of a semiconductor	CO1	U	3
7	If the base current in a transistor is 20 μ A and the emitter current is 6.4 mA. Calculate α , β and I_C	CO4	Ap	3
8	Describe the graphical method used to determine the DC load line in a transistor amplifier.	CO4	E	3
9	Convert 1101.0110 ₂ to decimal equivalent	CO6	R, Ap	3
10	Convert 3AB ₁₆ to decimal equivalent.	CO6	R, Ap	3

PART – B

All questions can be attended.
Each question carries six marks.

Ceiling -36 Marks

		COs	Knowledge Level(KL)	Marks
11	A full-wave rectifier uses a diode, the forward resistance of each element being 25 ohms. The rectifier supplies current to a load of 1000 ohms. The primary to secondary turns ratio of the centre-tapped transformer is 10:1. The transformer primary is fed from a supply of 240 Vrms Find:(i) dc load current (ii) direct current in each diode (iii) the ripple voltage (iv) the efficiency of rectification	CO3	U,Ap	6

12	A transistor with $\alpha = 0.98$ carries a base current of $50 \mu\text{A}$. It produces a collector to base leakage current of $5 \mu\text{A}$. Determine the values of emitter current and collector current of the transistor	CO4	An	6
13	(a) What is the hexadecimal equivalent of decimal 62359 (b) What is the binary equivalent of FA8_{16}	CO6	R, A	6
14	Design a Zener voltage regulator to meet the following specifications: Output voltage 5 V, Load current 10 mA, Zener wattage 400 mW and Input voltage $10 \text{ V} \pm 2 \text{ V}$.	CO3	Ap, E	6
15	A germanium transistor is to be operated at zero signal $I_C = 1 \text{ mA}$, If the collector supply $V_{CC} = 12 \text{ V}$, what is the value of R_B in the base resistor method? Take $\beta = 100$. Draw dc load line and find out operating point if $R_C = 1.2 \text{ k}\Omega$.	CO4	Ap, An	6
16	How do you convert a decimal number into its equivalent BCD representation and vice versa. Convert the decimal number 3789 to its equivalent BCD representation	CO6	U, Ap	6
17	Explain the working of a photodiode. Draw its current voltage characteristics for different light intensity.	CO2	U, An	6
18	Explain the formation of potential barrier in pn junction. Discuss the behavior of pn junction under forward and reverse bias.	CO2	Ap, An	6

PART - C

Answer any *one* questions.

Each question carries **Ten** marks.

		COs	Knowledge Level(KL)	Marks
19	Explain different transistor configurations of a transistor and current gains in these configurations. Sketch the input and output characteristics of transistor in CE mode and indicate active, saturation, and cut-off regions on the output curves.	CO4	U, Ap	10
20	Construct a Full wave bridge rectifier and obtain the expression for efficiency and ripple factor. Mention any two advantages and disadvantages compared to center tapped Full wave rectifier.	CO2	R, Ap	10

1 x 10 = 10 Marks

FAROOK COLLEGE (AUTONOMOUS), KOZHIKODE

Second Semester B.Sc Degree Examination, April 2025

PHY2MN101 – Electromagnetism and Network Theorems

(FYUGP 2024 Admission)

Time: 2 hours

Max. Marks : 70

Course Outcome Mapping Scheme

Q.NO	1	2	3	4	5	6	7	8	9	10
COS	CO1	CO4	CO1	CO1	CO5	CO2	CO3	CO4	CO2	CO1
Q.NO	11	12	13	14	15	16	17	18	19	20
COS	CO1	CO5	CO5	CO2	CO3	CO1	CO2	CO2	CO1	CO5

Section A

Answer All. Each question carries 3 marks

(Ceiling: 24 Marks)

1. What is an electric dipole Calculate the potential energy of an electric dipole?
2. Discuss the variation of voltage, current and power across a capacitor which is connected to an ac source.
3. Explain Lorentz force
4. Calculate the force due to a current carrying conductor
5. Discuss different characteristics such as voltage, current and impedance of a circuit consisting a resistor and an inductor connected in series to an ac source
6. Calculate the magnetic field of a circular current loop
7. Explain Thevenin's theorem
8. Write down two properties of dielectric.
9. Give an analysis on force experienced by charged particles moving in a uniform magnetic field
10. Draw the electric field lines of 2 equal positive charges placed close together

