Course – 1 Essential and Applications of Mathematical, Physical and Chemical Sciences

QUESTION BANK

Govt (A) College

Essentials - Mathematics

Question Bank.

Essays:-

1. If $x+iy = \frac{1}{1+\cos\theta+i\sin\theta}$ Then Show that

$4x^2-1=0$.

2. If The points whose position vectors are $3\bar{i}-2\bar{j}-\bar{k}$, $2\bar{i}+3\bar{j}-4\bar{k}$, $-\bar{i}+\bar{j}+2\bar{k}$, $4\bar{i}+5\bar{j}+\lambda\bar{k}$ are coplanar Then Show that $\lambda = \frac{-146}{17}$

3. Find The Mean of The following distribution

C.I	60-62	63-65	66-68	69-71	72-74
frequency	15	118	142	127	18.

V.S Q's

1. find $\sin^2 60^\circ + \cos^2 60^\circ$
2. If $\sec\theta+\tan\theta=5$, Then find $\sec\theta-\tan\theta$
3. Find the multiplicative Inverse of $3-5i$
4. find $\cos 42 + \cos 78^\circ + \cos 162$
5. find The Mean of 40, 50, 45, 35, 25
6. Find The Median of 11, 15, 16, 14, 11, 13, 12, 14, 15, 16
7. find The Mode of 1, 2, 3, 4, 4, 4, 5, 6, 7, 4
8. Write The formulae for median grouped dat
9. If The vectors $2\bar{i}+\lambda\bar{j}-\bar{k}$ and $4\bar{i}-2\bar{j}+2\bar{k}$

are perpendicular To Each other find The value of λ.

10. If $4\bar{i} + \frac{2p}{3}\bar{j} + p\bar{k}$ is parallel To the vector $\bar{i} + 2\bar{j} + 3\bar{k}$, find The value of "p"

I Matching:

1. $\sin 60°$	( )	a)	$\frac{1-\tan^2 A}{1+\tan^2 A}$
2. $\tan 90°$	( )	(b)	$\frac{2\tan A}{1+\tan^2 A}$
3. $\sin 2A$	( )	(c)	$\frac{1}{2}$
4. $\cos 2A$	( )	(d)	∞
		(e)	$\frac{\sqrt{3}}{2}$

II

1. $2+\sqrt{5}i$ additive Inverse	( )	(a)	30
2. $3+4i$ Conjugate complex	( )	(b)	4
3. The mode of 1, 4, 5, 4, 4, 6, 4, 4, 1	( )	(c)	$-2-\sqrt{5}i$
4. The mean of 30, 40, 20, 10, 50	( )	(d)	$3-4i$
		(e)	$2-\sqrt{5}i$

Application of Maths

1. prove That (i) $\sin A \sin(60+A)\sin(60-A) = \frac{1}{4}\sin 3A$ and hence deduce That $\sin\frac{\pi}{9}\cdot\sin\frac{2\pi}{9}\sin\frac{3\pi}{9}\sin\frac{4\pi}{9} = \frac{3}{16}$

2. find The mode for The following data

C.I	0-10	10-20	20-30	30-40	40-50	50-60	60-70	70-80
f	5	8	7	12	28	20	10	10

PHYSICS Unit-2

Section A

Essay type answer Questions

1. State and explain Newton's Laws of motion
2. Explain about laws of thermodynamics and their significance
3. Explain various theories in understanding of Universe

Section B

One Sentence answer type Questions

1. What are the basic units?
2. Write two main domains of physics
3. State first law of thermodynamics
4. Give significance of 2^{nd} law of thermodynamics
5. Write failures of Newtonian Mechanics
6. Write a short note on Relativistic Mechanics
7. What are acoustic waves?
8. What are electromagnetic waves?
9. Define electromagnetic induction
10. State uncertainty principle

Section C

Match the following

Column 1	Column 2
1. Energy	( ) a. Quantum Mechanics
2. Microscopic domain	( ) b . Generator
3. Second Law of Thermodynamics	( ) c. Joul
4. Electro-Magnetic Induction	( ) d. Refrigerator

	Column 1		Column 2
5.	Electron	( )	a. smallest unit of matter
6.	Proton	( )	b. Negative
7.	Neutron	( )	c. Neutral
8.	Atom as a whole	( )	d. Positive

Unit-4

SECTION-A

1. How physics helps in environmental monitoring?

2. Write the applications of chemistry in Material Science.

SECTION-B

1. Integrated circuit industry is mainly based on which the principles ?
   Ans: Solid state Physics

2. Development of high-performance electronic components and Nano scale devices requires the essential knowledge on_____(Quantum Mechanics)

3. Which principles help in designing robots with the desired range of motion, speed, and accuracy?(Kinematics and Dynamics)

4. An Application of Physics in automotive industry is_____ (Braking systems for improved stability, handling, and safety)

5. An Application of Physics in aerospace industry is_____(To design aircraft that can take off, maneuver, and land safely and efficiently.)

6. Write two types of calculus.

Ans:1. Differential Calculus 2. Integral Calculus

7. If we take the derivative of a function and then take the integral of it, we get_____(The same given function)

8. Give one physics problem that involves the application of differential equations

Ans: Newton's laws of motions and laws of thermodynamics

9. Give two application of chemistry in material science

Ans: To synthesis and fabricate various new materials and Material design and modifications

10. Write one application of complex analysis

Ans:To analyze sound waves in in speech recogniti

Unit III
Chemistry

Essays

1.what are the branches in chemistry & give its significance.

2.Define Carbohydrate & explain its classification.

VSAQs

1. Give an example for physical change & chemical change.
2. What are Write the Electronic configuration of chromium.
3. What are water soluble & fat soluble vitamins.
4. Write any two functions of proteins.
5. Define Homogeneous & Heterogeneous mixtures.
6. Write the Structure of glucose.
7. What are Disaccharides.
8. What is peptide bond.
9. Write a note on vitamin B12.
10. Write a note on vitamin K.
11. Write any two application of food and beverages industries.
12. Write any two application of medicinal chemistry.

