# GOVERNMENT COLLEGE (A), RAJAHMUNDRY

## I B.Sc Honors – I SEM

**Course1: Essentials and Applications of Mathematical, Physical and Chemical Sciences**

## Model Paper

**Time: 2 Hr. 30 Min.** **MAX MARKS: 50M**

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**SECTION - A**

**Answer any Three of the following Essays** **3x10= 30M**

1. If $(x + iy) = \frac{1}{1+cos\theta+isin\theta}$ , Show that $4x^2 - 1 = 0$
2. State and explain Newton's laws of motion
3. Explain briefly about the electronic configuration
4. Explain how physics helps in environmental monitoring?
5. What is Internet and give its applications

**SECTION - B**

**Answer All of the following Very Short Answers questions 12x1= 12M**

6. If Secθ + Tanθ= 5, then find Secθ - Tanθ
7. Find the multiplicative inverse of 3-5i
8. Find the median of numbers 11,15,16,14,11,13,12,14,15,16
9. Prove that 2i+3j-k and 4i-2j+2k are perpendicular
10. Write any two applications of Mathematics in physics and chemistry
11. What is the derivative of integral of $x^2$
12. Give any two Applications of physics in automotive industry
13. Expand the forms NMR and FBDD in drug industry
14. What type of firewall operates as an intermediary between two systems?
15. What is the system that translates human-readable domain names into numerical IP addresses?
16. What is IP address?
17. Give two example of 3rd generation of computer?

**SECTION - C**

**Match the following** **2x4= 08**

| **Column 1** | | **Column 2** |
|---|---|---|
| 18. Energy | ( ) | a.Quantum Mechanics |
| 19. Microscopic domain | ( ) | b .Generator |
| 20. Second Law of Thermodynamics | ( ) | c.Joul |
| 21. Electro-Magnetic Induction | ( ) | d.Refrigerator |

| Column 1 | | Column 2 |
|---|---|---|
| 22. Proteins | ( ) | a. Monosaccharides |
| 23. Carbohydrates | ( ) | b. Triglycerides |
| 24. Lipids | ( ) | c. Nucleotides |
| **25.** Nucleic acids | ( ) | d. Amino acids |

# GOVERNMENT COLLEGE (A), RAJAHMUNDRY
## I B.Sc Honors – I SEM
## Course 2: Advances in Mathematical, Physical and Chemical Sciences
## Model Paper

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**Time: 2 Hr. 30 Min.** **MAX MARKS: 50M**

**SECTION - A**

**Answer any Three of the following Essays** **3x10= 30M**

1. Transform $x + y - 2 = 0$
   i) Slop Intercept form ii) Normal form
2. Write about different Renewable Energy resources and energy storage methods?
3. What is Computer aided drug design and Delivery?
4. Write a note on solid waste management?
5. Explain the network devices?

**SECTION - B**

**Answer All of the following Very Short Answers questions** **12x1= 12M**

1. Find $\frac{d}{dx} e^x =$
2. Find $\frac{d}{dx} Sin\ 3x$
3. If A= $\begin{bmatrix} 1 & 2 \\ 1 & 3 \end{bmatrix}$ *Then find out* $A^{-1}$
4. write the slope intercept formula?

1. Energy _____ technologies play a crucial role in smoothing out fluctuations in enewable energy generation
2. _____ resources like batteries and pumped hydro storage can store excess energy for later use.
3. Nanoparticles can be engineered to carry drugs directly to the _____ of disease.
4. _____ is the process by which neurons adjust their sensitivity to incoming signals based on the level of simulation.
5. What is QSAR
6. What is Chemical Biology?
7. Write any two Applications of Nano sensors?
8. What is Fenton's Reaction?

**SECTION - C**

**Answer All of the following Matching questions** **2x4=8M**

**1.Match the following**

1. Photovoltaic cells ( ) a. Heating buildings and water
2. Wind turbines ( ) b Converting flowing water into electricity

3. Hydropower plants ( ) c. Generating electricity from sunlight
4. Solar water heaters ( ) d. Harnessing wind energy

**2. Match the following**

1. Modem ( ) a. continuity
2. Analog ( ) b. Bluetooth
3. Codec ( ) c. modulation-demodulation

Wireless media ( ) d. multiplexing and de multiplexing

**Model paper**
**RENEWABLE ENERGY RESOURCES-1**
**Subject code:**
**B.Sc(Honours)**
**RENEWABLE ENERGY MANAGEMENT**
**w.e.f., 2023-24 batch**

