

PART 1 - PHYSICS

Topic : Electromagnetic waves

SECTION-A : (Maximum Marks : 4)

This section contains **ONE** question.

Each question has **FOUR** options (A), (B), (C) and (D). **ONE OR MORE THAN ONE** of these four option(s) is(are) correct answer(s).

For each question, choose the option(s) corresponding to (all) the correct answer(s).

Answer to each question will be evaluated according to the following marking scheme :

Full Marks : +4 ONLY if (all) the correct option(s) is(are) chosen;

Partial Marks : +3 If all the four options are correct but ONLY three options are chosen;

Partial Marks : +2 If three or more options are correct but ONLY two options are chosen, both of which are correct;

Partial Marks : +1 If two or more options are correct but ONLY one option is chosen and it is a correct option;

Zero Marks : 0 If none of the options is chosen (i.e. the question is unanswered);

Negative Marks : -1 In all other cases.

For example, in a question, if (A), (B) and (D) are the ONLY three options corresponding to correct answers, then choosing ONLY (A), (B) and (D) will get +4 marks; choosing ONLY (A) and (B) will get +2 marks; choosing ONLY (A) and (D) will get +2 marks; choosing ONLY (B) and (D) will get +2 marks; choosing ONLY (A) will get +1 mark; choosing ONLY (B) will get +1 mark; choosing ONLY (D) will get +1 mark; choosing no option (i.e. the question is unanswered) will get 0 marks; and choosing any other combination of options will get -1 marks.

1. The electric field associated with an electromagnetic wave travelling in vacuum is given by $E_0 \sin(3y + 4z + \omega t) \hat{i}$, where ω is the angular frequency. All quantities are in SI units. The correct statement(s) about this wave is/are:

[Given: speed of light in vacuum $c = 3 \times 10^8 \text{ ms}^{-1}$.]

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(A) The wave is travelling in $-\frac{1}{5}(3\hat{j} + 4\hat{k})$ direction.

(B) The magnitude of the wave vector is 0.5 m^{-1} .

(C) The value of ω is $1.5 \times 10^9 \text{ rad s}^{-1}$.

(D) The magnetic field associated with this wave is given by $\frac{E_0}{c} \sin(3y + 4z + \omega t) (4\hat{j} - 3\hat{k})$.

Scan or tap for the
full solution



Space for Rough Work

SECTION-B : (Maximum Marks : 4)

This section contains **ONE** question.

The answer to each question is a **NUMERICAL VALUE**.

For each question, enter the correct numerical value of the answer (in decimal notation, truncated / rounded-off to the **SECOND DECIMAL PLACE**; e.g. 6.25, 7.00, -0.33, -.30, 30.27, -127.30) in the place designated to enter the answer.

Answer to each question will be evaluated according to the following marking scheme :

Full Marks : +4 If **ONLY** the correct answer is entered;

Zero Marks : 0 In all other cases.

2. A cube of unit volume contains 35×10^7 photons of frequency 10^{15} Hz. If the energy of all the photons is viewed as the average energy being contained in the electromagnetic waves within the same volume, then the amplitude of the magnetic field is $\alpha \times 10^{-9}$ T. Taking permeability of free space $\mu_0 = 4\pi \times 10^{-7}$ Tm/A, Planck's constant $h = 6 \times 10^{-34}$ Js and $\pi = \frac{22}{7}$, the value of α is _____

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Space for Rough Work

JEE ADVANCED ELECTROMAGNETIC WAVES — PYQS

Test Pattern : JEE (Advanced)

ANSWER KEY

SECTION-A																								
Ques.	1																							
Ans.	A, C																							
SECTION-B																								
Ques.	2																							
Ans.	21 to 25																							