Column I	Column II	
i). Proteins	a. Monosaccharides	(d)
ii). Carbohydrates	b. Triglycerides	(a)
iii). Lipids	c. Nucleotides	(b)
iv). Nucleic acids	d. Amino acids	(c)
V) vitamin B1	e. thiamine	(e)

2. Match the following

Column I	Column II
(A) Vitamin B_1	(i) Convulsions
(B) Vitamin B_2	(ii) Pernicious anaemia
(C) Vitamin B_{12}	(iii) Beri beri
(D) Vitamin B_6	(iv) Cheilosis
(E) Vitamin E	v) anemia

A

(A) → (iv), (B) → (iii), (C) → (i), (D) → (ii) ,E) V

Major 1 : Computers

Essay answer questions

1. Explain milestones of computer evolution
2. Explain the types of networks
3. Explain the basics of cryptography including the differences between symmetric and asymmetric encryption.

One Word Question &Answers

1. what is VLSI ?
2. what is two example of 3rd generation of computer?
3. what is TCP ?
4. ICMP is used for communication
5. What is encryption?
6. what is firewalls
7. what is VPN
8. what type of firewall operates as an intermediary between two systems?
9. what is the system that translates human-readable domain names into numerical IP addresses?
10. What is IP address?

Match The Following:

Matching - I

1. First Generation	(d)	a. Artificial Intelligence
2. Second Generation	(c)	b. Magnetic Tapes
3.Third Generation	(b)	c. Punched Cards
4.Fourth Generation	(e)	d. Machine Language
5.Fifth Generation	(a)	e. Microprocessor

Matching – II

1. TCP	(b)	a. Dynamic Host Control Protocol
2. VPN	(d)	b. Transmission Control Protocol
3. DHCP	(a)	c. User Datagram Protocol
4. UDP	(c)	d. Virtual Private Network

GOVERNMENT COLLEGE (A) , RAJAHMUNDRY

Course 2 : ADVANCES IN MATEMATICAL, PHYSICAL AND CHEMICAL SCIENCE

QUESTION BANK

Advances – Maths

Question – Bank.

Essays:-

1. Show That $2x-3y-23=0$, $2x+y-3=0$, $3x+2y-2=0$ lines are concurrent.

2. Evaluate $\int \sqrt{1-\sin 2x}\cdot dx$

3. Show That $\begin{vmatrix} a+b+c & 2a & 2a \\ 2b & b-c-a & 2b \\ 2c & 2c & c-a-b \end{vmatrix} = (a+b+c)^3$

V.S.Q :-

1. Find $\frac{d}{dx}(e^{3x})$

2. Find $\frac{d}{dx}(\sin 2x)$

3. Find The $\int (x^4+\cos x)\,dx$

4. Evaluate $\int \frac{dx}{9+x^2}$

5. Evaluate $\lim_{x\to 0} \frac{\sin 2x}{x}$

6. Evaluate $\lim_{x\to 1} \frac{x^4-1}{x^3-1}$

7. Evaluate $\lim_{x\to 0} \frac{e^{7x}-1}{x}$

8. slope Intercept formulae

9. If $A=\begin{bmatrix}1 & 2\\ 1 & 3\end{bmatrix}$ $I=\begin{bmatrix}1 & 0\\ 0 & 1\end{bmatrix}$ Then find AI

10. If $A=\begin{bmatrix}1 & 2\\ 1 & 3\end{bmatrix}$ Then find A^{-1}

are perpendicular To Each other find The value of λ.

10. If $4\bar{i} + \frac{2p}{3}\bar{j} + p\bar{k}$ is parallel To The vector $\bar{i} + 2\bar{j} + 3\bar{k}$, find The value of "p"

I Matching:

1. $\sin 60°$	( )	a)	$\frac{1-\tan^2 A}{1+\tan^2 A}$
2. $\tan 90°$	( )	(b)	$\frac{2\tan A}{1+\tan^2 A}$
3. $\sin 2A$	( )	(c)	$\frac{1}{2}$
4. $\cos 2A$	( )	(d)	∞
		(e)	$\frac{\sqrt{3}}{2}$

II

1. $2+\sqrt{5}i$ additive Inverse	( )	(a)	30
2. $3+4i$ Conjugate complex	( )	(b)	4
3. The mode of 1, 4, 5, 4, 4, 6, 4, 4, 1	( )	(c)	$-2-\sqrt{5}i$
4. The mean of 30, 40, 20, 10, 50	( )	(d)	$3-4i$
		(e)	$2-\sqrt{5}i$

Application of Maths

1. prove That (i) $\sin A \sin(60+A)\sin(60-A) = \frac{1}{4}\sin 3A$ and hence deduce That $\sin\frac{\pi}{9}\cdot\sin\frac{2\pi}{9}\sin\frac{3\pi}{9}\sin\frac{4\pi}{9} = \frac{3}{16}$

2. find The mode for The following data

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Physics

Essay type answer Questions

1. Write about different Renewable Energy resources and energy storage methods?
2. Explain about Quantum communication?
3. What are the recent advances in medical Physics?

Section B

One Sentence answer type Questions

1. What is the primary advantage of solar photovoltaic technology in renewable energy?

2. How does a pumped hydro storage system function as an energy storage device?

3. What is nanotechnology?

4. What is the significance of quantum dots in nanotechnology?

5. What distinguishes quantum communication from classical methods?

6 What is the significance of artificial intelligence in medical physics applications?

7. In what way have radiation therapy techniques advanced in medical physics?

8. How has advanced fluorescence microscopy contributed to recent breakthroughs in biophysics?

9. What role does single-cell biophysics play in understanding cellular heterogeneity?

10. How do recent advancements in magnetic resonance techniques contribute to studying biological systems?

Section C

Matching type Questions

I. Match the renewable energy technology with its application:

1. Photovoltaic cells	A. Heating buildings and water
2. Wind turbines	B. Producing electricity in remote areas
3. Hydropower plants	C. Generating electricity from sunlight
4. Solar water heaters	D. Harnessing wind energy
5. Biomass generators	E. Converting flowing water into electricity

Ans: 1C 2.D, 3.E 4.A 5.B

II. Match the medical imaging technique with its description:

1. Magnetic Resonance Imaging (MRI)	A. Uses X-rays to create detailed cross- sectional images
2. Computed Tomography (CT)	B. Utilizes strong magnetic fields and radio waves
3. Ultrasound	C. Provides real-time imaging using sound waves
4. Positron Emission Tomography (PET)	D. Visualizes metabolic activity in the body
5. Nuclear Medicine	E. Produces three-dimensional images of internal structures

Ans : 1B 2.A 3.C 4. E 5.D

Unit -4

I. Essays questions

1. Explain nano medicine and write applications?
2. Write a note on solid waste management?
3. Write a note on environmental remediation?

