REV-01
BSP/10/15

2024/05

SET A

B.Sc. PHYSICS
FOURTH SEMESTER
MATHEMATICAL PHYSICS-III
BSP – 402
[USE OMR FOR OBJECTIVE PART]

Duration: 1:30 hrs. **Full Marks: 35**

Objective

Time: 15 mins. **Marks: 10**

Choose the correct answer from the following: ***1×10=10***

1. The real part of the complex number $(-2\,i)(1-i)$ will be?
   a. 1 b. 2
   c. -2 d. -1

2. If $z = e^{-i\theta}$ then $z + \frac{1}{z}$ is
   a. $2\sin\theta$ b. $2\cos\theta$
   c. $2\sin 2\theta$ d. $2\cos 2\theta$

3. The real part of $\sqrt{2}e^{i\,\pi/4}$ will be
   a. $\sqrt{2}$ b. $-\sqrt{2}$
   c. 1 d. -1

4. If $z = \sqrt{2}(-1+i)$, then its modulus will be
   a. -1 b. 1
   c. 2 d. -2

5. The smallest value of n for which $\left(\frac{1+i}{1-i}\right)^n = 1$ is
   a. 0 b. 2
   c. 4 d. 6

6. The value of $e^{-i\frac{\pi}{2}}$ will be?
   a. 1 b. $-i$
   c. i d. -1

7. The value of i^{49} is
   a. i b. $-i$
   c. 1 d. -1

8. The square of $(1+i)$ will be
   a. 2 b. -2
   c. $-2i$ d. $2i$

9. The complex number x for which $x + \frac{1}{x} = 2\cos\left(\frac{\varphi}{2}\right)$ is

a. $e^{i\varphi}$
b. $e^{-i\varphi}$
c. $e^{-\frac{i\varphi}{2}}$
d. $e^{2i\varphi}$

10. The inverse of $(1 + i)$ will be

a. $\frac{1}{2}(1 +)$
b. $\frac{1}{2}(1 -)$
c. $\frac{1}{2}(-1 +)$
d. $-\frac{1}{2}(1 +)$

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Descriptive

Time : 1 hr. 15 mins. **Marks: 25**

[Answer question no.1 & any two (2) from the rest]

1. Find the modulus and argument of the complex number $\sqrt{2}(1 - i)$. Express this complex number in polar form. **3+2=5**

2. **a.** Show that **6+4=10**
   $(a + ib)^n + (a - ib)^n = 2(a^2 + b^2)^{\frac{n}{2}} \cos\left(n \tan^{-1}\left(\frac{b}{a}\right)\right)$.
   b. Express the complex number $\left(\frac{1+i}{4+3i}\right)$ in $a + ib$ form.

3. **a.** Find the complex number **6+4=10**
   z if $arg(z + 2i) = \pi/4$ and $arg(z - 2i) = 3\pi/4$.
   b. If $x + iy = \frac{1}{a+ib}$, find $x^2 + y^2$.

4. **a.** If a complex number $z = (1 + i)$, then find z^5.
   b. Find the value of θ for which the complex number $\left(\frac{3+2i\sin\theta}{1-2i\sin\theta}\right)$ is purely imaginary. **4+6=10**

5. **a.** Find the square root of the complex numbers $-4 - 3i$. **6+4=10**
   b. Find the Laplace transform of (*i*) x^n (ii) e^{ax}

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