



RAN - 2003000201030034



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**F.Y.B.Sc. (Sem. - I) (ATKT) Examination**

**March - 2023**

**MTH - 102 Mathematics - II**

**Time: 1 Hour ]**

**[ Total Marks: 50**

**સૂચના : / Instructions**

(૧)

નીચે દર્શાવેલ નિશાનીવાળી વિગતો ઉત્તરવહી પર અવશ્ય લખવી.  
Fill up strictly the details of signs on your answer book

Name of the Examination:

F.Y.B.Sc. (Sem. - I) (ATKT)

Name of the Subject :

MTH - 102 Mathematics - II

Subject Code No.: 2003000201030034

Seat No.:

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Student's Signature

- (2) આ પ્રશ્નપત્રમાં (૧) થી (૧૬) પ્રશ્નના ૧ ગુણ અને (૧૭) થી (૩૩) પ્રશ્નના ૨ ગુણ છે.  
Question (1) to (16) carry ONE mark and (17) to (33) carry TWO marks.
- (3) દરેક પ્રશ્નનો ફક્ત એક જ સાચો ઉત્તર છે.  
There is only ONE correct answer for each question.
- (4) પ્રચલિત સંકેતોને અનુસરો.  
Follow usual symbols.
- (5) પરીક્ષાનો સમય ૧ કલાક નો છે.  
The EXAM is of 1 hour duration.

***O.M.R. Sheet ભરવા અંગેની અગત્યની સૂચનાઓ આપેલ  
O.M.R. Sheetની પાછળ છાપેલ છે.  
Important instructions to fillup O.M.R. Sheet  
are given on back side of the provided O.M.R. Sheet.***

SECTION- A / વિભાગ - A

(Question number 1 to 16 each is of 1 mark)

(પ્રશ્ન ક્રમાંક 1 થી 16, દરેકનો 1 ગુણ છે.)

1.  $\int_0^{\pi/2} \sin^7 x dx = \underline{\hspace{2cm}}$ .

(A)  $-\frac{35}{16}$

(B)  $\frac{16}{35}$

(C)  $-\frac{16}{35}$

(D)  $\frac{35}{16}$

2. Justify that  $\int_0^{\pi/2} \sin^{10} x dx = \frac{63}{512}$  is true?

(A) Yes

(B) No

(C) Can't say anything

(D) Undefined

વિધાન  $\int_0^{\pi/2} \sin^{10} x dx = \frac{63}{512}$  સાંચું છે?

(A) હા

(B) ના

(C) કશું જ ન કહેવાય

(D) અવ્યાખ્યાયિત

3.  $\int_0^{\pi/2} \sin^4 x \cos^3 x dx = \underline{\hspace{2cm}}$ .

(A)  $\frac{2}{35}$

(B)  $\frac{2}{35}\pi$

(C)  $\frac{35}{2}$

(D)  $\frac{35}{2}\pi$

4.  $\int \cos ec^n x dx = \underline{\hspace{2cm}}$ .

(A)  $\frac{\cot x \cos ec^{n-2}x}{n-1} + \frac{n-2}{n-1} \int \cos ec^{n-2} x dx$

(B)  $\frac{\cot x \cos ec^{n-2}x}{n-1} - \frac{n-2}{n-1} \int \cos ec^{n-2} x dx$

(C)  $\frac{-\cot x \cos ec^{n-2}x}{n-1} - \frac{n-2}{n-1} \int \cos ec^{n-2} x dx$

(D)  $\frac{-\cot x \cos ec^{n-2}x}{n-1} + \frac{n-2}{n-1} \int \cos ec^{n-2} x dx$

5. If  $y = \frac{1}{(3x+2)^6}$  then  $y_n =$  \_\_\_\_\_.

ಇಲ್ಲಿ  $y = \frac{1}{(3x+2)^6}$  ಓಲಿ  $y_n =$  \_\_\_\_\_.

(A)  $\frac{(-1)^n (n-5)!2^n}{5!(3x+2)^{n+6}}$

(B)  $\frac{(-1)^n (n-5)!3^n}{5!(3x+2)^{n+6}}$

(C)  $\frac{(-1)^{n+1} (n-5)!2^n}{5!(3x+2)^{n+6}}$

(D)  $\frac{(-1)^{n+1} (n-5)!3^n}{5!(3x+2)^{n+6}}$

6. If  $y = \log x$  then  $y_n =$  \_\_\_\_\_.

ಇಲ್ಲಿ  $y = \log x$  ಓಲಿ  $y_n =$  \_\_\_\_\_.