II. One word Sentence answer type Questions

1. Energy _____ technologies play a crucial role in smoothing out fluctuations in renewable energy generation (Storage)

2. Grid _____ refers to the ability of a power system to accommodate and manage large amounts of renewable energy. (Integration)

3. _____ converters are used to convert DC power from solar panels or wind turbines into AC power for the grid. (Inverters)

4. _____ resources like batteries and pumped hydro storage can store excess energy for later use. (Energy)

5. Smart grids use advanced _____ and control systems to improve the efficiency and reliability of the electrical grid. (Technology)

7. _____is a key aspect of a smart grid, allowing utilities to better respond to changes in supply and demand. (Demand response)

8. Nano medicine involves the application of _____ and nanotechnology to the field of medicine. (Nano Particles)

9. Nanoparticles can be engineered to carry drugs directly to the _____ of disease. (Site)

10. Fluorescence _____ is a method used to visualize cellular structures and molecules in living organisms. (Microscopy)

11. Scanning _____ microscopy is a technique that allows for high-resolution imaging of surfaces. (tunnelling)

12. The study of the mechanical aspects of living organisms is known as _____ (bio mechanics)

13. In neurophysics, the _____ equation describes how electrical signals propagate along neurons. (cable)

14. _____ is the process by which neurons adjust their sensitivity to incoming signals based on the level of simulation. (plasticity)

15. Radiation therapy may be used as a _____ treatment or in combination with other treatments like surgery or chemotherapy. (primary)

III match the following

1. Smart Grid	( )	a) A localized group of interconnected loads and distributed energy resources that can operate independently from the traditional grid.
2. Frequency Regulation	( )	b) A system that allows utilities to communicate with and control various elements of the electrical grid in real-time.
3.Energy Storage	( )	c) The ability to change electricity usage in response to signals indicating a need to reduce demand.
4. Micro grid	( )	d) The ability of a power system to match generation and consumption in real-time.

ANS: 1. C 2. B 3. D 4. A 5. E

1. Demand Response	( )	a) Real-%me monitoring and control devices that provide synchronized measurements of the power grid.
2. Advanced Metering Infrastructure (AMI)	( )	b) Technology that allows utilities to adjust electricity usage in response to grid conditions or pricing signals.
3. Distribution Automation	( )	c) A system that enables two-way communication between utilities and customers, providing detailed information about electricity usage.
4. Energy Efficiency	( )	d) Implementing technologies to improve the use of electricity, reduce waste, and conserve energy.
5. Phasor Measurement Units (PMUs)	( )	e) Automation of the distribution system, including devices that can automatically re-route power and isolate faults.

Ans 1) B 2). C 3). E 4). D 5). A

Advances in Chemistry

Unit III &IV

10M Essays

1. What is Computer aided drug design and Delivery?
2. What are Nano sensors?
3. Explain the impact of Chemical pollutants on human health
4. Explain the impact of Chemical pollutants on ecosystem
5. what is chemical biology?

VSAQs. 1M

1. What is QSAR?
2. What is Pharmacophore modelling?
3. What are the types of Nano sensors including?
4. What is Chemical Biology?
5. What is Chemical Genetics?
6. What is Chemical pollutants on Ecosystem?
7. What is Heterogeneous Catalysis?
8. Explain Biodiversity Loss Impact of Chemical pollutants on Ecosystem?
9. Write any two Applications of Nano sensors?
10. Write advantages for dye removal?
11. What is bio orthogonal chemistry?
12. What is Fenton's Reaction?

1. Match the following

Part A	**part B**
1. Particle size of Nano sensor	a) nickel (e)
2. Semiconductor of CNT	b) CO2 (a)
3. Rolled of carbon lattice	c) covalent (b)
4. Carbon bonding in CNT	d) SWCNT (c)
5. Gaseous chemicals	e) 10- 200nm (d)

2. Match the following

Part A		**part B**
1.CADD	(C)	a) tiny particles of 10- 100nm
2. inrtradermal	(e)	b) lock and key model
3. Nano sensors	(a)	c) applied to the majority 0f drug development
4. Emil fisher proposed by	(b)	d) rate of reaction
5. catalyst	(d)	e)drugs and injected into the top layer of the skin

Essay answer questions

1. Classification of number system
2. Explain the transmission media
3. Explain the network devices

Short answer questions

1. Which number system is foundational for computer science and digital electronics?
A. Binary
2. Conversion of Octal number $(540)_8$ to binary number?A. $(101100000)_2$
3. what Speed of data transmission in 4G network of telecom?
A. 100 mbps to 1 gbps
4. what is the primary function of a modem?
A. Converting analog signals to digital signals
5. What is the primary function of a codec?
A. multiplexing and demultiplexing signals
6. what is the purpose of the parity bit in parity check?
A. to indicate the presence of errors in the data
7. what types of errors can parity check detect?
A. both single-bit and burst errors
8. what is the primary purpose of a repeater?
A. Signal amplification and extension
9. what is the primary function of a gateway?
A. Protocol translation and network interconnectivity
10. what do routers use to determine the best path for data packets to travel?
A. internet protocol (IP) addresses

Following Matchings

Matching - I

1. Modem	(c)	a. continuity
2. Analog	(a)	b. Bluetooth
3. Codec	(d)	c. modulation-demodulation
4. Wireless media	(b)	d. multiplexing and de multiplexing

Matching – II

1. MAC	(c)	a. Local area network
2. LAN	(a)	b. Internet protocol
3. WWW	(d)	c. media access control addres
4. IP	(b)	d. world wide web

Course 3: RENEWABLE ENERGY RESOURCES-1

Question bank

Essays

Unit-1

1. Explain the classification of energy sources? (BL1)

2. Write the importance of renewable energy sources and write their examples of it? (BL2)

Unit - 2

1.Explain the classification of solar cells? (BL3)

