

## Determinants - Class XII

### Past Year JEE Questions

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#### Questions

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##### Question: 01

$$\text{Let } f(x) = \begin{vmatrix} \sin^2 x & -2 + \cos^2 x & \cos 2x \\ 2 + \sin^2 x & \cos^2 x & \cos 2x \\ \sin^2 x & \cos^2 x & 1 + \cos 2x \end{vmatrix}, x \in [0, \pi]. \text{ Then the maximum value of } f(x) \text{ is}$$

equal to \_\_\_\_\_.

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#### Solutions

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##### Solution: 01

#### Answer

Correct Answer is **6**

#### Explanation

$$\begin{vmatrix} -2 & -2 & 0 \\ 2 & 0 & -1 \\ \sin^2 x & \cos^2 x & 1 + \cos 2x \end{vmatrix} \begin{pmatrix} R_1 \rightarrow R_1 - R_2 \\ & R_2 \rightarrow R_2 - R_3 \end{pmatrix}$$

$$= -2(\cos^2 x) + 2(2 + 2 \cos 2x + \sin^2 x)$$

$$= 4 + 4 \cos 2x - 2(\cos^2 x - \sin^2 x)$$

$$\therefore f(x) = 4 + \underbrace{2 \cos 2x}_{\max=1}$$

$$\Rightarrow f(x)_{\max} = 4 + 2 = 6$$