Section B

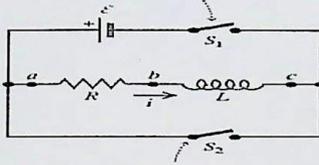
Answer All. Each question carries 6 marks

(Ceiling: 36 Marks)

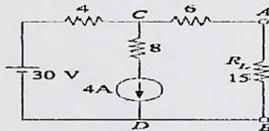
11. A beam of protons ($1q = 1.6 \times 10^{-19}$ C).2 moves at 3.0×10^5 m/s. through a uniform 2.0 T magnetic field directed along the positive z axis the velocity of each proton lies in the xz-plane and is directed at 30° to the +z axis. Find the force on a proton.

12. Calculate the energy in an L-C circuit. A sensitive electronic device of resistance $R = 175 \Omega$ is to be connected to a source of emf (of negligible internal resistance) by a switch. The device is designed to operate with a 36 mA current, but to avoid damage to the device, the current can rise to no more than 4.9 mA in the first 58 ms after the switch is closed. An inductor is therefore connected in series with the device, as in Fig.; the switch in question is S_1 .

- (a) What is the required source emf E ? (b) What is the required inductance L ?



13. In a given R-L circuit, $R=350$ and $L=0.1$ H. Find (i) the current through the circuit and (ii) power factor if a 50-Hz voltage $V=220 \sin 430t$ is applied across the circuit
14. Find the magnetic field a distance s from a long straight wire carrying a steady current I
15. Using Norton's theorem, calculate the current flowing through the 15W load resistor in the circuit



16. Define electric field at a point. Two equal and opposite charges of magnitude 12nC each are placed on x-axis at +5cm and -5cm about the origin. Find out the direction and magnitude of electric field at +5cm on y-axis.
17. What is Ampere's law? A cylindrical conductor with radius R carries a current I . The current is uniformly distributed over the cross-sectional area of the conductor. Find the magnetic field as a function of the distance from the conductor axis for points both inside ($r < R$) and outside ($r > R$) of the conductor.
18. Obtain the expression for torque acting on a current carrying loop. What is the potential energy of a dipole placed in a magnetic field?

Section C

Answer any one. Each question carries 10 marks
(1x10=10marks)

19. State and explain Gauss law. Two infinite parallel planes carry equal but opposite uniform charge densities $\pm\sigma$. Find the field in each of the three-region using Gauss law: (i) to the left of both, (ii) between them, (iii) to the right of both.
20. Discuss the charging and discharging of the following circuits as connected in series
a) LR b) LC c) CR

FAROOK COLLEGE (AUTONOMOUS), KOZHIKODE

Second Semester B.Sc Degree Examination, April 2025

PHY2MN102 – Modern Physics & Nuclear Physics

(FYUGP 2024 Admission)

Time: 2 hours

Max. Marks : 70

PART – A

All questions can be attended.
Each question carries **Three** mark.

Ceiling -24 Marks

		COs	Knowledge Level(KL)	Marks
1	State Planck's radiation law and explain the terms in it.	CO1	C	3
2	Explain the three key observations of Photoelectric effect that could not be justified by the electromagnetic theory?	CO1	C	3
3	What are De-Broglie waves?	CO2	C	3
4	Analyse why pair production can't take place in empty space applying the conservation principles	CO2	P	3
5	Write down Rutherford scattering formula and explain the terms in it.	CO3	P	3
6	Differentiate between work function and ionization energy.	CO3	P	3
7	Differentiate between strong and weak interactions.	CO4	P	3
8	Compare the compositions of alpha , beta and gamma rays.	CO5	P	3
9	Derive the equation for activity of radioactive nucleus. Check the correctness of its unit	CO5	P	3
10	Explain the terms decay constant and half-life	CO5	C	3

PART – B

All questions can be attended.
Each question carries six marks.