(A)  $\frac{(-1)^n (n-1)}{x^n}$

(B)  $\frac{(-1)^n (n-1)!}{x^n}$

(C)  $\frac{(-1)^{n+1} (n-1)}{x^n}$

(D)  $\frac{(-1)^{n-1} (n-1)!}{x^n}$

7. If  $y = a^{mx+k}$  then  $y_n =$  \_\_\_\_\_.

ಇಲ್ಲಿ  $y = a^{mx+k}$  ಓಲಿ  $y_n =$  \_\_\_\_\_.

(A)  $m^n (\log a)^n a^{mx+k}$

(B)  $m^n (\log a) a^{mx+k}$

(C)  $m (\log a)^n a^{mx+k}$

(D)  $m (\log a) a^{mx+k}$

8. If  $y = x^4 + 3x^3 + 2x^2 + x + 1$  then  $y_4 =$  \_\_\_\_\_.

ಇಲ್ಲಿ  $y = x^4 + 3x^3 + 2x^2 + x + 1$  ಓಲಿ  $y_4 =$  \_\_\_\_\_.

(A) 4!

(B) 4

(C) 3!

(D) 3

9. For real valued function  $f$ ,  

$$f(a+h) = f(a) + hf'(a) + \frac{h^2}{2!} f''(a) + \frac{h^3}{3!} f'''(a) + \dots + \frac{h^{n-1}}{(n-1)!} f^{(n-1)}(a)$$
 $(a) \in \mathbb{R}; 0 < \theta < 1$  is called

- (A) Taylor's expansion (B) Maclaurin's expansion  
 (C) A and B both (D) None of these

વાસ્તવિક વિધેય  $f$  માટે

$$f(a+h) = f(a) + hf'(a) + \frac{h^2}{2!} f''(a) + \frac{h^3}{3!} f'''(a) + \dots + \frac{h^{n-1}}{(n-1)!} f^{(n-1)}(a)$$

$(a) \in \mathbb{R}; 0 < \theta < 1$  ને \_\_\_\_\_ કહેવાય છે.

- (A) ટેલર નું વિસ્તરણ (B) મેકલોરીન વિસ્તરણ  
 (C) A અને B બંને (D) આ પૈકી એક પણ નહિ

10.  $f(x) = \frac{1}{1+x^2}$  is \_\_\_\_\_ function in  $(-\infty, 0)$

- (A) Increasing (B) Constant  
 (C) Decreasing (D) None of these

$f(x) = \frac{1}{1+x^2}$  વિધેય  $(-\infty, 0)$  માં \_\_\_\_\_ છે.

- (A) વધતું (B) અચળ  
 (C) ઘટતું (D) આ પૈકી એક પણ નહિ

11. A real valued function  $f$  is continuous on  $[a, b]$  and differentiable in  $(a, b)$  then there exists  $\lambda \in (a, b)$  such that  $f'(\lambda) =$  \_\_\_\_\_.

- (A)  $\frac{f(b)-f(a)}{b-a}$  (B)  $\frac{f(a)-f(b)}{b-a}$   
 (C) 0 (D) None of these

જો વાસ્તવિક વિધેય  $f$  એ  $[a, b]$  માં સતત અને  $(a, b)$  માં વિકલનીય હોય તો  $\lambda \in (a, b)$  એવા મળે જે જેથી  $f'(\lambda) =$  \_\_\_\_\_.

- (A)  $\frac{f(b)-f(a)}{b-a}$  (B)  $\frac{f(a)-f(b)}{b-a}$   
 (C) 0 (D) આ પૈકી એક પણ નહિ

