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Reg. No:.....

Name:

FAROOK COLLEGE (AUTONOMOUS), KOZHIKODE

First Semester B.Sc Degree Examination, November 2025

PHYIMN103 - Semiconductor Physics and Electronics

(FYUGP 2024 Admission onwards)

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	Explain filter circuits.	CO2	U	3
2	Show that $A(A+B) = A$.	CO4	AP	3
3	Describe pn junction and its properties.	CO1	R	3
4	Explain the temperature dependence in semiconductors.	CO1	U	3
5	Write a note on “voltage follower circuit”.	CO3	U	3
6	Compare Zener breakdown and avalanche breakdown.	CO3	AP	3
7	Draw and interpret the input and output characteristics of a CB transistor configuration.	CO3	U	3
8	Define universal gates and realize XOR using only NAND gates.	CO4	R	3
9	Explain intrinsic and extrinsic semiconductors.	CO1	U	3
10	Define load line analysis and operating point.	CO3	U	3

PART – B

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

Ceiling -36 Marks

		COs	Knowledge Level(KL)	Marks
11	Simplify the following Boolean expressions to a minimum number of literals: (i) $Y = A + \bar{A}B$ (ii) $Y = AB + \bar{A}C + BC$	CO4	AP	

12	Explain Bohr atomic model and energy levels.	CO1	U	6
13	Using detailed energy band diagram differentiate conductors, semiconductors and insulators.	CO1	U	6
14	What is a Zener diode? Draw the equivalent circuit of an ideal Zener in the breakdown region.	CO3	AP	6
15	Discuss the operation of a summing amplifier with two applications.	CO3	U	6
16	Describe the various methods used for transistor biasing. State their advantages and disadvantages.	CO2	U	6
17	Explain the working of an amplifier in CE configuration with neat circuit diagram.	CO2	U	6
18	A transistor is connected in common emitter (CE) configuration in which collector supply is 8V and the voltage drop across resistance R_C connected in the collector circuit is 0.5V. The value of $R_C = 800 \Omega$. If $\alpha = 0.96$, determine: (i) collector-emitter voltage (ii) base current	CO2	AP	6

PART - C

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

		COs	Knowledge Level(KL)	Marks
19	a) With a neat sketch, explain the working of a diode as (i) Half wave rectifier (ii) Full wave rectifier b) Derive the expressions for efficiency and ripple factor.	CO2	U	10
20	a) What is a logic gate? Using detailed diagram describe various logic gates and combination gates. b) Using Boolean algebra prove De Morgans theorem with truth table.	CO4	U	10

1 x 10 = 10 Marks

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Reg. No:.....

Name:

FAROOK COLLEGE (AUTONOMOUS), KOZHIKODE

First Semester B.Sc Degree Examination, November 2025

PHYIMN101 - Mechanics and Optics

(FYUGP 2024 Admission onwards)

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	Compare gravitational and electromagnetic forces.	C01	Understand	3
2	Comment about coherent sources of light and list some of their properties.	C04	Understand	3
3	Develop the law that relates the magnitude of the force on a spring and the displacement that produced by that force.	C02	Create	3
4	Describe Newton's second law of motion.	C01	Remember	3
5	State laws of reflection.	C04	Remember	3
6	Describe the phenomenon of dispersion.	C05	Remember	3
7	Classify kinetic friction and static friction.	C01	Understand	3
8	Write down the condition for constructive interference and destructive interference formed by two slit interferences.	C04	Understand	3
9	Discuss the conservation of total mechanical energy.	C03	Understand	3
10	Describe diffraction grating.	C04	Remember	3

PART - B

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

Ceiling -36 Marks

		COs	Knowledge Level(KL)	Marks
11	The wavelength of the red light from a helium-neon laser is 633 nm in air but 474 nm in the aqueous humor inside your eyeball. Calculate the index of refraction of the aqueous humor and the speed and frequency of the light in it.	C04	Apply	6
12	A gymnast with mass $m_G = 50.0$ kg suspends herself from the lower end of a hanging rope of negligible mass. The upper end of the rope is attached to the gymnasium ceiling. (a) What is the gymnast's weight? (b) What force (magnitude and direction) does the rope exert on her? (c) What is the tension at the top of the rope?	C01	Analyze	6