2.Define solar constant and explain how can you determine it?(BL3)

3. Describe the Solar Radiation distribution spectrum? (BL2)

Unit - 3

1. Write the principle of wind energy conversion and also briefly explain it? (BL1)

2. Explain the types of wind turbines?(BL3)

Unit - 4

1.Briefly explain about tidal energy technologies? (BL2)

2. Explain ocean thermal energy conversion methods?(BL2)

3.Briefly explain about wave energy technologies? (BL2)

Unit- 5

1.Explain biomass conversion technologies?(BL3)

2. .Explain briefly about wet process and dry process?(BL1)

3. Explain about the aerobic and anaerobic process?

Short answer questions

Unit-1

1.Define energy and write their units of it?(BL1)

2. Explain the green footprint concept briefly?(BL2)

3. Define erg, calorie?(BL1)

4. Define watt, horse power?(BL1)

Unit-2

1. Write the applications of solar PV systems?(BL4)

2. Explain first generation of solar cells?(BL3)

3. write the applications of solar PV modules?

4. What are the key elements of solar cell?

Unit-3

1.Write the conditions for site selection to establish a wind turbine?(BL2)

2.Explain the origin of wind?(BL1)

Unit-4

1. Write the nature of tidal energy?(BL1)

Unit-5

1. Define bio energy? what are the resources of it?(BL1)

2. What are the properties of biomass sources?(BL1)

3. .Explain photosynthesis?(BL1)

4.What are the usable form of biomass?(BL1)

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Course 4: MECHANICS AND WAVES AND OSCILLATIONS

QUESTIONS BANK

CHAPTER -I

MECHANICS OF A PARTICLE & MECHANICS OF A RIGID BODY

LONG ANSWER TYPE QUESTIONS (7 MARKS)

1. Discuss the motion of a Rocket. Derive an expression for the velocity of a rocket at any instant of time moving under gravitational field.(BT1)
2. From the Rutherford scattering experiment, obtain the relation between Impact parameter (p) and scattering angle (ϕ).(BT2)
3. Obtain the expression for Rutherford's Scattering cross section (BT1)
4. Derive the Euler equations of rotational motion for a rigid body fixed at one point.(BT2)
5. What is a Symmetric top. Arrive at an expression for the angular velocity of precession of a symmetric top.(BT1)

SHORT ANSWER TYPE QUESTIONS (3 MARKS)

1. Obtain the general expression for the external force on any system of variable mass.(BT1)
2. Explain impact parameter, scattering cross- section.(BT1)
3. State and prove the law of conservation of angular momentum with examples.(BT2)
4. Explain the precession of Equinoxes.(BT1)
5. Explain the principle and working of a gyroscope.(BT2)

CHAPTER -II

MOTION IN A CENTRAL FORCE FIELD

LONG ANSWER TYPE QUESTIONS (7MARKS)

1. Define central force. Deduce the equation of a motion of a particle under central force.(BT1)
2. State Kepler's laws and hence deduce Kepler's laws of planetary motion.(BT2)
3. What is a conservative force? Prove that Central force is conservative in nature.(BT1)

SHORT ANSWER TYPE QUESTIONS (3 MARKS)

1. Write a short note on Global Positioning System (GPS)(BT3)
2. Explain the orbital motion of satellites based on Kepler's laws.(BT2)
3. What are the characteristics of a central force?(BT1)

CHAPTER -III

RELATIVISTIC MECHANICS

LONG ANSWER TYPE QUESTIONS (7 MARKS)

1. State the basic postulates of special theory of relativity. Describe the Michelson – Morley experiment and explain the physical significance of the negative result.(BT1)
2. Deduce Lorentz transformation equations.(BT2)

SHORT ANSWER TYPE QUESTIONS (3 MARKS)

1. Explain Lorentz – Fitz Gerald contraction (length contraction) and obtain an expression for it.(BT1)
2. Explain time dilation(BT2)
3. Derive Einstein's mass – energy relation.(BT2)

CHAPTER -IV

UNDAMPED, DAMPED AND FORCED OSCILLATIONS & COUPLED OSCILLATIONS

LONG ANSWER TYPE QUESTIONS (7 MARKS)

1. What are damped vibrations? Derive an expression for its motion and obtain its solution. Discuss the various cases.(BT1)
2. What are Forced Oscillations? Derive an expression for its motion and obtain its solution. Discuss the various cases.(BT1)
3. Explain the principle and working of an electric oscillator?(BT2)
4. What are coupled Oscillations. What are normal modes and normal coordinates.(BT2)

SHORT ANSWER TYPE QUESTIONS (3 MARKS)

1. What are the characteristics of SHM?(BT1)
2. Explain the terms Logarithmic decrement, relaxation time and quality factor.(BT2)
3. Explain Amplitude resonance and sharpness of resonance.(BT1)
4. What are coupled oscillators? Give two examples.(BT2)
5. Explain the velocity resonance?(BT1)

CHAPTER -V

VIBRATING STRINGS AND ULTRASONICS

LONG ANSWER TYPE QUESTIONS (7 MARKS)

1. Derive an equation for the propagation of transverse wave on a stretched string and obtain its solution?(BT2)
2. What are transverse laws of motion of a stretched string? Discuss the modes of vibrations of a stretched string fixed at both ends(BT1).
3. What are Ultrasonics. Explain Magnetostriction method for production of ultrasonics.(BT2)
4. What are Ultrasonics. Explain piezo-electric method for production of ultrasonics.(BT2)

SHORT ANSWER TYPE QUESTIONS (3 MARKS)

1. What are the methods of detection of Ultrasonics?(BT2)
2. Give the applications of ultrasonics.?(BT3)
3. Obtain an expression for energy density of stretched string vibrating transversely?(BT1)
4. Obtain an expression for energy transport of stretched string vibrating transversely(BT1)

COURSE 5: Renewable Energy Resources-II

Question bank

CHAPTER –I Global & Indian Energy Scenario

LONG ANSWER TYPE QUESTIONS (7 MARKS)

1. Identify Energy resources availability in India.(BT2)
2. Discuss about Governance of energy sector in India(BT3)
3. Explain about Global Energy Scenario in terms of Energy Demand?(BT2)