Ceiling -36 Marks

		COs	Knowledge Level(KL)	Marks
11	Assuming the inelastic collision between photons and electrons estimate the shift in wavelength of incident and scattered photon.	CO1	P	6
12	Compute the total energy of a hydrogen atom	CO3	P	6
13	Isobars are nuclides that have the same mass number A. Derive a formula for the atomic number of the most stable isobar of a given A and use it to find the most stable isobar of A=25.	CO4	C	6
14	(a) Estimate the energy needed to remove a neutron from the nucleus of the calcium isotope $^{42}_{20}\text{Ca}$. (b) Find the energy needed to remove a proton from this nucleus. (c) Why are these energies different?	CO4	C	6
15	Calculate the density of the $^{12}_6\text{C}$ nucleus whose radius is 2.7fm.	CO4	C	6
16	Estimate the activity of 1.00 mg of radon, ^{222}Rn , whose atomic mass is 222 u and half life is 3.8 days.	CO5	P	6
17	Explain the concept of tunnel theory of Alpha decay	CO5	P	6
18	Critically evaluate the need of Pauli neutrons hypothesis in β decay.	CO5	P	6

PART - C

Answer any *one* questions.
Each question carries **Ten** marks.

		COs	Knowledge Level(KL)	Marks
19	Explain and draw energy levels and spectra of Hydrogen atom	CO3	P	10
20	Critically analyse the liquid drop model of the nucleus. Discuss its assumptions, strength and limitation in explain the nucleus properties.	CO4	P	10

FAROOK COLLEGE (AUTONOMOUS), KOZHIKODE

Second Semester B.Sc Degree Examination, April 2025

PHY2MN103 – Fundamentals of Optics

(FYUGP 2024 Admission)

Time: 2 hours

Max. Marks : 70

PART – A

All questions can be attended.
Each question carries **Three** marks.

Ceiling -24 Marks

		COs	Knowledge Level(KL)	Marks
1	Write any two uses of optical fiber.	CO6	U	3
2	Write down the properties of images in plane mirrors.	CO1	U	3
3	Explain the term ‘paraxial approximation”	CO1	U	3
4	Distinguish between Fresnel and Fraunhofer diffraction.	CO2	F	3
5	State and explain Brewster’s law.	CO3	U	3
6	Define lateral magnification and write it in terms of object and image focal distance.	CO1	R	3
7	Explain the phenomenon stimulated emission.	CO4	U	3
8	Illustrate the term “numerical aperture”.	CO5	P	3
9	Write any three applications of laser	CO4	C	3
10	How does a diffraction grating create different colours	CO2	R	3

PART – B

All questions can be attended.
Each question carries **six** marks.

Ceiling -36 Marks

		COs	Knowledge Level(KL)	Marks
11	Derive the expression for numerical aperture and maximum acceptance angle in case of a step index optical fiber.	CO5	A	6
12	Discuss Fraunhofer diffraction due to a single slit	CO2	F	6

13	Explain thin film interference with normal incidence.	CO2	U	6
14	Describe the working of semiconductor diode laser	CO5	U	6
15	A monochromatic light of wavelength 5000\AA from a distance source falls on a slit 0.5mm wide. What is distance between the two dark bands on each side of the central bright band of the diffraction pattern observed on a screen placed 2m from the slit.	CO2	P	6
16	Newton's rings are observed normally in reflected light of wavelength 6000\AA . The diameter of the 10 th dark ring is 0.50 cm. Find the radius of curvature of the lens and the thickness of the film.	CO2	P	6
17	When sunlight is incident on water surface at glancing angle of 37° , the reflected light is found to be completely plane polarized. Determine the refractive index of water and angle of diffraction.	CO3	AP	6
18	Explain the term total internal reflection.	CO5	U	6

PART - C

Answer any *one* questions.
Each question carries **Ten** marks.

		COs	Knowledge Level(KL)	Marks
19	Illustrate the formation of Newton's ring. Derive expression for the radii of the ring.	CO2	U	10
20	With suitable diagrams explain the principle and working of ruby laser	CO5	Ap	10

1 x 10 = 10 Marks

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(Pages : 2)

Reg. No:.....