13	Compare conservative and non-conservative forces.	C03	Understand	6
14	A two-slit interference experiment uses coherent light of wavelength 5.00×10^{-7} m. Rank the following points in the interference pattern according to the intensity at each point, from highest to lowest. (i) A point that is closer to one slit than the other by 4.00×10^{-7} m; (ii) a point where the light waves received from the two slits are out of phase by 4.00 rad; (iii) a point that is closer to one slit than the other by 7.50×10^{-7} m; (iv) a point where the light waves received by the two slits are out of phase by 2.00 rad.	C04	Understand	6
15	Steve exerts a steady force of magnitude 210 N on the stalled car, as he pushes it a distance of 18 m. The car also has a flat tire, so to make the car track straight Steve must push at an angle of 30° to the direction of motion. How much work does Steve do? (b) In a helpful mood, Steve pushes a second stalled car with a steady force $\vec{F} = (1160\text{N})\hat{i} - (140\text{N})\hat{j}$. The displacement of the car is $\vec{s} = (114\text{m})\hat{i} + (111\text{m})\hat{j}$. How much work does Steve do in this case?	C02	Analyze	6
16	With suitable ray diagram compare the images formed by a concave mirror and a convex mirror.	C05	Understand	6
17	State and explain work-energy theorem.	C02	Understand	6
18	Interpret how Fraunhofer diffraction is distinct from Fresnel diffraction.	C04	Understand	6

PART - C

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

		COs	Knowledge Level(KL)	Marks
19	Discuss the concept of fluid resistance and deduce the expression for terminal speed.	C01	Understand	10
20	Explain in detail about the refraction at a spherical surface and hence obtain the expression for the lateral magnification	C05	Understand	10

1 x 10 = 10 Marks

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Reg. No:.....

Name:

FAROOK COLLEGE (AUTONOMOUS), KOZHIKODE
First Semester B.Sc Degree Examination, November 2025
PHYIMN102 - Properties of matter and Thermodynamics
 (FYUGP 2024 Admission onwards)

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	Define the centre of gravity and centre of mass.	CO1	Remember	3
2	Differentiate between static and dynamic equilibrium	CO1	Understand	3
3	Define internal energy and state the first law of thermodynamics.	CO4	Apply	3
4	State and explain Pascal's Law	CO2	Remember	3
5	An ice cube floats in a glass of water. When the ice melts, will the water level in the glass rise, fall, or remain unchanged? Explain	CO2	Apply	3
6	Explain the terms Stress, Strain and Elastic moduli	CO1	Understand	3
7	Explain Elastic hysteresis.	CO1	Understand	3
8	Distinguish between reversible and irreversible process	CO3	Understand	3
9	Define thermal equilibrium and explain its significance in thermodynamics	CO3	Understand	3
10	State and explain the second law of thermodynamics.	CO5	Remember	3

PART – B

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

Ceiling -36 Marks

		COs	Knowledge Level(KL)	Marks
11	Find out the gravitational torque on an object of arbitrary shape	CO1	Understand	6
12	Find the mass and weight of the air at 20°C in a living room with a 4.0 m x 5.0 m floor and a ceiling 3.0 m high, and the mass and weight of an equal volume of water	CO1	Apply	6
13	Derive the work done by an ideal gas in an adiabatic process	CO3	Understand	6
14	Write a note on Viscosity and Turbulence	CO2	Remember	6
15	Prove the equation of continuity for a compressible fluid	CO2	Understand	6
16	How is entropy related to the disorder of energy?	CO6	Understand	6
17	State and obtain the mathematical relationship between pressure and volume during an adiabatic process.	CO4	Understand	6
18	A Carnot engine whose high-temperature reservoir is at 620 K takes in 550 J of heat at this temperature in each cycle and gives up 335 J to the low-temperature reservoir. What is (a) the temperature of the low-temperature reservoir; (b) the thermal efficiency of the cycle	CO5	Apply	6

PART - C

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

		COs	Knowledge Level(KL)	Marks
19	Derive Bernoulli's equation, by applying the work-energy theorem to the fluid in a section of a flow tube.	CO1	Apply	10
20	Explain the working of a Carnot engine. Derive the expression for its efficiency	CO5	Apply	10

1 x 10 = 10 Marks

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Reg. No:.....

Name:

FAROOK COLLEGE (AUTONOMOUS), KOZHIKODE

First Semester B.Sc Degree Examination, November 2025

PHYIFM105 - Physics in daily life

(FYUGP 2024 Admission onwards)

Time: 1 ½ 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 LPG and why is propane added to butane in LPG?	2	Ap	2
2	Why is stainless steel preferred for cooking vessels?	2	U	2
3	Analyze the principle behind modern gas lighters?	2	U	2
4	Explain the role of the seam in a cricket ball during pace bowling?	3	Ap	2
5	Explain “arm ball” in spin bowling.	3	Ap	2
6	Draw the significance of “sweet spot” of a cricket bat.	3	Ap	2
7	Give one example of conservation of momentum in football.	4	Ap	2
8	State Newton’s third law of motion. How does it apply when a player kicks a ball?	4	Ap	2
9	When pushing a child on a playground swing, what happens if you push him/her forward each time s/he moves toward you?	5	Ap	2
10	How does a quartz clock work?	5	Ap	2

PART – B

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

Ceiling -24 Marks

		COs	Knowledge Level(KL)	Marks
11	Describe the working of ionisation smoke detectors with a neat diagram	1	Ap	6
12	Explain the Magnus effect in football with a neat diagram.	4	Ap	6
13	Describe the differences between topspin, backspin, and sidespin deliveries in cricket.	3	Ap	6
14	How does the photocopier work?	5	Ap	6
15	Give examples for harmonic oscillator and analyse the motion.	5	AP	6

PART - C

Answer any *one* questions.

