

SC 103 – ENGINEERING PHYSICS

Course Title	Engineering Physics	Course Code	SC 103
Year	I Year	Course Group	Basic Science
Teaching Scheme in Periods(L:T:P)	120:30:0	Credits	3.0
Methodology	Lecture+ Tutorial	Total Contact Periods	150
CIE	60 Marks	YearEndExamination (YEE)	40 Marks

Pre requisites

This course requires the basic knowledge of Science and Mathematics.

Course Outcomes

Upon completion of the course, the student shall be able to

CO1	Apply the concepts of units, dimensions, errors in measurement, and properties of vectors to solve basic engineering problems related to forces, work, power and torque.
CO2	Analyze physical behaviour of bodies and solve numerical problems related to motion of projectiles, motion on rough surfaces, deformation of materials, capillarity, and flow of liquids and gases in basic engineering applications.
CO3	Develop the knowledge on Renewable Energy sources for sustainable environment and utilize the principles of thermal expansion and laws of thermodynamics to basic engineering applications.
CO4	Extend the formulation of Simple Harmonic Motion to determine time period of simple pendulum and identify the noise controlling methods in practical engineering and environmental applications.
CO5	Apply the principles of electricity and magnetism to analyze electric circuits, model transformers, and solve related numerical problems in basic engineering applications.
CO6	Apply the principles of Photoelectric effect, LASER and semiconductors to build Photocell, Ruby LASER and LED for engineering applications.

CO – PO Mapping Matrix

Correlation Scale:

1 - Low

2 – Medium

3 - High

Course Outcome/ Programme Outcome	Basic and Discipline Specific Knowledge	Problem Analysis	Design/Development of Solutions	Engineering Tools, Experimentation and Testing	Engineering Practices for Society, Sustainability and Environment	Project Management	Lifelong Learning	Linked PO
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO 7	
CO1	3	1	-	-	-	-	2	1,2,7
CO2	3	1	-	-		-	2	1,2,7
CO3	3	-	-	1	1	-	2	1,4,5,7
CO4	3	-	-	1	-	-	2	1,4,7
CO5	3	1	-	1	-	-	2	1,2,4,7
CO6	3		-	1	1	-	2	1,4,5,7
	3	1	-	1	1	-	2	1,2,4,5,7

COURSE CONTENTS

Unit 1 Units, Dimensions and Vectors

Duration: 25 periods (L:20 – T:5)

Physical quantity, Fundamental and derived quantities, unit-definitions- SI units -Advantages of S.I. units, Dimensions and dimensional formula - units and dimensional formulae for physical quantities - Dimensionless quantities - Principle of homogeneity –numerical problems, Applications of dimensional analysis -problems- Limitations of dimensional analysis – Errors in measurement.

Scalar and Vector quantities – definition and examples, Classification of vectors - Resolution of a vector-numerical problems. Triangle law of vectors, Parallelogram law of vectors – statement-expression for magnitude and direction of resultant vector –derivation- illustrations (working of sling and flying bird), Representation of a vector in unit vectors $\hat{i}, \hat{j}$ and $\hat{k}$ – numerical problems. Scalar product of vectors- application to work done by a force and power – properties of scalar product– Numerical problems. Vector product of two vectors– application to torque –areas of triangle and parallelogram -properties of vector product -numerical problems.

Unit 2 Dynamics and Properties of Matter

Duration: 25 periods (L:20 – T:5)

Projectile motion of a body- examples, Oblique projection-expression for path of a projectile-derivation-Maximum height, Time of ascent, Time of descent, Time of flight, Horizontal range and maximum horizontal range of a projectile in oblique projection - related numerical problems. Friction – causes-types- Normal reaction, angle of repose and coefficient of friction-laws of static friction, expression for acceleration, displacement and time taken to come to rest by a body on a rough horizontal surface –derivation-numerical problems, advantages and disadvantages, methods of minimizing friction.

Elasticity and elastic bodies-definition- examples, Stress and Strain-expressions-numerical problems, types of stress and strain, Elastic limit-definition, Hooke's law, stress and strain curve, Young's modulus of a wire – derivation-numerical problems, Cohesive and Adhesive forces, Surface tension- explanation and illustrations, capillarity and angle of contact-definitions, formula for determination of surface tension of a liquid based on capillary rise method – outline and related numerical problems, effect of temperature and impurity on surface tension of a liquid, Viscosity-explanation- Newton's formula for viscous force-derivation- coefficient of viscosity-numerical problems- Poiseuille's equation for coefficient of viscosity- related numerical problems, effect of temperature on viscosity of liquids and gases.

