

### Questions 5 and 6

Consider the complex number  $z = 4 - 4\sqrt{3}i$ .

$$\arg z = -\cos^{-1}\left(\frac{4}{8}\right) = -$$

5 Select the option which is the modulus of  $z$ .

$$16 + 48 = 64$$

Options

- A 2      B 4      C 8      D 12  
E 16      F 32      G 48      H  $4\sqrt{3}$

6 Select the option which is the argument of  $z$ .

Options

- A  $-\frac{5}{6}\pi$       B  $-\frac{2}{3}\pi$       C  $-\frac{1}{3}\pi$       D  $-\frac{1}{6}\pi$   
E  $\frac{1}{6}\pi$       F  $\frac{1}{3}\pi$       G  $\frac{2}{3}\pi$       H  $\frac{5}{6}\pi$

$$\arg z = -\cos^{-1}\left(\frac{4}{8}\right) = -60^\circ$$

### Question 7

Select the option which is the Cartesian form of the complex number  $e^{-i2\pi/3}$ .

Options

- A  $\frac{1}{2}(1 + \sqrt{3}i)$       B  $\frac{1}{2}(1 - \sqrt{3}i)$       C  $\frac{1}{2}(-1 + \sqrt{3}i)$       D  $\frac{1}{2}(-1 - \sqrt{3}i)$   
E  $\frac{1}{2}(\sqrt{3} + i)$       F  $\frac{1}{2}(\sqrt{3} - i)$       G  $\frac{1}{2}(-\sqrt{3} + i)$       H  $\frac{1}{2}(-\sqrt{3} - i)$

$$\cos\left(-\frac{2\pi}{3}\right) + i\sin\left(-\frac{2\pi}{3}\right) = \frac{1}{2}(-1 - \sqrt{3}i)$$

### Questions 8 and 9

The function  $\cos^5 \theta$  can be expressed in the form  $a \cos \theta + b \cos 3\theta + c \cos 5\theta$ , where  $a$ ,  $b$ , and  $c$  are numbers.

8 What is the value of  $a$ ?

9 What is the value of  $b$ ?

Options for Questions 8 and 9

- A  $-\frac{5}{8}$       B  $-\frac{5}{16}$       C  $-\frac{1}{8}$       D  $-\frac{1}{16}$   
E  $\frac{1}{16}$       F  $\frac{1}{8}$       G  $\frac{5}{16}$       H  $\frac{5}{8}$

$$\begin{aligned} \cos^5 \theta &= \frac{1}{32}(e^{i\theta} + e^{-i\theta})^5 = \frac{1}{32}(e^{5i\theta} + 5e^{3i\theta} + 10e^{i\theta} + 10e^{-i\theta} + 5e^{-3i\theta} + e^{-5i\theta}) \\ &= \frac{1}{32}(e^{5i\theta} + e^{-5i\theta} + 5e^{3i\theta} + 5e^{-3i\theta} + 10e^{i\theta} + 10e^{-i\theta}) \\ &= \frac{1}{16}(\cos 5\theta + \cos 3\theta + 5\cos \theta) \end{aligned}$$

### Question 10

Choose the option which is the phasor of the sinusoidal function

$$-3 \cos \omega t - 2 \sin \omega t,$$

where  $\omega$  is a positive constant.

Options

- A  $2 + 3i$       B  $2 - 3i$       C  $-2 + 3i$       D  $-2 - 3i$   
E  $3 + 2i$       F  $3 - 2i$       G  $-3 + 2i$       H  $-3 - 2i$

$$\begin{aligned} Z &= -3 \cos \omega t - 2 \sin \omega t \\ &= \sqrt{13} \cos(\omega t + 146.31^\circ) \\ &= \sqrt{13}(\cos(146.31^\circ) + i \sin(146.31^\circ)) \\ &= -3 - 2i \end{aligned}$$

The phasor of  $-3 \cos \omega t$  is  $-3$

The phasor of  $-2 \sin \omega t$  is  $2i$

Hence phasor of  $-3 \cos \omega t - 2 \sin \omega t$  is  $-3 + 2i$