Manuscript

Avinashilingam Institute for Home Science and Higher Education for Women
(Deemed to be University under Category 'A' by MHRD, Estd. u/s 3 of UGC Act 1956)
Re-accredited with 'A+' Grade by NAAC. Recognised by UGC Under Section 12B
Coimbatore - 641 043, Tamil Nadu, India.

Bachelor's Degree Examination – March 2021
I Semester

Class : I UG **Time : 3 Hours**
Major : Physics **Max. Marks: 100**

18BPHI01 DSE - I Mathematics I

Part A **10 x 1=10**
Choose the correct answer

1. $(1-x)^{-1}$ is equal to

a. $1 - x + x^2 - x^3 + \ldots\ldots + (-1)^n x^n + \ldots\ldots$
b. $1 + x + x^2 + x^3 + \ldots\ldots + x^n + \ldots\ldots$
c. $1 - x^2 + x^4 + \ldots\ldots$
d. $1 + x^2 + x^4 + \ldots\ldots$

2. The coefficient of x^3 in $(1+x)^{-2}$ is
a. – 4 b. 4 c. 3 d. 2

3. $1 + \frac{\log_e a}{1!} + \frac{(\log_e a)^2}{2!} + \frac{(\log_e a)^3}{3!} + \ldots\ldots \infty$ is equal to

a. a b. 0 c. $\log_e a$ d. 1

4. $x + \frac{x^3}{3} + \frac{x^5}{5} + \ldots..$ to ∞ is equal to

a . $\frac{1}{2} \log \frac{(1-x)}{(1+x)}$ b. $\frac{1}{2} \log \frac{x}{(1+x)}$

c. $\frac{1}{2} \log \frac{x}{(1-x)}$ d. $\frac{1}{2} \log \frac{(1+x)}{(1-x)}$

5. The value of $\mathrm{E}^n e^x$, when the interval of differencing is h,

a. e^x b. e^{x-nh} c. e^{x+nh} d. e^{x+h}

6. The value of $\Delta + 1$ is

a. E b. δ c. ∇ d. 0

7. $\sin\theta =$

a. $\theta + \frac{\theta^3}{3!} + \frac{\theta^5}{5!} - \ldots\ldots$
b. $1 - \frac{\theta^2}{2!} + \frac{\theta^4}{24} - \ldots$
c . $\theta - \frac{\theta^3}{3!} + \frac{\theta^5}{5!} - \ldots\ldots$
d. $1 + \frac{\theta^2}{2!} + \frac{\theta^4}{24} + \ldots$

8. The value of $\log_{n\to\infty} \frac{tan\theta + sec\theta - 1}{tan\theta - sec\theta + 1}$ is

a. 1 b. 0 c. θ d. 2

9. The nth derivative of e^{ax} is

a. $log\ x$ b. $a^n e^{-ax}$ c. e^{ax} d. $a^n e^{ax}$

10. If $y = a\ cos\ 5x + bsin5x$, then $\frac{d^2y}{dx^2}$ is $equal$ to

a. $-25y$ b. $25y$ c. y d. y^2

Part B $5 \times 6 = 30$

Answer ALL questions

Each answer should not exceed 400 words or two pages

11.a. Find the sum to infinity of the series

$$1 + \frac{3}{4} + \frac{3.5}{4.8} + \frac{3.5.7}{4.8.12} + \frac{3.5.7.9}{4.8.12.16} + \ldots\ldots\ldots$$

(or)

11.b. Find to five decimal places the value of $\sqrt{98}$.

12.a. Find the coefficient of $\frac{2+3x}{e^x}$.

(or)

12.b. Sum the series $\frac{1}{2.3} + \frac{1}{4.5} + \frac{1}{6.7} + \ldots \infty$.

13 .a. Evaluate $\left(\frac{\Delta^2}{E}\right) x^3$.

(or)

13.b. Using Newton's forward interpolation formula, find $f(2)$

x :	1	3	5	7	9
$f(x)$:	46	66	81	93	101

14.a. Express tan 7θ in terms of tan θ.

(or)

14.b. If $\frac{\sin\theta}{\theta} = \frac{5045}{5046}$, then show that θ = 1°58'.

15.a. If $y =$ sin $(m\ sin^{-1}x)$, then show that $(1 - x^2)\ y_2 - x\ y_1 + m^2\ y = 0$.

(or)

15.b. Find the n th derivative of $x^2 e^{5x}$.

Part C $5 \times 12 = 60$

Answer the following

Answer should not exceed 800 words or four pages

16.a. Find the sum to infinity of the series

$$\sum \frac{1.4.7.....(3n-2)}{n!} . \frac{1}{4^n}$$

(or)

16.b. When x is small, prove that

$$\sqrt{(x^2 + 4)} - \sqrt{(x^2 + 1)} = 1 - \frac{x^2}{4} + \frac{7x^4}{64}$$ nearly.

17.a. Sum the series $\sum_{n=1}^{\infty} \frac{5n+1}{(2n+1)!}$.

(or)

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

18.a. i. Find the missing term in the following data:

X	:	0	1	2	3	4
Y	:	1	3	9	**?**	81

ii. Derive Lagrange's interpolation formula.

(or)

18.b. Using following data find the Newton's interpolating polynomial and also find the value of y at x = 24.

x	20	35	50	65	80
y	3	11	24	50	98

19.a. Show that $\sin 7\theta = 7cos^6\theta sin\theta - 35cos^4\theta sin^3\theta + 21\, cos^2\theta sin^5\theta - sin^7\theta$.

(or)

19.b. Expand $\sin^4\theta \cos^2\theta$ in cosines of multiples of θ.

20.a. i. Find the nth derivative of $e^x \log x$.

ii. Find the nth derivative of $\frac{2x+1}{(2x-1)\ (2x+3)}$.

(or)

20.b. If $y = \log\ (x + \sqrt{1 + x^2})$, then prove that

$(1 + x^2)\, y_{n+2} + (2n + 1)\, x\, y_{n+1} + n^2\, y_n = 0$ and find y_n (0).

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