Unit 3 Energy Sources and Thermal Physics

Duration: 25 periods (L:20 – T:5)

Work, Power and Energy-explanation-numerical problems, Potential energy and Kinetic energy-explanation- examples, expressions for Potential energy and Kinetic energy and related numerical problems, Work-Energy theorem – statement-related numerical problems, law of conservation of energy-statement-examples-proof in case of a freely falling body - solve related numerical problems, Non-renewable and Renewable energy sources-explanation- sources, Solar water heater, Wind mill and Biogas.

Transmission of heat -Thermal expansion of solids and three coefficients of expansion of solids, thermal conductivity of a solid – expression, principle of bimetallic strip, bimetallic thermostat, Boyle's law in gases –explanation- its limitations-related numerical problems, concept of Absolute Zero, Absolute scale of temperature, Charles' laws in gases in terms of absolute temperature – related numerical problems, Ideal gas equation-derivation- related numerical problems - Isothermal and Adiabatic processes, internal energy and external work done – explanation, expression for work done by the gas –derivation- related numerical problems, 1st law of thermodynamics-explanation-applications, 2nd law of thermodynamics –explanation- list of applications.

Unit 4 Simple Harmonic Motion and Acoustics

Duration: 25 periods (L:20 – T:5)

Periodic motion and Simple Harmonic Motion (SHM) – examples of SHM, conditions of SHM, time period, frequency, amplitude and phase of a particle in SHM-definitions, expressions for Displacement, Velocity, Acceleration, Time period and Frequency of a particle executing in SHM –derivations- numerical problems, Ideal simple pendulum-definition, expression for time period of simple pendulum-derivation- numerical problems, laws of simple pendulum, second's pendulum-length of second's pendulum.

Wave-definition-characteristics, longitudinal and transverse waves –explanation- examples – Audible range, infrasonic and ultrasonic waves, expression relating wave velocity, frequency and wavelength-derivation- numerical problems, echo –explanation- time of echo from a distant obstacle-derivation- numerical problems-applications of echo, SONAR, Reverberation, reverberation time and Sabine's formula, acoustics of good auditorium, free and forced vibrations, and resonance – definition-examples, noise pollution- causes, effects and methods to minimize noise pollution.

Unit 5 Electricity and Magnetism

Duration: 25 periods (L:20 – T:5)

Electric current and potential difference-summarize, Ohm's law-explanation-numerical problems, specific resistance-explanation-numerical problems, conductivity and conductance-definitions, combination of resistors in electric circuit –formula for series and parallel combination-related numerical problems, Kirchhoff's laws in electricity –explanation- numerical problems, Wheatstone's bridge –explanation, condition for balancing of Wheatstone's bridge –derivation-numerical problems, Meter Bridge-circuit diagram-formula for unknown resistance- numerical problems. Superconductivity-basic concepts-Examples and applications of Superconductors.

Magnetic pole, pole strength, magnetic length of a bar magnet, Magnetic field, magnetic lines of force and magnetic induction, properties of magnetic lines of force, uniform and non uniform magnetic fields, magnetic flux, types of magnetic materials.Coulomb's inverse square law of magnetism-explanation-numerical problems, expression for moment of couple on a bar magnet placed in a uniform magnetic field- derivation- numerical problems, Faraday's laws of electromagnetism, self induction and mutual induction, construction of transformer-types-numerical problems.

Unit 6 Modern Physics and Semiconductor Physics

Duration: 25 periods (L:20 – T:5)

Photo electric effect-explanation-Einstein's photo electric equation, work function and threshold frequency, laws of photo electric effect, working of photocell, applications of photocell, LASER-definition, concept of energy levels, Spontaneous emission, Stimulated emission, population inversion and optical pumping, characteristics of LASER, Ruby LASER, applications of LASER, critical angle and total internal reflection of light, principle and working of Optical fiber, applications of optical fiber, Nano scale and properties of nano materials - applications.

