



K18U 0306

Reg. No.:

Name:

**II Semester B.Sc. Hon's (Mathematics) Degree
(Regular/Supple./Improv.) Examination, May 2018
BHM 203 : INTEGRAL CALCULUS
(2016 Admn. Onwards)**

Time : 3 Hours

Max. Marks : 60

SECTION – A

Answer **any 4** questions from **5** questions. **Each** question carries **1** mark. **(4×1=4)**

1. Find a formula for the n^{th} term of the sequence $1, -1, 1, -1, \dots$

2. Given $a_n = (-1)^{n+1} \left(\frac{n-1}{n} \right)$. Find the first 4 terms of the sequence.

3. Evaluate $\sum_{k=1}^2 \frac{6k}{k+1}$.

4. Find $\frac{d}{dx} \left(\int_0^x \frac{1}{1+t^2} dt \right)$.

5. Define the interval of convergence of a power series.

SECTION – B

Answer **any 6** questions out of **9** questions. **Each** question carries **2** marks. **(6×2=12)**

6. For what values of x do the following power series $\sum_{n=0}^{\infty} n! x^n = 1 + x + 2! x^2 + \dots$ converge?

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7. Find the Maclaurin series for the function $f(x) = \frac{1}{1+x}$.
8. Suppose that $\int_{+1}^{-1} f(x) dx = 5$, $\int_1^4 f(x) dx = -2$. Find $\int_{-1}^4 f(x) dx$.
9. Find $\int_1^4 \left(\frac{3}{2} \sqrt{x} - \frac{4}{x^2} \right) dx$.
10. Evaluate $\int_{\pi/4}^{\pi/2} \cot \theta \operatorname{cosec}^2 \theta d\theta$.
11. Find the area of the region enclosed by the parabola $y = 2 - x^2$ and the line $y = -x$.
12. Find the volume of the solid generated by revolving the region between the y-axis and the curve $x = 2/y$, $1 \leq y \leq 4$ about the y-axis.
13. Using reduction formula, evaluate $\int \cos^5 x dx$.
14. Using reduction formula, evaluate $\int_0^{\pi/2} \sin^7 x dx$.

SECTION - C

Answer **any 8** questions out of **12** questions. **Each** question carries **4** marks. **(8×4=32)**

15. Find the convergence and divergence of the geometric series $\frac{1}{9} + \frac{1}{27} + \frac{1}{81} + \dots$
16. Find the sum of the series $\sum_{n=1}^{\infty} 4/2^{n-1}$.
17. Find the Maclaurin series for $\cos x$.
18. Evaluate $\int_0^{\pi/2} \sin^5 x \cos^6 x dx$, using reduction formula.
19. Find the area of the surface generated by revolving the area $y = 2\sqrt{x}$, $1 \leq x \leq 2$ about the x-axis.



20. Find the center of mass of a wire of constant density δ shaped like a semicircle of radius a .
21. Find the work required to compress a spring from its natural length of 1 ft to a length of 0.75 ft, if the force constant is $k = 16$ lb/ft.
22. Using the definition of limit, show that $\lim_{n \rightarrow \infty} k = K$, where K is any constant.
23. Give an example of a series whose n^{th} term $\rightarrow 0$ and the series is divergent.
24. Using an area, evaluate the definite integral $\int_a^b f(x) dx$, $0 < a < b$.

25. Find $\frac{dy}{dx}$ if $y = \int_1^{x^2} \cos t dt$.

26. Evaluate $\int_{-1}^1 \frac{5r}{(4+r^2)^2} dr$ and $\int_0^1 \frac{5r}{(4+r^2)^2} dr$.

SECTION - D

Answer **any 2** questions out of **4** questions. **Each** question carries **6** marks. **(2×6=12)**

27. Find the area of the surface generated by revolving the curve $y = x^3$, $0 \leq x \leq \frac{1}{2}$ about the x-axis.
28. Find the length of the cardioid $r = 1 - \cos \theta$.
29. Find the area of the region that lies inside the circle $r = 1$ and outside the cardioid $r = 1 - \cos \theta$.
30. Find the reduction formula for $\int \sin px \cos qx$ where p and q are positive integers.