



K20U 0234



Reg. No. :

Name :

**II Semester B.Sc. Hon's (Mathematics) Degree (Reg./Supple./Improv.)
Examination, April 2020
(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. Give a sequence which is neither increasing nor decreasing.
2. State the n^{th} term test for divergence.
3. Evaluate $\lim_{n \rightarrow \infty} \sqrt[n]{n^2}$.
4. Express the sum $1 + 2 + 3 + 4 + 5 + 6$ in sigma notation.
5. Find the work done by a force $F(x) = 1/x^2$ N along the x-axis from $x = 1$ m to $x = 10$ m. **(4x1=4)**

SECTION – B

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

6. Find a geometric series $\sum ar^{n-1}$ that converges to the number 5 if $a = 2$.
7. For what values of x does the power series $\sum_{n=0}^{\infty} \frac{x^n}{n!}$ converge ?
8. Find the Taylor series generated by $f(x) = x^3 - 2x + 4$ at $x = 2$.
9. Use reduction formula to evaluate $\int \cos^4 x \, dx$.

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10. Use reduction formula to evaluate $\int \tan^4 x dx$.
11. Evaluate $\sum_{k=1}^4 (k^2 - 3k)$.
12. Show that the value of $\int_0^1 \sqrt{1 + \cos x} dx$ cannot possibly be 2.
13. Find the centre of mass of a thin plate of constant density δ covering the region bounded by the parabola $y = x^2$ and the line $y = 4$.
14. Find the area of the region in the plane enclosed by the cardioid $r = 2(1 + \cos\theta)$. **(6x2=12)**

SECTION - C

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

15. Find an infinite series whose sum is 2019.
16. Find series for $f'(x)$ and $f''(x)$ if $f(x) = \frac{1}{1-x} = \sum_{n=0}^{\infty} x^n$, $-1 < x < 1$.
17. Find the interval of convergence for the series $\sum_{n=0}^{\infty} \frac{(x-1)^{2n}}{4^n}$.
18. Find the linearization and quadratic approximation of $f(x) = \ln(\cos x)$ at $x = 0$.
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 $\int \sin^3 x \cos^3 x dx$, $\int_0^{\pi/6} (1 - \cos 3t) \sin 3t dt$.
21. Find the average value of $f(x) = 4 - x^2$ on $[0, 3]$. Does f actually take on this value at some point in the given domain?
22. Find dy/dx if $y = \int_1^{x^2} \cos t dt$.



23. A curved wedge is cut from a cylinder of radius 3 by two planes. One plane is perpendicular to the axis of the cylinder. The second plane crosses the first plane at a 45° angle at the centre of the cylinder. Find the volume of the wedge.
24. Find the area of the surface generated by revolving the curve $y = x^2$, $0 \leq x \leq 2$ about the x -axis.
25. Show that the centre of mass of a straight, thin strip of constant density lies halfway between its two ends.
26. Find the length of the cardioid $r = 1 - \cos\theta$. **(8x4 = 32)**

SECTION - D

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

27. Show that the Maclaurin series for $\cos x$ converges to $\cos x$ 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. Find the area of the region in the first quadrant that is bounded above by $y = \sqrt{x}$ and below by the x -axis and the line $y = x - 2$.
30. Find the length of the curve $y = (x/2)^{2/3}$ from $x = 0$ to $x = 2$. **(2x6=12)**