**Time: 2 Hr. 30** **Max. Marks: 50**

**Answer the following questions**
**SECTION-A**

**Answer ALL Questions** **5x7 = 35**

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

2. Write the importance of renewable energy sources and write their examples of it? (BL3)

3. Explain the classification of solar cells? (BL3) **(OR)**

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

5. Write the principle of wind energy conversion and also briefly explain for it? (BL1) **(OR)**

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

7. Briefly explain about tidal energy technologies? (BL2) **(OR)**

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

9. Explain biomass conversion technologies?(BL3) **(OR)**

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

**SECTION-B**

**Answer any five from the following Questions** **5x3 = 15**

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

12. Explain green foot print concept briefly?(BL2)

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

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

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

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

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

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

**GOVERNMENT COLLEGE (A):: RAJAMAHENDRAVARAM**

# DEPARTMENT OF PHYSICS

## MODEL PAPER FOR II-SEMESTER- END EXAMINATION

### course 4: Mechanics, Wave and Oscillations

### RENEWABLE ENERGY MANAGEMENT (REM)

### w.e.f., 2023-2024

**Time: 2 Hr. 30 Min.** **Max. Marks: 50**

## SECTION – A

**Answer ALL questions** **(5x7=35)**

1. Define Variable Mass System? Derive an expression for the final velocity of the Rocket (BT2)

[OR]

2. Describe Rutherford scattering Experiment? Derive an expression for Scattering Angle (BT1)
3. Define Central Force? Obtain the equation of motion of a body under central Force (BT1)

[OR]

4. State Kepler's Laws? Prove Kepler's First law of Planetary Motion (BT2)
5. Write the short-comings of the Galilean Transformations? Derive equations of Lorentz Transformations of Space and Time (BT1)

[OR]

6. Derive the Einstein Mass-Energy Relationship (BT3)
7. What are damped oscillations? Obtain equation of motion for a damped Oscillator? (BT1)

[OR]

8. What are forced oscillations? Derive the equation of motion of a Forced oscillator and find its solution. (BT2)
9. What is piezo-electric effect? Describe how ultrasonics are produced by this Effect? (BT2)

[OR]

10. What are transverse laws of motion of a stretched string? Discuss the modes of vibrations of a stretched string fixed at both ends. (BT3)

## SECTION – B

**Answer any FIVE questions** **(5x3=15)**

11. What are central forces? Write the characteristics of central forces (BT1)
12. Show that the length of a rod moving with relativistic speeds, relative to a stationary Observer decreases. (BT3)
13. State the postulates of special theory of relativity (BT1)
14. A Rocket with mass 40 Kg is filled with fuel of mass 360 Kg. Exhaust velocity of gases is 2Km/sec. Find the final velocity attained by the Rocket. (BT3)
15. The Jupiter's period of revolution around Sun is 12 times that of the Earth. Assuming that Planetary orbits are circular. Find how many times the distance between the Jupiter and Sun Exceeds that between Earth and Sun? (BT3)
16. Explain the concept of length contraction? (BT1)
17. Write the applications of ultrasonics? (BT2)
18. Define impact parameter and scattering cross section (BT1)

# II B.Sc. SEMESTER – III

## (*MAJOR*) COURSE 5: Renewable Energy Resources-II

***{for 2023-2027 Batch (w.e.f. 2024-2025)}***

**MODEL QUESTION PAPER**

**Time: 2 1/2 Hrs.** **Max. Marks: 50**

### SECTION – A

**Answer ALL questions. Each question carries 7 marks.** **5 x 7 = 35M**

**1.** Identify Energy resources availability in India**.** **( BL1**)

( OR)

2. Discuss about Governance of energy sector in India. **(BL2**)

3. Give the origin of Geothermal energy & Explain about types of their resources **(BL1,BL3)**

(OR)

4. Explain one of the basic extraction mechanisms with neat diagram **( BL2,BL3)**

5. Classify Hydropower Plants with explanation **( BL2)**

**(OR)**

6. Write overview of micro, mini and small hydro systems **( BL2)**

7. Explain the principle, working and construction of conventional nuclear reactor**.(BL1,BL4)**

(OR)

8 Explain the working of nuclear power plant with a block diagram **(BL3)**

9. Explain Environmental degradation due to energy production and utilization **( BL2)**

(OR)

10.Discuss the environmental effects of Wind , Solar and Bio energies harvesting**.(BL1, BL2**)

### SECTION – B

**Answer any FIVE questions. Each question carries 3 marks.** **5 x 3 = 15M**

11**.** Give the demand of Global Energy**.(BL2)**

12. Write a note on Energy Trilemma Index **(BL2)**

13. Explain Magma Resources **(BL1,BL2)**

14. Explain the advantages and Disadvantages of Hydropower **(BL2)**

15. How do you Select a site to establish hydroelectric plant **(BL3)**

16. Explain the types of Chain Reactions **(BL2**)

17. Write a note on Global warming **(BL1)**

**18.** What is biological damage? **(BL1)**

GOVERNMENT COLLEGE (A), RAJAHMUNDRY

Program: II-REM
SEMESTER III
COURSE 6: ELECTRICAL AND ELECTRONICS INSTRUMENTATION
COURSE-CODE:
MODEL QUESTION PAPER

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**Time: 2.30Hr.** **MAX MARKS 50M**