Valence band, Conduction band and Forbidden energy gap in solids-explanation, Conductors, Insulators and Semiconductors on the basis of energy band diagram, Intrinsic semiconductors-explanation-examples, concept of hole and doping in semiconductors, Extrinsic semiconductors-explanation, PN Junction Diode-explanation, Forward bias and Reverse bias of PN diode, applications of PN Diode, half wave rectifier and full wave rectifier, working principle of Light Emitting Diode (LED).

Reference Books

1. Principles of Physics by N. Subrahmanyam and Brijlal, S. Chand & Co, New Delhi, edition, 1982
2. Engineering. Physics by R.K. Gaur, S.L. Gupta, Dhanpatrai Publications, New Delhi.
3. Intermediate Physics, Vol. I & II, Telugu Academy, TS, Hyderabad.
4. Fundamentals of Physics by Halliday and Resnick.
5. Physics Part-I & II, NCERT

E-learning resources

Hyper Physics website: <http://hyperphysics.phy-astr.gsu.edu/>

Learning Outcomes

Upon completion of this course the student will be able to

CO1: Apply the concepts of units, dimensions, errors in measurement, and properties of vectors to solve basic engineering problems related to forces, work, power and torque.

- 1.1 Define Physical quantity, Fundamental quantity, derived physical quantity and Unit.
- 1.2 List SI units of fundamental quantities with their symbols and outline advantages of S.I. units.
- 1.3 Define Dimensions and Dimensional formula of a physical quantity.
- 1.4 List SI units and dimensional formulae of physical quantities (Area, Volume, Density, Velocity, Acceleration, Momentum, Impulse, Force, Work, Energy, Power, Pressure, Stress, Modulus of Elasticity, Angular velocity, Torque, Frequency, Surface Tension, Coefficient of viscosity, Universal Gravitational constant, Wavelength, Planck's constant)
- 1.5 List dimensionless quantities.
- 1.6 Explain principle of homogeneity of dimensions and solve related numerical problems (finding dimensions of terms in an equation).
- 1.7 List applications of dimensional analysis and solve problems on correctness of physical equations.
- 1.8 List the limitations of dimensional analysis.
- 1.9 Explain error, absolute error and percentage error in measurement of a physical quantity and solve related numerical problems.
- 1.10 Define Scalar and Vector quantities with examples.

- 1.11 Classify Vectors (Proper vector, Equal vectors, Parallel vectors, Negative vector, Unit vector, Null vector, Collinear vectors, Coplanar vectors and Position vector).
- 1.12 Explain resolution of a Vector into two orthogonal components and solve related numerical problems.
- 1.13 Explain Triangle law of vectors.
- 1.14 Explain Parallelogram law of vectors and develop expressions for magnitude and direction of resultant of two vectors and solve related numerical problems.
- 1.15 Illustrate parallelogram law of vectors (working of sling and flying bird).
- 1.16 Represent a vector in terms of unit vectors ($\hat{i}, \hat{j}, \hat{k}$) (no explanation) and solve related numerical problems on finding magnitude and unit vector.
- 1.17 Explain Scalar product of vectors and solve numerical problems.
- 1.18 Construct expressions for work done and power in vector notation starting from force $[(W = \vec{F} \cdot \vec{S})$ and power $(P = \vec{F} \cdot \vec{v})]$ and solve related numerical problems.
- 1.19 Identify the properties of scalar product.
- 1.20 Explain vector product of vectors and solve related numerical problems.
- 1.21 Construct an expression for torque in vector notation starting from force and position vector $\{(\vec{\tau} = \vec{r} \times \vec{F})\}$ and solve numerical problems.
- 1.22 Outline the expressions for areas of triangle and parallelogram in vector notation and solve numerical problems.
- 1.23 Identify the properties of vector product.

CO2: Analyze physical behaviour of bodies and solve numerical problems related to motion of projectiles, motion on rough surfaces, deformation of materials, capillarity, and flow of liquids and gases in basic engineering applications.

