



K19U 0772

Reg. No. :

Name :

**II Semester B.Sc. Hon's (Mathematics) Degree (Reg./Supp./Imp.)
Examination, April 2019
(2016 Admission Onwards)
BHM 203 : INTEGRAL CALCULUS**

Time : 3 Hours

Max. Marks : 60

SECTION – A

Answer **any 4** questions out of 5 questions. **Each** question carries **1** mark.

1. Write the 100th term of the sequence $\frac{1}{2}, \frac{-2}{3}, \frac{3}{4}, \frac{-4}{5}, \dots$

2. Find the sum of the series $\frac{1}{2} + \frac{-1}{4} + \frac{1}{8} + \frac{-1}{16} + \dots$

3. Evaluate $\lim_{n \rightarrow \infty} \frac{\ln n}{n}$.

4. Evaluate $\int_0^{\pi} \cos x \, dx$.

5. Give an example of a smooth function. (4×1=4)

SECTION – B

Answer **any 6** questions out of 9 questions. **Each** question carries **2** marks.

6. Show that $\lim_{n \rightarrow \infty} k = k$, where k is a constant.

7. For what values of x does the power series $\sum_{n=0}^{\infty} n! x^n$ converge.

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8. Find the Taylor series and Taylor polynomials generated by $f(x) = e^x$ at $x = 0$.
9. Use reduction formula to evaluate $\int \sin^4 x \, dx$.
10. Use reduction formula to evaluate $\int \tan^4 x \, dx$.
11. Evaluate $\int_{-1}^1 3x^2 \sqrt{x^3 + 1} \, dx$.
12. Find the area between $y = \sec^2 x$ and $y = \sin x$ from 0 to $\pi/4$.
13. Find the length of the curve $y = x^2$ from $x = -1$ to $x = 2$.
14. 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. **(6x2=12)**

SECTION - C

Answer **any 8** questions out of 12 questions. **Each** question carries **4** marks.

15. Find the sum of the series $\sum_{n=1}^{\infty} \frac{1}{n(n+1)}$.
16. Identify the function $f(x) = x - \frac{x^3}{3} + \frac{x^5}{5} - \dots$, $-1 < x < 1$.
17. State the series multiplication theorem for power series and use it to find the power series for $1/(1-x)^2$, $|x| < 1$.
18. Find the Taylor series generated by $f(x) = 1/x$ at $a = 2$. Where, if anywhere, does the series converges to $1/x$?
19. If $I_n = \int_0^1 (a^2 - x^2)^n \, dx$, then show that $I_n = \frac{2na^2}{2n+1} I_{n-1}$.
20. Use reduction formula to evaluate $\int \sin^3 x \cos^3 x \, dx$.



21. Show that there exist functions which are not Riemann integrable.
22. State and prove the mean value theorem for definite integrals.
23. State the fundamental theorems of calculus part 1 and part 2.
24. Find the length of the curve $y = \frac{4\sqrt{2}}{3} x^{3/2} - 1$, $0 \leq x \leq 1$.
25. Find the center of mass of a wire of constant density δ shaped like a semicircle of radius a .
26. Find the area of the region in the plane enclosed by the cardioid $r = 2(1 + \cos\theta)$. **(8x4=32)**

SECTION - D

Answer **any 2** questions out of 4 questions. **Each** question carries **6** marks.

27. Show that the Maclaurin series for $\sin x$ converges to $\sin x$ for all x .
28. Evaluate the definite integral $\int_0^{\pi/2} \sin^p x \cos^q x \, dx$ where p, q are positive integers.
29. The region bounded by the parabola $x = y^2 + 1$ and the line $x = 3$ revolved about the line $x = 3$ to generate a solid. Find the volume of the solid.
30. 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. **(2x6=12)**