| QP CODE: D2BAM2401 | (Pages: 2) | Reg. No | : ............................... |
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**SECOND SEMESTER FYUGP EXAMINATION, APRIL 2025**

**MAJOR COURSE**

**AMA2CJ101 : Calculus II**

**(Credits: 4)**

**Time: 2 Hours** **Maximum Marks: 70**

## Section A

**Answer the following questions. Each carries 3 marks (Ceiling: 24 marks)**

| | | | |
|---|---|---|---|
| 1. | Prove the identity $cosh^2 x - sinh^2 x = 1$. | BL1 | CO1 |
| 2. | Verify whether the series $\Sigma_{n=1}^{\infty} \frac{1}{n^2+2}$ converges or diverges. | BL1 | CO2 |
| 3. | a) Sate "divergence test".<br>b) Using divergence test verify whether the series $\Sigma_{n=1}^{\infty} (-1)^{n-1}$ converges or not. | BL1 | CO2 |
| 4. | Define lenght of a smooth curve. | BL1 | CO3 |
| 5. | Define the natural exponential function and explain two of its properties. | BL1 | CO1 |
| 6. | a) Evaluate $lim_{x\to 1} \frac{lnx}{x-1}$.<br>b) Evaluate $lim_{x\to 0} \frac{sin2x}{x}$. | BL2 | CO1 |
| 7. | Evaluate a) $\int_{-5}^{\infty} e^{-x} dx$.<br>b) $\int_{0}^{\infty} sinx dx$. | BL2 | CO1, CO2 |
| 8. | Show that the series $\Sigma_{n=1}^{\infty} \frac{(-1)^{n-1}}{n^4}$ is absolutely convergent. | BL2 | CO2 |
| 9. | Find the area of the region bounded between the curves $r = sin\theta$ and $r = 1 - sin\theta$. | BL2 | CO3, CO4 |
| 10. | Find the area of the surface obtained by revolving the curve $r = 4cos\theta$ about the polar axis. | BL2 | CO4 |

## Section B

**Answer the following questions. Each carries 6 marks (Ceiling: 36 Marks)**

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|---|---|---|---|
| 11. | a) Use logarithmic differentiation to find the derivative of the function $y = \sin x^{\tan x}$ . | BL2 | CO1 |

**(PTO)**

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|---|---|---|---|
| | b) Evaluate $\int 2^x \sin 2^x dx$.<br>c) Differentiate the function $f(u) = 2^{u^2}$. | | |
| 12. | Peter and Paul take turns tossing a pair of dice. The first person to throw a 7 wins. If Peter starts the game, then it can be shown that his chances of winning are:<br>$p = \frac{1}{6} + (\frac{1}{6})(\frac{5}{6})^2 + (\frac{1}{6})(\frac{5}{6})^4 + \ldots$. Find $p$. | BL3 | CO2 |
| 13. | Determine whether the alternating series $\Sigma_{n=1}\infty(-1)^{n-1}\frac{3n}{4n^2-1}$ converges or diverges. | BL2 | CO2 |
| 14. | Find $\frac{d^2y}{dx^2}$ where $x = \sqrt{t^2+1}$ ; $y = t \ln t$. | BL2 | CO3 |
| 15. | Use integral test to determine whether the series $\Sigma_{n-1}^{\infty} e^{-n}$ is convergent or divergent. | BL2 | |
| 16. | a) Find the derivative of $y = \frac{(2x-1)^3}{\sqrt{3x+1}}$ (4 marks).<br>b) Find $\int \tan x dx$ (2 marks). | BL1 | CO1 |
| 17. | a) State " Monotone Convergence Theorem for sequences".<br>b) Determine whether the sequence $\{a_n\}=\{3 - \frac{1}{n}\}$ is monotonic. Is the sequence bounded? | BL2 | CO2 |
| 18. | Find the radius of convergence and interval of convergence of $\Sigma_{n=0}^{\infty}\frac{(x-2)^n}{n^2 5^n}$. | BL1 | CO2 |
| | | | |
| | **Section C** | | |
| | **Answer any one question. Each carries 10 marks (1 x 10 = 10 Marks)** | | |
| 19. | Find the Maclaurin series of $f(x) = \sin x$, and determine its interval of convergence. | BL2 | CO2 |
| 20. | a) Plot the point with the polar coordinates $(-\sqrt{2}, \frac{\pi}{4})$. Then find the rectangular coordinates of the point.<br>b) Convert the polar equation $rcos\theta = 2$ to a rectangular equation.<br>c) Convert the rectangular equation $x^2 + y^2 = 9$ to a polar equation. | BL2 | CO3 |
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| | **CO : Course Outcome** | | |
| | **BL : Bloom's Taxonomy Levels** (1 – Remember, 2 – Understand, 3 – Apply, 4 – Analyse, 5 – Evaluate, 6 – Create) | | |