- 2.1 Explain projectile motion of a body with examples and develop the expression for path of a projectile in oblique projection.
- 2.2 Develop formulae for Maximum height, Time of ascent, Time of descent, Time of flight, Horizontal range and maximum horizontal range of a projectile in oblique projection and solve related numerical problems.
- 2.3 Explain friction and causes of friction.
- 2.4 Classify types of friction.
- 2.5 Explain the concept of Normal reaction, Angle of repose and Coefficient of friction.
- 2.6 Outline the laws of Static friction.
- 2.7 Develop the expression for acceleration of a body on a rough horizontal surface and solve simple numerical problems on $a = -\mu g$ and $F = \mu R$
- 2.8 Develop the expressions for displacement and time taken to come to rest by a body over a rough horizontal surface and solve simple numerical problems on $s = \frac{u^2}{2\mu g}$ and $t = \frac{u}{\mu g}$

- 2.9 Outline the advantages and disadvantages of friction.
- 2.10 Identify the methods of minimizing friction.
- 2.11 Define Elasticity and elastic bodies with examples.
- 2.12 Explain Stress and Strain with their expressions and solve related numerical problems.
- 2.13 Explain types of stress and strain (longitudinal, shear and bulk).
- 2.14 Define Elastic limit and explain Hooke's law.
- 2.15 Explain stress and strain curve of a metallic wire.
- 2.16 Develop a formula for Young's modulus of a wire having circular cross-sectional area and solve related numerical problems.
- 2.17 Compare Cohesive and Adhesive forces.
- 2.18 Explain Surface tension and illustrate Surface tension with examples.
- 2.19 Explain capillarity and angle of contact.
- 2.20 Outline the formula for determination of surface tension of a liquid based on capillary rise method with legible diagram ($T = \frac{hrdg}{2 \cos \theta}$)(no derivation) and solve related numerical problems.
- 2.21 Explain the effect of temperature and impurity on surface tension of a liquid.
- 2.22 Explain Viscosity and develop Newton's formula for viscous force and explain coefficient of viscosity and solve related numerical problems.
- 2.23 Outline Poiseuille's equation for coefficient of viscosity and solve related numerical problems.
- 2.24 Explain the effect of temperature on viscosity of liquids and gases.

CO3: Develop the knowledge on Renewable Energy sources for sustainable environment and utilize the principles of thermal expansion and laws of thermodynamics to basic engineering applications.

- 3.1 Explain the concept of Work, Power and Energy and solve related numerical problems.
- 3.2 Explain Potential energy and Kinetic energy with examples.
- 3.3 Develop expressions for Potential energy and Kinetic energy and solve related numerical problems.
- 3.4 Outline Work-Energy theorem (no derivation) and solve related numerical problems.
- 3.5 Explain law of conservation of energy with examples.
- 3.6 Prove law of conservation of energy in the case of a freely falling body and solve related numerical problems.
- 3.7 Explain Non-renewable and Renewable energy sources and list the sources.
- 3.8 Build Solar water heater, Wind mill and Biogas plant with legible diagrams.
- 3.9 Explain modes of transmission of heat.
- 3.10 Explain thermal expansion of solids and develop three coefficients of expansion of solids and identify the applications.

- 3.11 Explain thermal conductivity of a solid and develop the expression for it $\left[Q = \frac{KA(\theta_1 - \theta_2)t}{L}\right]$.
- 3.12 Explain principle of bimetallic strip and construct bimetallic thermostat as an automatic temperature control device in electrical gadgets.
- 3.13 Explain Boyle's law in gases and its limitations and solve related numerical problems.
- 3.14 Explain concept of Absolute Zero using volume and pressure coefficients of a gas $[V_t = V_0(1 + \frac{t}{273}) \text{ and } P_t = P_0(1 + \frac{t}{273})]$ and develop Absolute temperature scale.
- 3.15 Explain Charles' laws in gases in terms of absolute temperature and solve related numerical problems.
- 3.16 Develop Ideal gas equation and calculate universal gas constant and solve related numerical problems.
- 3.17 Explain Isothermal and Adiabatic processes and identify differences between them.
- 3.18 Explain the terms internal energy and external work done by a gas.
- 3.19 Develop the expression for work done by the gas $[W = P(V_2 - V_1)]$ and solve related numerical problems.
- 3.20 Explain first law of thermodynamics and list applications of it and solve related numerical problems.
- 3.21 Explain second law of thermodynamics and list applications of it.