Name:

FAROOK COLLEGE (AUTONOMOUS), KOZHIKODE

Second Semester B.Sc Degree Examination, April 2025

PHY2FM106 – Astronomy & Stargazing

(FYUGP 2024 Admission)

Time: 1.5 hours

Max. Marks : 50

PART – A

All questions can be attended.
Each question carries **Two** mark.

Ceiling -16 Marks

		COs	Knowledge Level(KL)	Marks
1	Define parallax and stellar parallax	1	1	
2	Discuss the colour change of the sky during sunset and sunrise.	2	2	
3	Distinguish between terrestrial planets and Jovian planets .	4	2	
4	Examine the evidence for earth's roundness.	3	4	
5	Illustrate the term 'city henge''	2	2	
6	Explain the term "celestial sphere" .	2	2	
7	Define Zenith and Horizon.	2	1	
8	Explain the internal structure of the sun.	2	2	
9	Name two brightest stars in the constellation Orion, mention their colour of appearance.	3	1	
10	Explain the phenomenon of super moon.	4	2	

PART – B

All questions can be attended.
Each question carries six marks.

Ceiling -24 Marks

		COs	Knowledge Level(KL)	Marks
11	Compare the evidence Galileo used to support the heliocentric theory with the arguments against it.	1	4	
12	State Kepler's laws of planetary motion. Estimate the period of revolution of an asteroid in an elliptical orbit with semi-major axis equal to 3 AU	2	3	
13	Briefly explain about solar eclipse and its different stages.	2	2	
14	Briefly describe how stars are formed and different stages in the life cycle of a star.	2	1	
15	Briefly discuss the different methods to find the exoplanets	2	1	

PART - C

Answer any *one* questions.
Each question carries **Ten** marks.

		COs	Knowledge Level(KL)	Marks
16	Explain the working of a telescope. . How does the formation of an Image by a lens or a mirror happen.	3	2	
17	Describe how season change in the northern and southern hemispheres is earth goes around the sun.	2	2	

1 x 10 = 10 Marks

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Reg. No:.....

Name:

FAROOK COLLEGE (AUTONOMOUS), KOZHIKODE

Second Semester B.Sc Degree Examination, April 2025

PHY2IC02 – Optics, Laser & Electronics

(2022 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, Overall Ceiling 20)

1. Define bandwidth in interference fringes.
2. Explain why gratings with larger number of lines are preferred?
3. Differentiate between interference and diffraction of light.
4. How Faunhoffer diffraction is obtained in practice?
5. What is the difference between unpolarized light and circularly polarized light?
6. What is a half wave plate ?
7. Explain the use of polaroids in sunglasses.
8. How optical activity principle help us in determining the quality of sugar cane.
9. What is the use of rectifiers ?
10. Draw the circuit diagram of a NOT gate using transistor.
11. What is a transistor? Why is it so called?
12. What is population inversion?

(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. Obtain condition for darkness in thin film interference.
14. Calculate the possible order of spectra with a plane transmission grating having 18000 lines per inch when light of wavelength 4500 \AA is used.
15. In a single slit diffraction pattern the distance between the first minima on either side of the central zero maximum is 4.4mm as observed on a screen at a distance of 0.7 m . The wavelength of light used is 5890 \AA . Calculate the slit width.

16. Calculate the thickness of a plate which would convert plane polarized into circularly polarized light. Given $\lambda = 5890 \text{ \AA}$, $\mu_o = 1.658$, $\mu_e = 1.486$.
17. A sugar solution in a tube of length 20cm produces optical rotation of 13° . The solution is then diluted to one-third of its previous concentration. Find the optical rotation produced by 30cm long tube containing the diluted solution.
18. Illustrate the universal property of NAND and NOR gates.
19. Explain working of a Ruby laser.

(Ceiling- 30)

Section C
Essay Type

Answer any one question. Answer carries 10 marks

20. Explain formation of Newton's rings. How will you determine wavelength of monochromatic light using Newton's ring arrangement?
21. What is a full wave rectifier? Derive expression for efficiency of a full wave bridge rectifier. What are advantages of a bridge rectifier over centre-tap rectifier?

(1x10= 10)