Reg. No. : ....

Name : ....

Third Semester B.A. Degree Examination, March 2022

First Degree Programme under CBCSS

Mathematics

Complementary Course for Economics

MM 1331.5 : MATHEMATICS FOR ECONOMICS — III

(2019 and 2020 Admission)

Time : 3 Hours   Max. Marks : 80

PART–A

Answer **all** questions. Each question carries 1 mark.

1. Evaluate the integral $\int x^3 \, dx$.

2. Evaluate the integral $\int \frac{1}{x} \, dx$.

3. Evaluate the integral $\int e^{x+3} \, dx$.

4. What is $f(x)$ if $f'(x) = \cos x$?

5. Write an anti derivative of $f(x) = \dfrac{-1}{x^2}$.

6. Write Taylor's series of function f at a point c.

7. Find the sum of the geometric series $\sum\limits_{n=1}^{\infty} \dfrac{(-1)^{n-1} 5}{4^{n-1}}$.

8. Write the geometric series with $a = 1/4$ and $r = 1/5$.

P.T.O.

9. Determine whether the series $1+\dfrac{1}{2}+\left(\dfrac{1}{2}\right)^{2}+\left(\dfrac{1}{2}\right)^{3}+\cdots$ is convergent or divergent.

10. Write the Maclaurin series expansion of $\sin x$.

<div align="right">(10 × 1 = 10 Marks)</div>

<div align="center">PART – B</div>

Answer any **eight** questions from among questions **11** to **26**. Each question carries **2 marks.**

11. Evaluate the integral $\displaystyle\int \dfrac{x}{x^{2}+1}\,dx$.

12. Evaluate the integral by substitution $\displaystyle\int \left(x^{3}+10\right)^{50} 3x^{2}\,dx$.

13. Evaluate $\displaystyle\int_{0}^{5} \sqrt{4x+1}\,dx$.

14. If $f(x)=f'(x)$, what is $f(x)$?

15. Find $\dfrac{d}{dx}\displaystyle\int_{0}^{x} \dfrac{1}{1+t^{2}}\,dt$.

16. Find the area under the straight line $y=x$ above the x-axis between the co-ordinates $x=0$ and $x=1$.

17. If the marginal cost $f'(x)=2+x+x^{2}$ and $f(0)=50$, find the total cost function?

18. Write the Simpson's rule to approximate $\displaystyle\int_{a}^{b} f(x)\,dx$.

19. If the marginal revenue function is $p_{m}=\dfrac{a}{\sqrt{ax+b}}$ and if the cost of zero output is zero, find the total cost as a function of x.

20. Find the Maclaurin series for $f(x)=e^{x}$.

21. Expand $(1+x)^{1/2}$, $|x|<1$.

22. Find the binomial series for the function $(1+x)^{5}$, $|x|<1$.

23. If $\displaystyle\int_{1}^{6} f(x)\,dx = 8$ and $\displaystyle\int_{4}^{6} f(x)\,dx = 5$, find $\displaystyle\int_{1}^{4} f(x)\,dx$.

24. Write all the anti derivatives of $f(x) = \sec^2 x$.

25. State fundamental theorem of calculus Part 2.

26. Find the sum of the series $1 + \dfrac{1}{3} + \dfrac{1}{9} + \cdots$

<div align="right">(8 × 2 = 16 Marks)</div>

PART – C

Answer any **six** questions from the questions **27** to **38**. Each question carries **4** marks.

27. Express the number $3.2\overline{14} = 3.2141414\ldots$ as a rational number.

28. Show that the accumulated value of a constant income stream a will be $\dfrac{a}{r}(e^{rx} - 1)$.

29. Using integration by parts, evaluate $\int x^3 e^{2x} \, dx$.

30. Evaluate :

    (a) $\displaystyle\int_{-1}^{1} 3x^2 \sqrt{x^3 + 1} \, dx$ (b) $\displaystyle\int_{\pi/4}^{0} \tan x \sec^2 x \, dx$.

31. Use the trapezoidal rule with $n = 4$ to estimate $\displaystyle\int_{1}^{2} x^2 \, dx$.

32. Evaluate the integral $\displaystyle\int_{0}^{1} \dfrac{dx}{1 + x}$. Use Simpson's rule to find an approximate value of ln 2.

33. Find the Maclaurin series for $\cos 2x$.

34. Find the series expansion for $\tan^{-1} x$, $-1 \le x \le 1$.

35. Find the Taylor series generated by $f(x) = 1/x$ at $a = 2$.

36. Find the area under the parabola $y = x^2 + 3x + 2$ lies above the x-axis from $x = 0$ and $x = 3$.

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37. Show that the sum to infinity of the series $\dfrac{1.2}{1!} + \dfrac{2.3}{2!} + \dfrac{3.4}{3!} + \ldots = 3e$.

38. Show that the length of life of the capital good $f(t) = b\sqrt{t}$, b a constant, varies inversely with respect to the rate of interest.

<div align="right">(6 × 4 = 24 Marks)</div>

PART – D

Answer any **two** questions from the questions **39** to **44**. Each question carries **15** marks.

39. Evaluate :

(a) $\displaystyle\int a^{2x+3}\,dx$ (b) $\displaystyle\int_{3}^{5} \dfrac{dx}{\sqrt{x-3}}$ (c) $\displaystyle\int xe^{-x^2}\,dx$

40. Use Simpson's rule with

(a) $n = 6$ to approximate $\displaystyle\int_{0}^{2} \dfrac{dx}{\sqrt{x+1}}$.

(b) $n = 4$ to approximate $\displaystyle\int_{0}^{1} 5x^4\,dx$.

41. Explain Domar's model of public debt and national income.

42. (a) Find the series for $f'(x)$ and $f''(x)$ of $f(x) = 1/(1-x)$, $|x| < 1$.

(b) Expand $\ln(1+x)$ about $x = 0$.

43. Find the sum of the series

(a) $\displaystyle\sum_{n=1}^{\infty} \dfrac{2^{n+1}}{5^n}$ (b) $\displaystyle\sum_{n=1}^{\infty} \dfrac{3^{n-1}-1}{6^{n-1}}$.

44. Express $\displaystyle\int \sin x^2\,dx$ as a power series.

<div align="right">(2 × 15 = 30 Marks)</div>