

2023

PHYSICS — HONOURS

Paper : SEC-A-1 and SEC-A-2

*The figures in the margin indicate full marks.**Candidates are required to give their answers in their own words as far as practicable.*

Paper : SEC-A-1

(Scientific Writing)

Full Marks : 20

Time : 1 hour

Answer *any ten* questions.

2×10

1. What will be the command to write e^{x^2} in math mode?

(a) <code>S e^x^2 S</code>	(b) <code>e^{x^2} S</code>
(c) <code>S e^{**}{x**2} S</code>	(d) <code>S ** x ** 2 S</code>
2. Which of the following code block includes a picture inside a LaTeX document?

(a) <code>\begin{picture}</code> <code>\end{picture}</code>	(b) <code>\begin{figure}</code> <code>\end{figure}</code>
(c) <code>\begin{fig}</code> <code>\end{fig}</code>	(d) <code>\begin[figure]</code> <code>\end[figure]</code>
3. The LaTeX statement to create a vertical line is

(a) <code>\vline</code>	(b) <code>\Vline</code>
(c) <code>\wline</code>	(d) <code>\Vrline</code>
4. Which of the following code block prints more than one equations without any equation number inside a LaTeX document?

(a) <code>\begin{eqnarray*}</code> <code>\end{eqnarray*}</code>	(b) <code>\begin{eqs*}</code> <code>\end{eqs*}</code>
(c) <code>\begin{eqn_array*}</code> <code>\end{eqn_array*}</code>	(d) <code>\begin{equations*}</code> <code>\end{equations*}</code>

Please Turn Over

5. To create table in a LaTeX document which statement in the following is correct?
- | | |
|----------------------------------|----------------------------------|
| (a) <code>\begin[table]</code> | (b) <code>\begin{table}</code> |
| <code>\begin[tabular]</code> | <code>\begin{tabular}</code> |
| <code>\end[tabular]</code> | <code>\end{tabular}</code> |
| <code>\end[table]</code> | <code>\end{table}</code> |
| (c) <code>\begin[tabular]</code> | (d) <code>\begin{tabular}</code> |
| <code>\begin[table]</code> | <code>\begin{table}</code> |
| <code>\end[table]</code> | <code>\end{table}</code> |
| <code>\end[tabular]</code> | <code>\end{tabular}</code> |
6. Which of the following commands for font typesetting is not valid in LaTeX?
- | | |
|--------------------------|--------------------------|
| (a) <code>\textsc</code> | (b) <code>\textit</code> |
| (c) <code>\textbf</code> | (d) <code>\textmr</code> |
7. To type \vec{E} symbol in math mode which of the following LaTeX instructions is used?
- | | |
|---------------------------------------|-------------------------------|
| (a) <code>S\overarrow{E}S</code> | (b) <code>S\vector{E}S</code> |
| (c) <code>S\overrightarrow{E}S</code> | (d) <code>S\vec{E}S</code> |
8. What is the use of % symbol inside a text in LaTeX?
- To calculate percentage
 - To convert into percentage
 - To make rest of the line out of compilation
 - To convert into math mode.
9. How do you write $\vec{\nabla} \cdot \vec{E}$ in LaTeX?
- `\divergence \cdot E`
 - `\vector{\divergence}\Cdot\vector{E}`
 - `\vector{\nabla}\Cdot\vector{E}`
 - `\vec{\nabla}\Cdot\vec{E}`
10. What is correct sequence of font size in increasing order?
- | | |
|-------------------------------|-------------------------------|
| (a) small, tiny, large, Large | (b) small, tiny, Large, large |
| (c) tiny, small, large, Large | (d) tiny, small, Large, large |

11. How do you write $\log_{10} x^{57}$?

(a) $\log_{10} x^{57}$

(c) $\log_{10} x^{57}$

(b) $\log_{10} x^{57}$

(d) $\log_{10} x^{57}$

12. How do you write $\left. \frac{dy}{dx} \right|_{x=1}$?

(a) $\frac{dy}{dx} \big|_{x=1}$

(c) $\frac{dy}{dx} \big|_{x=1}$

(b) $\frac{dy}{dx} \big|_{x=1}$

(d) $\frac{dy}{dx} \big|_{x=1}$

Paper : SEC-A-2
(Renewable Energy and Energy Harvesting)
Full Marks : 80

1. Answer any ten questions :

2/10

- (a) What do you mean by Betz limit, related with wind turbine?
- (b) What are the end products of Biomass energy generation?
- (c) What is hybrid energy system?
- (d) What do you mean by greenhouse effect?
- (e) Define Piezoelectric effect. Name one piezoelectric material.
- (f) Mention one merit and one demerit of nuclear energy harvesting.
- (g) Name two major fossil fuels used by us.
- (h) What is Geothermal power?
- (i) Mention any two applications of wind energy.
- (j) Differentiate between tide and wave.
- (k) Define solar constant.
- (l) What is electromagnetic energy harvesting?

2. Answer any four questions :

- (a) Write the advantages and disadvantages of nuclear power production. 5
- (b) What is photovoltaic effect? Explain working principle of a PV array. 2+3
- (c) (i) Describe briefly the working principle of a solar cooker. 3+2
- (ii) What are the disadvantages of using a solar cooker? 4+1
- (d) Describe how electricity can be generated using biogas plant with a neat diagram. 4+1
- (e) Explain how energy is released in nuclear fission process of ${}_{92}\text{U}^{235}$. Is nuclear energy renewable? 4+1
- (f) Explain with a neat diagram, how wind energy can be converted to electrical energy. 5

3. Answer any four questions :

- (a) (i) Is nuclear energy renewable or not? 2+8
- (ii) Explain detail processes of electrical energy using three stage nuclear program. 5+5
- (b) (i) Write a note on Osmotic Power.
- (ii) Explain power production from waves.

- (c) Write short notes on *any two* from the following ; 5×2
- (i) Fuel cell
 - (ii) Carbon Capture Technology
 - (iii) Ocean biomass
 - (iv) Global Warming.
- (d) (i) Mention the main factors to be considered for proposing a wind power site.
(ii) Describe an expression for energy available in the wind.
(iii) Draw a neat diagram of the basic components of a wind electric system and explain it. 4+3+3
- (e) (i) Explain why geothermal energy sources are important in future. Explain briefly the technology used in geothermal energy harvesting.
(ii) What is sustainable development? (2+6)+2
- (f) (i) What are wastelands? How do we reclaim wastelands?
(ii) Write a short note on bioenergy from agricultural waste. (2+3)+5
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