12. A real valued function  $f$  is continuous on  $[0, x]$  where  $x > 0$  and differentiable in  $(0, x)$  then  $f(x) - f(0) = \underline{\hspace{2cm}}$  Where  $\theta \in (0, 1)$ .
- (A)  $f'(\theta x)$  (B)  $xf'(\theta)$   
 (C)  $xf'(\theta x)$  (D)  $\theta f'(\theta x)$
- જો વાસ્તવિક વિધેય  $f$  એ  $(0, x)$  જ્યાં  $x > 0$  માં સતત અને  $(0, x)$  માં વિકલનીય હોય તો  $f(x) - f(0) = \underline{\hspace{2cm}}$  જ્યાં  $\theta \in (0, 1)$ .
- (A)  $f'(\theta x)$  (B)  $xf'(\theta)$   
 (C)  $xf'(\theta x)$  (D)  $\theta f'(\theta x)$
13. Curve  $y = e^{5x}$  is \_\_\_\_\_.
- (A) Concave downward (B) Concave upward  
 (C) Convex upwards (D) None of these
- વક્ર  $y = e^{5x}$  \_\_\_\_\_ છે.
- (A) અધઃઅંતર્મુખ (B) ઉધર્વ-અંતર્મુખ  
 (C) ઉધર્વ-બહિર્મુખ (D) આ પૈકી એક પણ નહિ
14. The point of inflexion of  $y = 3x^5 - 40x^3 + 3x - 20$  is \_\_\_\_\_.
- (A)  $x = 0$  (B)  $x = 2$   
 (C)  $x = -2$  (D) All of these
- $y = 3x^5 - 40x^3 + 3x - 20$  નું વક્રતા પરીવૃત્તિ બિંદુ \_\_\_\_\_ છે.
- (A)  $x = 0$  (B)  $x = 2$   
 (C)  $x = -2$  (D) આ પૈકી બધા
15. Vertical asymptote of the curve  $y = \frac{2x-3}{x^2-3x+2}$  are \_\_\_\_\_.
- વક્ર  $y = \frac{2x-3}{x^2-3x+2}$  ના લંબક અનંત સ્પર્શકો \_\_\_\_\_ છે.
- (A)  $x = 1$  and  $x = -2$  (B)  $x = -1$  and  $x = 2$   
 (C)  $x = 1$  and  $x = 2$  (D)  $x = -1$  and  $x = -2$

16. The curvature of the curve  $y = \sin x$  at the point  $(\frac{\pi}{2}, 1)$  is \_\_\_\_\_.
- વક્ર  $y = \sin x$  ની  $(\frac{\pi}{2}, 1)$  બિંદુએ વક્રતા \_\_\_\_\_ છે.
- (A) 1 (B) 2  
(C) 3 (D) 4

**SECTION - B / વિભાગ - B**

(Question number 17 to 33 each is of 2 marks)

(પ્રશ્ન ક્રમાંક 17 થી 33, દરેકના 2 ગુણો છે.)

17. Asymptote of the curve  $y = \frac{x^2 + 2x - 1}{x}$  is \_\_\_\_\_.
- વક્ર  $y = \frac{x^2 + 2x - 1}{x}$  નો અનંત સ્પર્શક \_\_\_\_\_ છે.
- (A)  $y = 2x + 1$  (B)  $y = 2x - 1$   
(C)  $y = x - 2$  (D)  $y = x + 2$

18. The point of inflexion of  $y = x^3 - 6x^2$  is \_\_\_\_\_.
- $y = x^3 - 6x^2$  નું વક્રતા પરિવૃત્તિ બિંદુ \_\_\_\_\_ છે.
- (A) (1, 2) (B) (-1, 2)  
(C) (-1, -2) (D) (1, -2)

19.  $\int \tan^4 x dx =$  \_\_\_\_\_.
- (A)  $\frac{\tan^3 x}{3} - \tan x + x$  (B)  $\frac{\tan^3 x}{3!} - \tan x + x$   
(C)  $-\frac{\tan^3 x}{3} + \tan x - x$  (D)  $-\frac{\tan^3 x}{3!} + \tan x - x$

20.  $\int_0^{\pi/4} \sin^5 2x dx = \text{_____}$ .

- (A)  $\frac{4}{15}\pi$  (B)  $\frac{4}{15}$   
(C)  $\frac{15}{4}\pi$  (D)  $\frac{15}{4}$

21.  $\int \cos ec^4 x dx = \text{_____}$ .