SHORT ANSWER TYPE QUESTIONS (3 MARKS)

1. What is the Energy Trilemma Index, and what three dimensions does it assess?(BT2)
2. List two primary sources of energy available in India and explain their significance.(BT3)
3. What is the role of the National Green Tribunal (NGT) in India?(BT2)

CHAPTER –II Geothermal energy

LONG ANSWER TYPE QUESTIONS (7MARKS)

1. Give the origin of Geothermal energy & Explain about types of their resources?(BT1)
2. Explain one of the basic extraction mechanisms of geothermal energy with a neat diagram.(BT2)
3. Explain the basic extraction mechanism of Geo-pressured resources?(BT2)

SHORT ANSWER TYPE QUESTIONS (3 MARKS)

1. What is the origin of geothermal energy(BT1)
2. Name and briefly describe two types of geothermal resources.?(BT2)
3. What is the primary method used to extract energy from hydrothermal resources?(BT3)
4. Explain Magma Resource extraction briefly?(BT3)

CHAPTER –III Hydropower and Hydrology

LONG ANSWER TYPE QUESTIONS (7 MARKS)

1. Classify Hydropower Plants with explanation.(BT3)
2. Write overview of micro, mini and small hydro systems?(BT2)
3. Describe the hydrological cycle and its significance in hydropower generation.(BT2)

SHORT ANSWER TYPE QUESTIONS (3 MARKS)

1.What is the basic principle behind hydropower generation?(BT1)

2.What are the main classifications of hydropower plants based on size?(BT3)

3.Define micro, mini, and small hydro systems and their typical power outputs.(BT2)

4.List two advantages and two disadvantages of hydropower.(BT2)

5.What key factors should be considered when selecting a site for a hydroelectric plant?(BT3)

CHAPTER –IV Radioactivity

LONG ANSWER TYPE QUESTIONS (7 MARKS)

1. Explain the principle, working and construction of conventional nuclear reactor(BT1)
2. Explain the working of nuclear power plant with a block diagram?(BT2)
3. What are chain reactions and classify various nuclear reactors?(BT3)
4. Explain about the principle behind a fast breeder reactor, and how does it differ from traditional reactors?(BT3)

5.SHORT ANSWER TYPE QUESTIONS (3 MARKS)

1. What is radioactivity, and what types of radiation can be emitted during decay?(BT1)
2. Define mass defect and explain its relationship to binding energy in atomic nuclei.(BT1)
3. Explain types of chain reactions(BT1)
4. List and briefly describe two types of nuclear reactors.?(BT2)
5. What are the main components of a conventional nuclear power plant?(BT2)

CHAPTER –V Environmental Effects

LONG ANSWER TYPE QUESTIONS (7 MARKS)

1. Explain Environmental degradation due to energy production and utilization?(BT2)
2. Discuss the environmental effects of Wind , Solar and Bio energies harvesting?(BT1)
3. Explain the potential environmental impacts of hydroelectric power generation?(BT2)
4. Give environmental advantages and disadvantages of using available renewable energy sources(BT1)(BT3)

SHORT ANSWER TYPE QUESTIONS (3 MARKS)

1. Write a note on Global warming?(BT3)
2. What is meant by biological damage(BT2)
3. How does air pollution from thermal power stations affect human health?(BT3)
4. Explain the environmental concerns associated with nuclear power generation.(BT2)
5. How can global warming affect biodiversity?(BT3)

COURSE 6: ELECTRICAL AND ELECTRONICS INSTRUMENTATION

Question Bank
Essays

Unit-1

1. Derive the expression for current and voltage using L C R series circuit.(BT2)
2. Explain in detail about star and delta connections with a neat diagram. (BT2)

Unit-2

1. Give the comparison between different wirings. (BT1)
2. Explain the principle and construction of PMMC. (BT3)
3. Explain the construction and working of multimeter?(BT3)
4. Write a note on Voltmeter, Ammeter, Ohm meter and Watt meter?(BT3)

Unit-3

1. Explain the construction and working of Full Wave Rectifier (Bridge type). (BT2)
2. What is BJT? Explain how transistor acts as an amplifier(BT2).
3. Explain the construction and working of half Wave Rectifier (Bridge type). (BT2)
4. Explain the transistor as a switch?(BT3)

Unit-4

1. Explain the construction and working of Lead Acid Battery in detail. (BT2)
2. Explain about Voltage dimmer using DIAC and TRIAC.(BT3)
3. Explain the principle and construction of UPS?(BT3)
4. Explain about IC voltage regulator with a neat diagram? (BT3)

Unit-5

1. Write about the circuit breaker and explain different types of lamps. (BT3)
2. Explain about the electrical safety rules. (BT2)
3. Write a note on National Policy on Safety, Health and Environment at Workplace (NPSHEW)?(BT3)

Short answer questions

Unit-1

1. Define active power and reactive power.(BT2)
2. Explain Causes & effects of low power factor?(BT2)
3. Write the Methods of Improving power factor?(BT3)
4. distinguish between 2 phase and three phase power?(BT3)
5. A potential difference across 24 ohms resistor is 12 volts .What is the current through the resistor.(BT3)

Unit-2

1. Distinguish wire joints and Soldering.(BT1)
2. Write a note on MCB?(BT3)
3. Write a note on RCCB?(BT3)
4. Write a short note on earthing?(BT3)
5. Write the uses of Multimeter?(BT3)
6. Write about the working principle of Ammeter.(BT2)

Unit-3

1. Explain diode I-V characteristics?
2. Distinguish between half wave and full wave rectifiers?(BT3)
3. Explain Zener diode as Voltage Stabilizer.(BT3)
4. A Potential difference with frequency of 50Hz is applied to a coil of 1000 ohms an inductance of 2 Henry. Calculate the power factor of the circuit. (BT3)
5. A full wave rectifier uses two diodes with load resistance of 100 ohms. Each diode is having negligible forward resistance. Find the efficiency of Full Wave Rectifier.(BT3)

Unit-4

1. Write the differences between cell and battery?(BT3)
2. Explain about care and maintenance of the battery?(BT3)

Unit-5

1. Explain about circuit breaker?(BT3)
2. What are the necessary things to be kept in the First Aid Kit.(BT2)
3. Write the Laws of Illumination?(BT2)
4. Explain about the Electrical safety Rules?(BT3)
5. Explain briefly about the Fire extinguishers.(BT3)
6. What are the Advantages of DC transmission and High voltage transmission?