**SECTION - A**

**Answer ALL questions** **5×7=35M.**

1. Derive the expression for current and voltage using L C R series circuit.(BT2)

OR

2. Explain in detail about star and delta connections with a neat diagram. (BT2)
3. Give the comparison between different wirings. (BT1)

OR

4. Explain the principle and construction of PMMC. (BT3)
5. Explain the construction and working of Full Wave Rectifier (Bridge type). (BT2)

OR

6. What is BJT? Explain how transistor acts as an amplifier(BT2).
7. Explain the construction and working of Lead Acid Battery in detail. (BT2)

OR

8. Explain the principle and working of UPS. (BT1)
9. Write about the circuit breaker and explain different types of lamps. (BT3)

OR

10. Explain about the electrical safety rules. (BT2)

**SECTION - B**

**Answer any FIVE of the questions** **5×3=15M**

11. Define active power and reactive power.(BT2)
12. Write a short note on Soldering.(BT1)
13. Write about the working principle of Ammeter.(BT2)
14. Explain Zener diode as Voltage Stabilizer.(BT3)
15. 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)
16. 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)
17. A potential difference across 24 ohms resistor is 12 volts .What is the current through the resistor.(BT3)
18. What are the necessary things to be kept in the First Aid Kit.(BT2)

Government College (A) Rajahmundry
II B.Sc.(REM) SEMESTER – III
(*MAJOR*) COURSE 7: HEAT AND THERMODYNAMICS
{*for 2023-2027 Batch (w.e.f. 2024-2025)*}
MODEL QUESTION PAPER

**Time: 2 1/2 Hrs.** **Max. Marks: 50**

## SECTION – A

**Answer any FIVE questions. Each question carries 7 marks. 5 x 7 = 35M**

**1.**Derive expression for the Maxwell's law of distribution of molecular velocities. **(BL3**)

**(OR)**

2. Derive an expression for the Viscosity of a gas on the basis of kinetic theory of gases. **(BL3**

3. Explain the working of Carnot's Heat Engine. Derive an expression for its efficiency. **(BL2)**

**(OR)**

1. Explain the concept of entropy. Calculate the change in entropy in case of (i) reversible process(ii) Irreversible process. **(BL2, BL3)**

5. Derive Maxwell's thermodynamic relations from thermodynamic potentials. **(BL3)**

**(OR)**

6. Derive Clausius- Clapeyron Equation based on Maxwell'Equatio**(BL2)**
7. Explain the Porous plug experiment? Obtain expression for the Joule Thomson Cooling. **(BL2, BL3)**

**(OR)**

1. Explain the production of low temperatures by the process of adiabatic demagnetization. **(BL1, BL2)**

9. Derive Planck's law of black body radiation. **(BL3)**

**(OR)**

10. Determine solar constant by using Angstrom Pyro heliometer. **(BL2, BL3**)

## SECTION – B

**Answer any FIVE questions. Each question carries 3 marks. 5 x 3 = 15M**

11**.** Explain mean free path of gases. (**BL1)**
12. State and Prove Carnot's theorem. **(BL1)**
13. Derive the relation $C_p - C_v = R$ **(BL3)**
14. Write the applications of substance at low temperature? **(BL3)**
15. Estimate the Surface Temperature of Sun. **(BL2**)
16. Calculate the Inversion temperature of Helium gas. Given a = $3.44 \times 10^{-3}$ newton-$m^4$/ $mol^2$ , b=$0.0237 \times 10^{-3}$ $m^3$ / mol and R=8.31 joule /(mol-k) **( BL3)**
17. A reversible engine works between two temperatures whose difference is 100 $^0$C. If it absorbs 746 J of heat from the source and gives 546 J of heat to the sink, then calculate the temperatures of source and sink. **(BL3)**
18. Calculate the RMS speed of $O_2$ molecules at 300 K. **(BL2)**

**Government college (A) Rajahmundry**
**II-B.Sc-III Semester Major - REM**
**Course – 8: WAVE OPTICS**
**(II BSC- -2024-25)**
**Model question paper**

**TIME: 2.30Hrs** **Max marks:50**

**I Answer the following questions** **7×5=35**

1. Explain the occurrence of the interference fringes in in Lloyds arrangement? (BL2)

OR

2. Explain about the determination of wavelength of monochromatic light by formation of Newton rings? (BL2)
3. Explain single slit Fraunhoffer diffraction? (BL2)

OR

4. Explain the construction of the Zone Plate and derive formula for the focal length? (BL2)
5. Describe the construction and working of a Nicolsl prism? (BL3)