- (A)  $-\frac{\cot x \cos ec^2 x}{3} + \frac{2}{3} \cot x$   
(B)  $-\frac{\cot x \cos ec^2 x}{3} - \frac{2}{3} \cot x$   
(C)  $\frac{\cot x \cos ec^2 x}{3} + \frac{2}{3} \cot x$   
(D)  $\frac{\cot x \cos ec^2 x}{3} - \frac{2}{3} \cot x$

22.  $\int x^2 \sin 2x dx = \text{_____}$

- (A)  $\frac{x^2 \cos 2x}{2} + \frac{x \sin 2x}{2} + \frac{\cos 2x}{4}$   
(B)  $-\frac{x^2 \cos 2x}{2} + \frac{x \sin 2x}{2} + \frac{\cos 2x}{4}$   
(C)  $\frac{x^2 \cos 2x}{2} - \frac{x \sin 2x}{2} + \frac{\cos 2x}{4}$   
(D)  $-\frac{x^2 \cos 2x}{2} - \frac{x \sin 2x}{2} + \frac{\cos 2x}{4}$

23. If  $y = xe^x$  then  $y_n =$  \_\_\_\_\_.

(A)  $nx e^x$

(B)  $(x + n)e^x$

(C)  $ne^x$

(D) None of these

જો  $y = xe^x$  હોય તો  $y_n =$  \_\_\_\_\_.

(A)  $nx e^x$

(B)  $(x + n)e^x$

(C)  $ne^x$

(D) આ પૈકી એક પણ નહિ

24. If  $y = \sin kx + \cos kx$  then  $y_n =$  \_\_\_\_\_.

જો  $y = \sin kx + \cos kx$  હોય તો  $y_n =$  \_\_\_\_\_.

(A)  $k^n [1 + (-1)^n \cos 2kx]^{\frac{1}{2}}$

(B)  $k^n [1 + (-1)^n \sin 2kx]^{\frac{1}{2}}$

(C)  $k^n [1 + (-1)^n \sin kx]^{\frac{1}{2}}$

(D)  $k^n [1 + (-1)^n \cos kx]^{\frac{1}{2}}$

25. If  $y = \frac{1}{4} [e^{2x} \sin x + e^{2x} \sin 3x]$  then  $y_n =$  \_\_\_\_\_.

જો  $y = \frac{1}{4} [e^{2x} \sin x + e^{2x} \sin 3x]$  હોય તો  $y_n =$  \_\_\_\_\_.

(A)  $\frac{e^{2x}}{4} \left[ 5^{\frac{n}{2}} \sin \left( x + n \tan^{-1} \frac{1}{2} \right) + 13^{\frac{n}{2}} \sin \left( 3x + n \tan^{-1} \frac{3}{2} \right) \right]$

(B)  $\frac{e^{2x}}{4} \left[ 5^{\frac{n}{2}} \sin \left( 3x + n \tan^{-1} \frac{3}{2} \right) + 13^{\frac{n}{2}} \sin \left( x + n \tan^{-1} \frac{1}{2} \right) \right]$

(C)  $\frac{e^{2x}}{4} \left[ 5^{\frac{n}{2}} \sin \left( x + n \tan^{-1} \frac{3}{2} \right) + 13^{\frac{n}{2}} \sin \left( 3x + n \tan^{-1} \frac{1}{2} \right) \right]$

(D)  $\frac{e^{2x}}{4} \left[ 13^{\frac{n}{2}} \sin \left( x + n \tan^{-1} \frac{3}{2} \right) + 5^{\frac{n}{2}} \sin \left( 3x + n \tan^{-1} \frac{1}{2} \right) \right]$

26. If  $y = \frac{1}{(ax+b)^m}$ ;  $ax+b \neq 0$  and  $m \in N$  then  $y_n =$  \_\_\_\_\_.

જો  $y = \frac{1}{(ax+b)^m}$ ;  $ax+b \neq 0$ ,  $m \in N$  હોય તો  $y_n =$  \_\_\_\_\_.

(A)  $\frac{(-1)^n (m+n)! a^n}{(m-1)! (ax+b)^{m+n}}$

(B)  $\frac{(-1)^n (m+n)! b^n}{(m-1)! (ax+b)^{m+n}}$

(C)  $\frac{(-1)^n (m+n-1)! a^n}{(m-1)! (ax+b)^{m+n}}$

(D)  $\frac{(-1)^n (m+n-1)! b^n}{(m-1)! (ax+b)^{m+n}}$

27. If  $y = \frac{ax}{(ax+b)}$ ;  $ax+b \neq 0$  then  $y_n =$  \_\_\_\_\_.

જો  $y = \frac{ax}{(ax+b)}$ ;  $ax+b \neq 0$  હોય તો  $y_n =$  \_\_\_\_\_.