COURSE 7: HEAT AND THERMODYNAMICS

Question bank

Unit-1

1. Describe the Toothed wheel experiment for verification of Maxwell's law of distribution of molecular velocities(BT2)
2. Define Mean free path
3. What is thermal conductivity? Derive an expression for coefficient of thermal conductivity.(BT1)
4. Define Viscosity of gases? Derive an expression for coefficient of viscosity of gases.(BT1)
5. What do mean by Diffusion of gases? Derive an expression for coefficient of Diffusion of gases.(BT1)
6. State the postulates of kinetic theory of gases (BT1)
7. Explain about the Transport phenomena in ideal gases(BT1)
8. How do you determine the C_{rms} velocity(BT2)

UNIT-II

1. Differentiate between Isothermal and Adiabatic processes.(BT1)
2. What is heat engine? Determine the efficiency of a Carnot heat engine.(BT2)
3. Explain briefly about Reversible and irreversible processes.(BT1)
4. Discuss about the second law of Thermodynamics.(BT1)
5. Explain about the change in entropy in reversible and irreversible processes.(BT1)
6. What is Entropy? Explain its physical significance. (BT1)
7. Discuss about principle of refrigeration.(BT2)
8. What is T-S diagram and mention its uses (BT2)

UNIT-III

1. Explain briefly about Thermo dynamical potentials and its significance (BT2)
2. Derive of Maxwell's thermodynamic relations from thermodynamic potentials(BT2)
3. Derive the difference and ratio between C_p and C_v (BT2)
4. Determine the expression for Clausius-Clayperon's equation (BT2)

UNIT-IV

1. Explain about Joule Kelvin effect- Porous plug experiment
2. Describe an expression for Joule-Thomson cooling
3. Distinguish between Adiabatic and Joule-Thomson expansion
4. Discuss about the liquefaction of Helium by Kapitza'a method
5. Interpret the phenomenon of Production of low temperatures by adiabatic demagnetization
6. Write down the practical applications of substances at low temperatures

UNIT-V

1. What is Black body radiation? Give examples (BT1, BT2)
2. Explain about spectral energy distribution of black body radiation(BT2)
3. Give definitions for (i) Kirchoff's law (ii) Wein's displacement law (iii) Stefan-Boltzmann's law and (iv) Rayleigh-Jean's law(BT2)
4. Derive Planck's law of black body radiation (BT2)
5. Deduction of Wein's law and Rayleigh- Jean's law from Planck's law(BT2)
6. Define Solar constant and determine it using Angstrom pyroheliometer(BT2)
7. How do estimate the surface temperature of Sun(BT,)BT2)

QUESTION BANK FOR SEMESTER -III
GOVERNMENT COLLEGE (A) RAJAHMUNDRY

WAVE OPTICS

CHAPTER –I **INTERFERENCE**

LONG ANSWER TYPE QUESTIONS (7 MARKS)

1. Explain the occurrence of Interference fringes in Lloyd's Arrangement. Explain the type of fringes obtained it.(BT2)
2. What is wedge shaped film .Describe the fringes observed when a wedge shaped film is illuminated by light. Calculate the separation between two consecutive bright and dark bands.(BT1)
3. Describe how the wavelength of sodium light can be determined using Newton rings. Derive the formula used for it.(BT2)
4. Describe Newton rings method for measuring the wavelength of monochromatic light. Give the necessary theory.(BT2)
5. Describe the Principle, construction and working of a Michelson Interferometer. Explain how the wavelength of light is determined with it.(BT1, BT2)

SHORT ANSWER TYPE QUESTIONS (3 MARKS)

1. What are the conditions of interference?(BT1)
2. Explain the cosine law.?(BT1)
3. Explain the formation of colors in thin films.(BT1)
4. Write a note on Interference fringes by wedge shaped films.(BT2)

CHAPTER –II **DIFFRACTION**

LONG ANSWER TYPE QUESTIONS (7MARKS)

1. Describe the Fraunhofer Diffraction due to a single slit and deduce the positions of maxima and minima.(BT2)
2. Describe the Fraunhofer Diffraction due to a single slit. Draw the respective graph of the Intensity distribution.(BT2)
3. What is a grating? Find conditions for Principal maxima, minima in Fraunhofer diffraction pattern with N slit.(BT2)
4. Explain how plane transmission grating is used to determine the wavelength of the given light.
5. What is Fresnel's half period zones. Give the theory of Fresnel's diffraction of light .Explain the intensity distribution in diffraction pattern.(BT1, BT2)
6. Explain Fresnel's half period zones. Derive an expression for the amplitude due to nth zone.(BT2)
7. What is a zone plate? How is it constructed? Show that it acts as a convex lens of different focal lengths.(BT2)

SHORT ANSWER TYPE QUESTIONS (3 MARKS)

1. Give the differences between Fraunhofer and Fresnel's diffraction.(BT3)
2. Distinguish between Interference and Diffraction.(BT3)
3. Compare zone plate and convex lens.(BT2)
4. Obtain the formula for resolving power of Grating.(BT2)
5. Define and explain diffraction with at least two examples?(BT2).