CO4: Extend the formulation of Simple Harmonic Motion to determine time period of simple pendulum and identify the noise controlling methods in practical engineering and environmental applications.

- 4.1 Explain periodic motion and Simple Harmonic Motion (SHM).
- 4.2 List the examples of SHM.
- 4.3 List the conditions of Simple Harmonic Motion.
- 4.4 Define the terms time period, frequency, amplitude and phase of a particle in SHM.
- 4.5 Develop the expressions for Displacement, Velocity, Acceleration, Time period and Frequency of a particle executing in SHM and solve numerical problems.
- 4.6 Define Ideal simple pendulum and develop the expression for time period of a simple pendulum and solve numerical problems.
- 4.7 Develop the laws of simple pendulum.
- 4.8 Define second's pendulum and determine its length on the Earth.
- 4.9 Define wave and its characteristics.
- 4.10 Explain longitudinal and transverse waves with examples.
- 4.11 Explain audible range, infrasonic and ultrasonic waves.
- 4.12 Develop the expression relating wave velocity, frequency and wavelength ($v = n\lambda$) and solve numerical problems.

- 4.13 Explain echo and develop the formula for time of echo from a distant obstacle and solve numerical problems.
- 4.14 List the applications of echo.
- 4.15 Explain SONAR.
- 4.16 Explain Reverberation, reverberation time and outline Sabine's formula.
- 4.17 Identify the requirements for acoustically good auditorium.
- 4.18 Explain free vibrations, forced vibrations and resonance with examples.
- 4.19 Explain noise pollution and identify the causes, effects and methods to minimize noise pollution.

CO5: Apply the principles of electricity and magnetism to analyze electric circuits, model transformers, and solve related numerical problems in basic engineering applications.

- 5.1 Summarize electric current and potential difference.
- 5.2 Explain Ohm's law and solve numerical problems.
- 5.3 Explain specific resistance ($\rho = \frac{RA}{l}$) and solve related numerical problems.
- 5.4 Define conductivity and conductance.
- 5.5 Explain combination of resistors in electric circuit and develop formulae for equivalent resistance in series and parallel connection and solve related numerical problems.
- 5.6 Explain Kirchhoff's laws in electricity and solve numerical problems.
- 5.7 Construct Wheatstone bridge and develop balancing condition of it starting from Kirchhoff's laws in electricity and solve numerical problems.
- 5.8 Draw the circuit diagram of Meter Bridge and outline the formula for determination of unknown resistance and solve numerical problems.
- 5.9 Explain basic concept of Superconductivity.
- 5.10 List the examples of super conductors.
- 5.11 List the applications of Superconductors.
- 5.12 Explain magnetic pole, pole strength and magnetic length of a bar magnet.
- 5.13 Explain magnetic field, magnetic lines of force and magnetic induction.
- 5.14 List properties of magnetic lines of force.
- 5.15 Explain uniform and non uniform magnetic fields.
- 5.16 Define magnetic flux.
- 5.17 Explain types of magnetic materials (dia, para and ferro magnetic materials) based on magnetic properties.
- 5.18 Explain Coulomb's inverse square law of magnetism and solve numerical problems.

- 5.19 Develop expression for moment of couple on a bar magnet placed in a uniform magnetic field ($C = MB\sin\theta$) and solve numerical problems.
- 5.20 Explain Faraday's laws of electromagnetic induction.
- 5.21 Explain Lenz's law.
- 5.22 Explain Self induction and Mutual induction.
- 5.23 Construct transformer making use of principle of electromagnetic induction.
- 5.24 Construct Step up and Step down transformers.

CO6: Apply the principles of Photoelectric effect, LASER and semiconductors to build Photocell, Ruby LASER and LED for engineering applications.