(A)  $\frac{(-1)^n (n)! a^n b}{(ax+b)^{n+1}}$

(B)  $\frac{(-1)^{n+1} (n)! a^n b}{(ax+b)^{n+1}}$

(C)  $\frac{(-1)^n n! a^{n-1} b}{(ax+b)^{n+1}}$

(D)  $\frac{(-1)^{n+1} n! a^{n-1} b}{(ax+b)^{n+1}}$

28. In \_\_\_\_\_ interval, function  $f(x) = 2x^3 - 15x^2 + 36x + 1$ ;  $x \in R$  is decreased.

(A)  $[3, \infty]$

(B)  $[-\infty, 2]$

(C)  $[2, 3]$

(D) None of these

વિધેય  $f(x) = 2x^3 - 15x^2 + 36x + 1$ ;  $x \in R$  \_\_\_\_\_ અંતરાલમાં ઘટતું છે.

(A)  $[3, \infty]$

(B)  $[-\infty, 2]$

(C)  $[2, 3]$

(D) આ પૈકી એક પણ નહિ

29. For the function  $f(x) = e^x; x \in [0,1]$ , according to the Lagrange's theorem's

$\lambda =$  \_\_\_\_\_.

વિધેય  $f(x) = e^x; x \in [0,1]$  માટે લાગ્રાન્જના પ્રમેય અનુસાર  $\lambda =$  \_\_\_\_\_.

- (A)  $e - 1$  (B)  $\frac{1}{e - 1}$   
(C)  $\log\left(\frac{1}{e - 1}\right)$  (D)  $\log(e - 1)$

30. Which of the following is true for  $0 < a < b$  ?

નીચેનું કયું  $0 < a < b$  માટે સત્ય છે?

- (A)  $\frac{a - b}{a^2 + 1} < \tan^{-1} a - \tan^{-1} b < \frac{a - b}{b^2 + 1}$   
(B)  $\frac{a - b}{b^2 + 1} < \tan^{-1} a - \tan^{-1} b < \frac{a - b}{a^2 + 1}$   
(C)  $\frac{b - a}{a^2 + 1} < \tan^{-1} a - \tan^{-1} b < \frac{b - a}{b^2 + 1}$   
(D)  $\frac{b - a}{b^2 + 1} < \tan^{-1} a - \tan^{-1} b < \frac{b - a}{a^2 + 1}$

31. For which value of  $\lambda$ , function  $f(x) = \log x; x \in [1,e]$  satisfy

$$f'(\lambda) = \frac{f(e) - f(1)}{e - 1} ?$$

જો  $f(x) = \log x; x \in [1,e]$  તો  $(\lambda)$  ની કઈ કિમંત માટે  $f'(\lambda) = \frac{f(e) - f(1)}{e - 1}$  થાય?

- (A)  $e - 1$  (B)  $\frac{1}{e - 1}$   
(C)  $e + 1$  (D)  $\frac{1}{e + 1}$

32. The curvature of the curve  $y = \log_e x$  at point  $(1, 0)$  is \_\_\_\_\_.

વક્ર  $y = \log_e x$  ની  $(1, 0)$  બિંદુએ વક્રતા \_\_\_\_\_ છે.

- (A)  $\frac{1}{2}$  (B)  $\frac{1}{\sqrt{2}}$   
(C)  $2\sqrt{2}$  (D)  $\frac{1}{2\sqrt{2}}$

33. Curve  $y = \cos x$ ;  $x \in (-2\pi, 2\pi)$  becomes concave upward in \_\_\_\_\_ interval.

$y = \cos x$ ;  $x \in (-2\pi, 2\pi)$  વક્ર \_\_\_\_\_ અંતરાલમાં ઉર્ધ્વ અંતર્બુજ બને છે.

(A)  $\left(\frac{3\pi}{2}, 2\pi\right)$

(B)  $\left(-\frac{\pi}{2}, \frac{\pi}{2}\right)$

(C)  $\left(\frac{\pi}{2}, \frac{3\pi}{2}\right)$

(D)  $\left(-2\pi, -\frac{3\pi}{2}\right)$

\_\_\_\_\_

**SPACE FOR ROUGH WORK**