CHAPTER –III **POLARIZATION**

LONG ANSWER TYPE QUESTIONS (7 MARKS)

1. Explain the construction and working of Nicol Prism.(BT2)
2. What is a Nicol prism? Explain how it works as Analyzer and Polarizer.(BT2,BT3)

3. What is optical activity? Describe how the specific rotation of sugar solution is determined experimentally.(BT1)
4. Define specific rotation. Describe the construction and working of Laurnt's half shade polarimenter.(BT2)
5. Define specific rotation. Explain how you would use it to determine the specific rotation of sugar solution.(BT1)

SHORT ANSWER TYPE QUESTIONS (3 MARKS)

1. State and explain Brewster's law.(BT1)
2. State and Explain malus Law.(BT1)
3. Explain the phenomena of double refraction.(BT2)
4. Explain what is meant by half wave plate.(BT2)

CHAPTER –IV **ABERRATIONS**

LONG ANSWER TYPE QUESTIONS (7 MARKS)

1. What is Chromatic Aberration? Obtain an expression for the Chromatic Aberration of a lens.(BT2)
2. What is Chromatic Aberration? Derive the condition for achromatism when two lenses are in contact and separated by a distance? (BT1)
3. What is spherical aberration in a lens? Discuss various methods to minimize it.(BT2)
4. What is spherical aberration in a lens? Explain how the spherical aberration can be minimized when two thin lenses separated by a distance. Obtain condition for it.(BT1)
5. Discuss different types of optical fibres.(BT2)
6. Discuss the Modes (i) Step index (ii) Graded index Fibres and their structures.(BT3)
7. Describe the how the optical fibre is used for communication and explain its advantages(BT3)

SHORT ANSWER TYPE QUESTIONS (3 MARKS)

1. What is the phenomenon on which the optical works?(BT2)
2. Give the principle of fibre communication.(BT2)
3. Explain the principle and working of optical fibre.(BT1)
4. Give the applications of fibre optics.(BT3)
5. What is coma? How it can be minimized?(BT1)
6. What is Astigmatism? What are the conditions for astigmatism?(BT1)
7. Explain curvature and distortion?(BT2)

CHAPTER –V **LASERS AND HOLOGRAPHY**

LONG ANSWER TYPE QUESTIONS (7 MARKS)

1. Describe the construction and working of Ruby Laser.(BT2)
2. Describe the construction and working of Helium- Neon Laser.(BT2)
3. Explain the basic of Holography and discuss the applications of holography.(BT2)

SHORT ANSWER TYPE QUESTIONS (3 MARKS)

1. What are the applications of Lasers?(BT3)
2. Define Spontaneous and stimulated emission.(BT2)
3. Distinguish between Spontaneous and stimulated emission.(BT3)
4. What is holography?(BT2)
5. Explain population Inversion and metastable state.(BT2)

Course-9: Electricity, Magnetism and Electronics

Question Bank:

UNIT-I

1. State the Gauss law in electrostatics and prove it.(BL1)
2. Derive the electric field intensity due to uniformly charged solid sphere. (BL2)
3. Obtain expression electric field intensity due to an infinite conducting sheet of charge. (BL1)
4. Deduce the Coulomb's law from Gauss law(BL2)
5. Derive the potential due to a uniformly charged sphere(BL2)
6. Discuss about the equipotential surfaces. (BL1)
7. Explain about the Polar and Non-polar dielectrics(BL1)
8. Derive an expression for capacitance of a parallel plate condenser with dielectric slab between the plates. (BL3)
9. Define Electric displacement vector (D), electric polarization (P) and Electric field intensity vector (E). Obtain the relation between D, E and P. (BL1)
10. Discuss about the Dielectric constant and electric susceptibility. (BL1)

UNIT-II

1. What is Biot-Savart's law? Derive its expression. (BL1)
2. Derive an expression for magnetic field due to circular loop. (BL2)
3. Obtain an expression for magnetic field due solenoid. (BL2)
4. Discuss about the Divergence and curl of magnetic field. (BL1)
5. What is Ampere's Circuital Law and discuss its application to Solenoid. (BL3)
6. What is Hall Effect and determine its Hall coefficient? (BL2)
7. Discuss about the applications of Hall Effect. (BL1)
8. State and explain Faraday's Laws in electromagnetic induction? Derive an expression for the self-inductance of a long solenoid. (BL2)
9. Explain briefly about mutual induction two coils. (BL3)
10. Derive an expression for energy storied in magnetic field. (BL1)
11. Explain about the principle and working of transformer. (BL2)
12. Discuss about eddy currents and electromagnetic damping. (BL2)

UNIT-III

1. What is alternative current (A.C)? Obtain expression of the average value and virtual value of A.C. (BL1)
2. Describe the behavior of LCR series circuit when an alternating current passing through it? Explain the condition of resonance. (BL2)
3. Derive the equation of electromagnetic wave and hence determine the velocity of propagation of electromagnetic wave in free space. (BL3)
4. Derive an expression for impedance of a series LCR circuit for A.C signals. (BL1)
5. Discuss the condition under which resonance occurs in series circuit and obtain an expression for resonant frequency. (BL2)

6. Discuss the growth and decay of current in L-R circuit. (BL3
7. Explain Q-factor and power factor. (BL1)

8. What is displacement current? How Maxwell modified Ampere's circuital law by displacement current. (BL1)
9. Derive four Maxwell's equations. (BL2)
10. Obtain an expression for Maxwell's electromagnetic waves equations. (BL3)
11. State and prove the Poynting theorem. (BL3)
12. Discuss the transverse nature of electromagnetic waves. (BL3)

UNIT-IV

1. Define α, β and γ of a Transistor? Derive the relation between them? (BL3)
2. What is a Transistor? Explain how it works and explain the CE characteristics of a Transistor? (BL1)
3. Draw the I-V characteristics of a P-N junction diode and explain it? (BL1)
4. Draw the I-V characteristics of a Zener diode and explain it? (BL2)
5. In a Transistor, base current and emitter current are 0.08mA and 9.6mA respectively. Calculate collector current, α and β? (BL3)
6. Explain about the Light Emitting Diode. (BL4)
7. Explain that how Zener diode is acts voltage regulator. (BL2)
8. Discuss about CE, CB and CC transistors. (BL2)
9. Discuss about hybrid parameters. (BL1)
10. Discuss that how transistor can be acts as an amplifier. (BL2)

UNIT-V

1. State and Prove De Morgan's Theorems? Explain how NAND gate can be used as a universal gate? (BL3)
2. Discuss the working of half - adder and Full- adder and give their truth-tables(BL3)
3. Convert 0.11001012 to decimal number? (BL3)
4. Explain NAND and NOR gates using their truth tables. (BL3)
5. Discuss about binary addition and subtraction(BL3).
6. Discuss about basic logic gates. (BL3)
7. What are universal gates and discuss those gates with examples. (BL3)
8. Discuss about Exclusive-OR gate. (BL3)