- 6.1 Explain Photo electric effect.
- 6.2 Outline Einstein's photo electric equation; explain work function and threshold frequency and solve numerical problems.
- 6.3 Develop laws of photo electric effect.
- 6.4 Construct photocell and explain its working.
- 6.5 Identify applications of photocell.
- 6.6 Explain LASER and concept of energy levels (Ground state, excited state and Meta stable state).
- 6.7 Explain Spontaneous emission, Stimulated emission, population inversion and optical pumping.
- 6.8 List the characteristics of LASER.
- 6.9 Construct Ruby LASER and explain its working.
- 6.10 Identify applications of LASER.
- 6.11 Explain critical angle and total internal reflection of light.
- 6.12 Make use of optical properties to explain working of Optical fiber.
- 6.13 Identify applications of optical fiber.
- 6.14 Explain Nano scale and identify properties at Nano scale.
- 6.15 Classify Nano materials (zero, one, two and three dimensional).
- 6.16 Identify applications of Nano materials.
- 6.17 Outline Valence band, Conduction band and Forbidden energy gap in solids.
- 6.18 Identify Conductors, Insulators and Semiconductors on the basis of energy band diagram.
- 6.19 Explain Intrinsic semiconductors with examples.
- 6.20 Explain the concept of hole and doping in semiconductors.
- 6.21 Explain Extrinsic semiconductors and identify differences between P-type and N-type semiconductors.
- 6.22 Explain PN Junction Diode.
- 6.23 Explain Forward bias and Reverse bias of PN diode.
- 6.24 Identify the applications of PN Diode.
- 6.25 Make use of diode to construct half wave and full wave rectifiers.

6.26 Utilize diode principles to build Light Emitting Diode (LED).

Course Content and Blue Print of Maths for MID Examinations & Year End Examination (YEE)

MID-I Examination					
S.No	Unit	Questions to be set for MID Exam			Remarks
		R	U	A	
1	UNIT-1 Units, Dimensions and Vectors	1, 2	5(a) 5(b)	7(a) 7(b)	
2	UNIT-2 Dynamics and Properties of Matter	3, 4	6(a) 6(b)	8(a) 8(b)	
Total Questions		4	4	4	
MID-II Examination					
S.No	Unit	Questions to be set for MID Exam			Remarks
		R	U	A	
1	UNIT-3 Energy Sources and Thermal Physics	1, 2	5(a) 5(b)	7(a) 7(b)	
2	UNIT-4 Simple Harmonic Motion and Acoustics	3, 4	6(a) 6(b)	8(a) 8(b)	

Total Questions		4	4	4	

Year End Examination (YEE)

S. No	Unit	Questions to be set for YEE				Remarks
		R		U	A	
1	UNIT-1 Units, Dimensions and Vectors	4	1	9(a)	13(a)	
2	UNIT-2 Dynamics and Properties of Matter					
3	UNIT-3 Energy Sources and Thermal Physics		2	10(a)	14(a)	
4	UNIT-4 Simple Harmonic Motion and Acoustics					
5	UNIT-5 Electricity and Magnetism		3	5, 6	9(b)	
					11(a)	
					11(b)	
6	UNIT- 6 Modern Physics and Semiconductor Physics		7,8		10(b)	
					12(a)	
					12(b)	
					15(a)	
					15(b)	
					16(a)	
					16(b)	
Total Questions		8		8	8	

Legend:	Remembering (R)	1 Mark
	Understanding (U)	3 Marks
	Application (A)	5 Marks

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TELANGANA
DIPLOMA EXAMINATION (C 26), MID 1 EXAMINATION
SC 103 Engineering Physics
Model Question paper

Duration: 1 hour

Max.Marks: 20

PART-A

Instructions: 1. Answer **ALL** questions.

2. Each question carries **ONE** mark.

4X1 =4

1. Define fundamental physical quantity.
2. How does a vector differ from a scalar?
3. Define Normal reaction
4. Define angle of contact.

PART-B

Instructions: 1. Answer **ALL** questions.

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

2X3 =6

- 5 (a). The displacement of a particle moving along x-axis with respect to time is $x=at+bt^2-ct^3$.
Find the dimensional formulae of a, b and c.

(OR)

- 5 (b). At an airport, a horizontal wind is blowing at 15 ms^{-1} at an angle of 60° north of east. Calculate the components of the wind velocity in the north and east directions.

6(a). A ball is kicked into air with velocity of 20 ms^{-1} at an angle 30° with the Earth's surface. Find maximum height reached by the ball. (Take $g = 10 \text{ ms}^{-2}$)

(OR)

6 (b). An object of weight 20 N is suspended vertically from a crane on a steel cable 4 m long and 2 mm in diameter produces an elongation of 0.24 mm. Calculate the stress and strain in the cable.

PART-C

Instructions: 1. Answer **ALL** questions.

