

**Avinashilingam Institute for Home Science and Higher Education for Women,
(Deemed to be University) Coimbatore-43
Bachelor's Degree Examinations – November 2018
I Semester**

**Class: I UG
Major: Physics**

**Time: 3 Hours
Max. Marks: 100**

18BPHI01-DSEI-Mathematics I

PART A

(10X1=10)

Circle the correct answer

1. If $|x| < 1$ then, $1 + \frac{nx}{1!} + \frac{n(n+1)}{2!}x^2 + \dots =$
 - a) $(1+x)^{-n}$
 - b) $(1-x)^n$
 - c) $(1+x)^n$
 - d) $(1-x)^{-n}$
2. The Coefficient of x^r in the expansion of $(1+2x+3x^2+4x^3+\dots)^2$ is
 - a) r^2
 - b) $\frac{r(r+1)(r+2)}{6}$
 - c) $\frac{(r+1)(r+2)(r+3)}{6}$
 - d) $\frac{r(r+1)}{2}$
3. $1 - \frac{1}{2} + \frac{1}{3} - \dots =$
 - a) $\log 2$
 - b) $\log \sqrt{2}$
 - c) $-\log 2$
 - d) $-\log \sqrt{2}$
4. $1 - \frac{1}{1!} + \frac{1}{2!} - \dots =$
 - a) e
 - b) e^{-1}
 - c) e^{-r}
 - d) e^r
5. Lagrange's interpolation formula is used to interpolate with _____ interval.
 - a) Unequal
 - b) open
 - c) closed
 - d) None of these
6. Given points (x_0, y_0) and (x_1, y_1) , the Lagrangian interpolation formula is
 - a) $x = \frac{y-y_1}{y_0-y_1}x_0 + \frac{y-y_0}{y_1-y_0}x_1$
 - b) $y = \frac{x-x_1}{x_0-x_1}y_0 + \frac{x-x_0}{x_1-x_0}y_1$
 - c) $y = \frac{x-x_1}{x_0-x_1}y_0 + \frac{x-x_0}{x_1-x_0}y_1$
 - d) None of these
7. $2^3 \cos^4 \theta =$
 - a) $\cos 4\theta + 4 \cos 2\theta + 3$
 - b) $\cos 4\theta - 4 \cos 2\theta + 3$
 - c) $\sin 4\theta + 4 \sin 2\theta + 3$
 - d) $\sin 4\theta - 4 \sin 2\theta + 3$
8. Expansion of $\sin n\theta$ is
 - a) $n \cos^{n-1} \theta \sin \theta + nC_2 \cos^{n-3} \theta \sin^3 \theta + \dots$
 - b) $n \cos^{n-1} \theta \sin \theta - nC_2 \cos^{n-3} \theta \sin^3 \theta + \dots$
 - c) $\cos^n \theta - nC_2 \cos^{n-2} \theta \sin^2 \theta + \dots$
 - d) $\cos^n \theta + nC_2 \cos^{n-2} \theta \sin^2 \theta + \dots$
9. $\frac{d^4}{dx^4}(2x^3) =$
 - a) $6x^2$
 - b) $12x$
 - c) 0
 - d) 12
10. The n^{th} derivative of e^{2x} is
 - a) $2ne^{2x}$
 - b) ne^{2x}
 - c) $2^n e^{2x}$
 - d) None of these

Part B

5 X 6=30

Answer the following

11. (a) Expand $\frac{1}{(3+2x)^2}$ in powers of x . Find a condition on x for which the expansion is valid.

or

- (b) Sum the series:

$$1 + \frac{1}{3} + \frac{1.3}{3.6} + \frac{1.3.5}{3.6.9}$$

12. (a) Show that $\left(1 + \frac{1}{2!} + \frac{1}{4!} + \dots\right)^2 = 1 + \left(1 + \frac{1}{3!} + \frac{1}{5!} + \dots\right)^2$.

or

12. (b) Show that $\frac{e+1}{e-1} = \frac{1}{1!} + \frac{1}{3!} + \frac{1}{5!} + \dots$
 $1 + \frac{1}{2!} + \frac{1}{4!} + \dots$

13. (a) Estimate the premium to be paid at age 32 from the following data:

Age	20	25	30	35	40
Premium	33	29.8	26.6	23.5	20.5

or

13. (b) Estimate the value of Y at X=12 from the following data:

X	5	10	15	20
Y	4	14	24	34

14. (a) Expand $\frac{\sin 6\theta}{\sin \theta}$ in terms of $\cos \theta$.

or

14. (b) Prove that $\cos^5 \theta = \frac{1}{16}(\cos 5\theta + 5 \cos 3\theta + 10 \cos \theta)$.

15. (a) If $y = \sin^{-1} x$, then find y'' .

or

15. (b) If $y = \log(1+x)$, then find $\frac{d^3 y}{dx^3}$.

Part C

5 x 12 = 60

Answer the following

16. (a) Find the sum to infinity of the series $1 + \frac{3}{4} + \frac{3.5}{4.8} + \frac{3.5.7}{4.8.12} + \dots$

or

16. (b) Sum the series: $\frac{1.4}{5.10} - \frac{1.4.7}{5.10.15} + \frac{1.4.7.10}{5.10.15.20} - \dots$

17. (a) Sum the series: $\frac{1}{1.2} + \frac{1}{3.4} + \frac{1}{3.6} + \dots$

or

17. (b) Sum the series: $\sum_{n=1}^{\infty} \frac{1}{(2n-1)2n(2n+1)}$

18. (a) Compute F(35) from the following data:

X	25	30	40	50
F(x)	52	67.3	84.1	94.4

or

18. (b) Find the value of "y" at x=4 from the following data:

x	0	2	3	5	6
y	5	7	8	10	12

19. (a) Expand $\sin^3 \theta \cos^3 \theta$ in a series of sines of multiples of θ .

or

19. (b) Expand $\sin^7 \theta$ in a series of sines of multiples of θ .

20. (a) If $y = e^{\tan^{-1} x}$, show that $(1+x^2)y'' + (2x-1)y' = 0$.

or

20. (b) If $y = \frac{\sin^{-1} x}{\sqrt{1-x^2}}$, show that $(1-x^2)y_2 - 3xy_1 - y = 0$.