COURSE-10: RENEWABLE ENERGY HARVESTING SYSTEMS

Question bank

Essays answer questions

unit-1

1. Describe the spectral distribution of solar radiation and various components of radiation reaching the earth surface. (BL2)
2. Compare and contrast the construction and working of Pyranometer and Pyrheliometer. (BL3)
3. Write the analysis of sun path diagram on shade analysis?

unit-2

1. Describe the construction and working of flat plate solar thermal collectors. (BL3)
2. Describe about various concentrated solar thermal collectors. (BL3)
3. Explain the methods of Solar hot water system?

unit-3

1. Describe the construction and working of solar photovoltaic cell. (BL2)
2. Describe various steps involved in installation, operation and maintenance of solar PV system. (BL2)
3. Explain the various steps to fabrication of solar module?

unit-4

1. Describe various types of wind turbines. (BL2)
2. Explain the offshore floating windmill technology. What are various challenges involved with it? (BL3)
3. Explain the methods to design Tower to produce wind energy?

unit-5

1. Describe the anaerobic digestion process. (BL1)
2. Explain about wave energy conversion systems. (BL1)
3. Explain an aerobic digestion to produce bio energy?

Short answer questions

unit-1

1. Define Zenith angle and write about air mass index. (BL2)
2. Define declination, hour angle and solar azimuth angle. (BL2)
3. Explain direct, diffuse radiation?

unit-2

1. Describe the principle of solar thermal conversion. (BL3)
2. Write about solar desalinators. (BL2)
3. Explain the construction and working of a solar cooker?
4. Explain the concept of solar greenhouse?

unit-3

1. Explain the use of bypass and blocking diodes in solar PV modules. (BL2)
2. Explain the economics and market analysis of SPV systems. (BL2)
3. Explain the Shading effect of IV characteristics of solar cell?
4. write the challenges of PV market analysis

unit-4

1. Explain the blade design of wind mills. (BL2)
2. Write the challenges to established wind energy?
3. Explain the concept of building integration
4. explain the methods of grid connection?

unit-5

1. Explain the production of biodiesel. (BL2)
2. explain how to generate hydrogen energy? (BL3)

GOVERNMENT COLLEGE (A): RAJAMAHENDRAVARAM
DEPARTMENT OF PHYSICS
MODEL PAPER –
II B.Sc-REM- SEMESTER –IV END EXAMINATION
COURSE-10: RENEWABLE ENERGY HARVESTING SYSTEMS
(As Approved in the BOS meeting held on 12 July 2024 for batch 2024-2025)

Time: 2hr. 30min. Max. Marks: 50

SECTION – A

Answer ALL Questions 5x7 = 35

1. Describe the spectral distribution of solar radiation and various components of radiation reaching the earth surface. (BL2)

[OR]

2. Compare and contrast the construction and working of Pyranometer and Pyrheliometer. (BL3)
3. Describe the construction and working of flat plate solar thermal collectors. (BL3)

[OR]

4. Describe about various concentrated solar thermal collectors. (BL3)
5. Describe the construction and working of solar photovoltaic cell. (BL2)

[OR]

6. Describe various steps involved in installation, operation and maintenance of solar PV system. (BL2)
7. Describe various types of wind turbines. (BL2)

[OR]

8.Explain the offshore floating windmill technology. What are various challenges involved with it? (BL3)
9. Describe the anaerobic digestion process. (BL1)

[OR]

10. Explain about wave energy conversion systems. (BL1)

SECTION – B

Answer Any FIVE Questions 5x3 = 15

11. Define Zenith angle and write about air mass index. (BL2)
12. Define declination, hour angle and solar azimuth angle. (BL2)
13. Describe the principle of solar thermal conversion. (BL3)
14. Write about solar desalinators. (BL2)
15. Explain the use of bypass and blocking diodes in solar PV modules. (BL2)
16. Explain the economics and market analysis of SPV systems. (BL2)
17. Explain the blade design of wind mills. (BL2)
18. Explain the production of biodiesel. (BL2)

COURSE-11-ENERGY STORAGE DEVICES

Question bank

Essays

Unit-1

1. Define energy storage describe flywheel storage system? (BT2)

2. Explain thermo chemical energy storage system (BT2)

3. Explain chemical energy storage system (BT2)

Unit-2

1. Explain the principle, construction and working of lithium ion battery(BT2)

2. Explain the role of carbon and its troops as electrodes in batteries (BT2)

3. Explain lithium solid state and molten solvent batteries (BT2)

Unit-3

1.Explain the construction and working of superconducting magnetic energy storage (BT1, BT2)

2. Explain the principle, construction and working of super capacitor? (BT2)

unit4

1. What is a real cell explain the principle and working of a fuel cell (BT2)

2. Write the advantages and disadvantages of fuel cell? (BT3)

3. Explain the performance characteristics, efficiency of a fuel cell as a stack? (BT3)

Unit5.

1. Explain the construction and working of phosphoric acid fuel cell? (BT2)

2. Explain the construction and working of a solid oxide fuel cell? (BT2)

3. Explain the working and construction of a proton exchange membranes fuel cell? (BT2)

Shorts questions

Unit 1.

1. Explain the need of energy storage (BT1)

2. Explain the methods to transfer the hydrogen as a fuel? (BT2)

3. Write the differences between fossil fuels and synthetic fuels? (BT3)

4. Write the differences between primary and secondary batteries(BT3)

Unit-2

1.Write a short note on Capacitors? (BT2)

2. Write the differences between battery and fuel cells. (BT3)

3. At the difference between primary and the secondary batteries? (BT3)

Unit-3

1. Write the differences between batteries and capacitors (BT2)

2. Upendra working of electrochemical double layer capacitor (BT2)

3. Write the applications of capacitors? (BT3)

Unit4.

1. Write about fuel cell efficiency. (BT2)
2. Mention the applications of fuel cells. (BT3)
3. Write the advantages and disadvantages of fuel cells? (BT3)

unit -5

1. Write a short note on lithium (Li) batteries.
2. Explain hydrogen storage system.
3. Explain alkaline fuel cell?
4. Explain the concept of polymer electrolyte fuel cell?
5. Explain phosphoric acid fuel cell?