OR

6. Explain construction and working of a Laurent half shade Polarimeter? (BL1)
7. Derive condition for achromatism for two thin lenses in contact and separated by a distance? (BL2)

OR

8. Explain the Advantages and application of the fiber optics communication?
9. Explain the construction and working of a ruby laser (BL2)

OR

10. Explain about the working and construction of a helium and Neon laser? (BL2)

**Section B**

**II answer any five from the following questions** **5×3=15**

11. What are the conditions for formation of interference of light? **(BL1)**
12. Write the differences between Fresnel and Fraunhofer diffraction? **(BL4)**
13. Explain about Brusters law? **(BL2)**
14. Explain about coma (BL3)
15. Write the applications of laser? **(BL3)**
16. What are the applications of Holography? **(BL4)**
17. In a Newton's rings experiment, the diameter of 5th ring was 0.3cm and the diameter of 25th ring was 0.8cm. If the radius of curvature of the Plano convex lens is 100cm, find the wave length of light used **(BL3)**
18. Calculate the minimum thickness of quarter wave plate made of quartz to be used for a light of wavelength 600nm. Given that $\mu 0 = 1.544$ & $\mu e = 1.533$ **(BL3)**

**GOVERNMENT COLLEGE (A): RAJAMAHENDRAVARAM**

**DEPARTMENT OF PHYSICS**
**MODEL PAPER –**
**II B.Sc-REM- SEMESTER –IV END EXAMINATION**
**Course-9: Electricity, Magnetism and Electronics**
**(As Approved in the BOS meeting held on 12 July 2024 for batch 2024-2025)**

**Time: 2 Hr. 30 Min.** **Max. Marks: 50**

## I Answer all questions 5×7=35

1. Derive the electric field intensity due to uniformly charged solid sphere. (BL2)

OR

2. Define Electric displacement vector (D), electric polarization (P) and Electric field intensity vector (E). Obtain the relation between D, E and P. (BL1)
3. Derive an expression for magnetic field due to circular loop. (BL2)

OR

4. Explain about the principle and working of transformer. (BL2)
5. 5. Describe the behavior of LCR series circuit when an alternating current passing through it? Explain the condition of resonance. (BL2) OR
6. State and prove the Poynting theorem. (BL3)
7. What is a Transistor? Explain how it works and explain the CE characteristics of a Transistor? (BL1)

OR

8. Discuss that how transistor can be acts as an amplifier. (BL2)
9. State and Prove De Morgan's Theorems? Explain how NAND gate can be used as a universal gate? (BL3)

OR

10. 10.Discuss the working of half - adder and Full- adder and give their truth-tables(BL3)

**II answer any 5 from the following questions** **3×5=15**

11. State the Gauss law in electrostatics and prove it.(BL1)
12. Explain about the Polar and Non-polar dielectrics(BL1)
13. 13.What is Hall Effect and determine its Hall coefficient? (BL2)
14. 14.Discuss about eddy currents and electromagnetic damping. (BL2)
15. Explain Q-factor and power factor. (BL1)
16. 16.Derive an expression for impedance of a series LCR circuit for A.C signals. (BL1)
17. Explain about the Light Emitting Diode. (BL4)
18. Explain NAND and NOR gates using their truth tables. (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)

**GOVERNMENT COLLEGE (A), RAJAHMUNDRY**

**Program: II REM SEMESTER IV**
**COURSE-11-ENERGY STORAGE DEVICES**
**MODEL QUESTION PAPER**

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**Time: 2 Hr. 30 Min.** **MAX MARKS 50M**

**SECTION - A**

**Answer ALL questions** **5×7=35M.**

1. Define Energy storage. Describe FlyWheel Storage System. (BL1)

OR

2. Explain thermochemical energy storage systems. (BL1)

3. Explain the principle, construction, and working of Li-ion batteries. (BL1, BL2)

OR

4. Explain the role of carbon Nanotubes in electrodes. (BL2)

5. Explain superconducting magnetic energy storage (SMES). (BL2)

OR

6. Explain principle, construction and working of super capacitor. (BL2)

7. What is a fuel cell? Explain the principle and working of a fuel cell. (BL2)

OR

8. Write the advantages and disadvantages of fuel cell? (BL3)

9. Explain the construction and working of phosphoric acid fuel cell (PAFC). (BL2)

OR

10.. Explain the construction and working of solid oxide fuel cell (SOFC). (BL2)

**SECTION –B**

**Answer any FIVE of the questions** **5×3=15M**.

11. Explain the need of energy storage. (BL1)
12. Write the differences between primary and secondary batteries. (BL2)
13. Write a short note on Capacitors. (BL2)
14. Write the differences between battery and fuel cells. (BL3)
15. Write about fuel cell efficiency. (BL2)
16. Mention the applications of fuel cells.
17. Write a short note on lithium (Li) batteries. (BL2)
18. Explain hydrogen storage system. (BL2)