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

2X5 =10

7(a). Develop expressions for magnitude and direction of resultant of two vectors using parallelogram law of vectors.

(OR)

7(b). Find the angle between two vectors $\vec{P} = 2\hat{i} - 2\hat{j} + \hat{k}$ and $\vec{Q} = \hat{i} - 2\hat{j} + \hat{k}$ by applying vector properties.

8(a). Develop the expression for path of a projectile in oblique projection.

(OR)

8(b). Develop a formula for Young's modulus of a wire having circular cross-sectional area.

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TELANGANA
DIPLOMA EXAMINATION (C 26), MID 2 EXAMINATION
SC 103 Engineering Physics
Model Question paper

Duration: 1 hour

Max. Marks: 20

PART-A

Instructions: 1. Answer **ALL** questions.

2. Each question carries **ONE** mark.

4X1 =4

1. What is kinetic energy?
2. Define convection.
3. Define second's pendulum.
4. Define reverberation.

PART-B

Instructions: 1. Answer **ALL** questions.

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

2X3 =6

- 5(a). Find the power of a machine gun if it fires 120 bullets per minute. The bullet travels with a velocity of 200 m/s and mass of each bullet is 20 grams.

(OR)

- 5(b). Explain principle of bimetallic strip.

- 6(a). The acceleration of a particle in S.H.M. is 0.09 ms^{-2} when its displacement is 0.25 m. Find the period of oscillation.

(OR)

6(b). List three applications of echo

PART-C

Instructions: 1. Answer **ALL** questions.

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

2X5 =10

7(a). Explain working of wind mill with legible diagram..

(OR)

7(b). Develop the relation between Pressure, Volume and Temperature of an ideal gas.

8(a). Develop the expression for time period of a simple pendulum.

(OR)

8(b). List five methods to minimize noise pollution.

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TELANGANA

DIPLOMA EXAMINATION (C 26)

FIRST YEAR END EXAMINATION

SC 103 Engineering Physics

Model Question paper

Duration: 2 hours

Max.Marks: 40

PART – A

Instructions: 1. Answer **ALL** questions.

2. Each question carries **ONE** mark.

8X1=8

1. Name the dimensional formula of power.
2. What is the formula for maximum acceleration of a particle in S.H.M?
3. Define magnetic field.
4. Define elastic limit.
5. Define specific resistance.
6. Define self induction.
7. What is photo electric effect?
8. What is forbidden gap?

PART – B

Instructions: 1. Answer **ALL** questions.

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

4X3=12

9(a). If $\vec{A} = \hat{i} + 2\hat{j} + n\hat{k}$ and $\vec{B} = 4\hat{i} + 3\hat{j} - 2\hat{k}$ are perpendicular vectors then find the value of n.

(OR)

9(b) Explain Coulomb's inverse square law of magnetism.

10(a). One mole of oxygen at 0°C is enclosed in a cylinder fitted with a frictionless piston. The external pressure on the piston is $1.013 \times 10^5 \text{ Pa}$. If it is heated such that its volume increases by 10% from its initial volume $2.24 \times 10^{-2} \text{ m}^3$. Find the work done.

(OR)

10(b). List the applications of optical fibre.

11(a) Develop formula for effective resistance of resistors connected in parallel in an electric circuit.

(OR)

11(b) A bar magnet of length 20 cm and pole strength 5 Am makes an angle 30° with a uniform magnetic field of induction 100 T. Find the moment of couple on it.

12(a) Outline Einstein's Photoelectric equation.

(OR)

12(b) Identify Conductors, Insulators and Semiconductors on the basis of energy band diagram.

PART – C

Instructions: 1. Answer **ALL** questions.

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

4X5 = 20

13(a). Develop expressions for magnitude and direction of resultant of two vectors using parallelogram law of vectors.

(OR)

13(b). Construct Wheatstone bridge and develop balancing condition of it.

14(a). Develop the relation between Pressure, Volume and Temperature of an ideal gas.

(OR)

14(b). Identify applications of nano materials.

15(a). Construct transformer starting from the principle of electromagnetic induction.

(OR)

15(b). Explain types of magnetic materials based on magnetic properties.

16(a). Construct Ruby LASER and explain its working.

(OR)

16(b). Build Light Emitting Diode.