Each question carries **Ten** marks.

		COs	Knowledge Level(KL)	Marks
16	Cricket is often called a “game of physics.” Justify this statement with suitable examples from bowling, batting, and technology.	3	Ap	10
17	Describe the sources of noise in the kitchen and explain the underlying physics of each.	2	Ap	10

1 x 10 = 10 Marks

FAROOK COLLEGE (AUTONOMOUS), KOZHIKODE
First Semester B.Sc Degree Examination, November 2025

PHY1CJ101 - FUNDAMENTALS OF PHYSICS

(FYUGP 2024 Admission onwards)

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	Explain the term “contact force”. Give examples.	CO1	U	3
2	Consider an apple sitting at rest on a table in equilibrium. Describe the action reaction pairs in this situation.	CO1	U	3
3	Give an inertial frame of reference? Give two examples.	CO1	R	3
4	A woman in a lift lets go of her briefcase, but it does not fall to the floor. How is the lift moving, and why is this so?	CO2	R	3
5	Describe the fundamental forces of nature? Compare their strengths.	CO2	U	3
6	Explain work -energy theorem	CO3	U	3
7	Define average power and instantaneous power. What is its unit.	CO3	R	3
8	For an elastic force $F = -kx$, derive the expression for the potential energy.	CO3	AP	3
9	Distinguish between conservative and non-conservative forces.	CO4	AN	3
10	Explain stable, unstable and neutral equilibriums.	CO4	U	3

PART – B

All questions can be attended.
Each question carries **six** marks.
Ceiling -36 Marks

		COs	Knowledge Level(KL)	Marks
11	A particle of mass 2 kg is placed at the origin. It is acted upon simultaneously by two forces: one of magnitude 3N directed along the positive x-axis and another of magnitude 4N directed along the positive y-axis. Using the superposition principle of forces, determine the net force on the particle, the direction of the resultant force, and the acceleration produced.	CO2	AP	6
12	A 68.5 kg skater moving initially at 2.40 m/s on rough horizontal ice comes to rest uniformly in 3.52s due to friction from the ice. What force does friction exert on the skater?	CO1	AP	6
13	Two 23.0-N weights are suspended at opposite ends of a rope that passes over a light, frictionless pulley. The pulley is attached to a chain from the ceiling. (a) What is the tension in the rope? (b) What is the tension in the chain?	CO2	AP	6

14	A stockroom worker pushes a box with mass 16.8 kg on a horizontal surface with a constant speed of 3.50 m/s. The coefficient of kinetic friction between the box and the surface is 0.20. (a) What horizontal force must the worker apply to maintain the motion? (b) If the force calculated in part (c) is removed, how far does the box slide before coming to rest?	CO2	AP	6
15	Using a cable with a tension of 1350 N, a tow truck pulls a car 5.00 km along a horizontal roadway. (a) How much work does the cable do on the car if it pulls horizontally? If it pulls at 35.0° above the horizontal? (b) How much work does the cable do on the tow truck in both cases of part (a)? (c) How much work does gravity do on the car in part (a)?	CO3	AP	6
16	A crate on a motorized cart starts from rest and moves with a constant eastward acceleration of $a = 2.60 \text{ m/s}^2$. A worker assists the cart by pushing on the crate with a force that is eastward and has magnitude that depends on time according to $F(t) = (15.40 \text{ N/s}^2)t$. What is the instantaneous power supplied by this force at $t = 4.70 \text{ s}$?	CO3	AP	6
17	In one day, a 90 kg mountain climber ascends from the 1560 m level on a vertical cliff to the top at 2500 m. The next day, she descends from the top to the base of the cliff, which is at an elevation of 1260 m. What is her change in gravitational potential energy (a) on the first day and (b) on the second day?	CO4	AN	6
18	A force parallel to the x-axis acts on a particle moving along the x-axis. This force produces potential energy $U(x)$ given by $U(x) = ax^4$, where $a = 1.43 \text{ J/m}^4$. What is the force (magnitude and direction) when the particle is at $x = -0.780 \text{ m}$?	CO4	AP	6

PART - C

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

		COs	Knowledge Level(KL)	Marks
19	Discuss the motion of an object falling through a fluid and derive the expression for its terminal velocity.	CO2	U	10
20	Define potential energy. Discuss potential energy in the context of gravitational, elastic, and frictional forces.	CO4	R	10

1 x 10 = 10 Marks