M 8737

Reg. No. : ...............................

Name : ...................................

# II Semester B.C.A. Degree (CCSS – Supple./Improv.) Examination, May 2015
## (2013 and Earlier Adm.)
## COMPLEMENTARY COURSE IN MATHEMATICS
## 2C02 MAT (BCA) : Numerical Analysis and Calculus

Time : 3 Hours　　　　　　　　　　　　　　　　　Max. Weightage : 30

1. Fill in the blanks.

   a) Derivative of $\sinh^{-1}x$ is ________.

   b) $\frac{d}{dx}(a^x)$ is ________.

   c) $\frac{d}{dx}\log\sin x$ is ________.

   d) $\lim_{x \to 0} \frac{1-\cos 2x}{x^2}$ is ________. 1

2. Choose the correct answer.

   i) $\int_{-\pi/2}^{\pi/2} \sin x \, dx$

   (0, 1, 2, ½)

   ii) $\int_0^1 \log(e^x)\, dx$

   (0, 1, 2, ½)

iii) $\int_0^1\int_0^1 dx\,dy$

(0, 1, 2, ½)

iv) $\lim_{x \to 0} \frac{1-\cos 2x - \sin^2 x + \tan^2 x}{x^2}$ 1

(– 2, –1, 0, 2)

Answer **any five** from the following. (weightage **1** each)

3. Solve $x^3 - 3x + 1 = 0$ by fixed point iteration method.
4. By Newton's method, solve the equation $x^3 + x - 1 = 0$.
5. Solve $y' = 1 + y^2$, $y(0) = 0$, by Piccard's method.
6. Using Taylor series method, solve $\frac{dy}{dx} = x^2 - y$. $y(0) = 1$ at $x = 0.1$.
7. Differentiate $x \sinh^{-1}x + \coth x + \sqrt{1-x^2}$.
8. Evaluate $\lim_{x \to 0} (1+x)^{1/x}$.
9. Integrate $x^3 e^{2x}$.
10. Evaluate $\int_0^1\int_0^x dx\,dy$. **(Wt. 5×1=5)**

Answer **any seven** from the following (weightage **2 each**)

11. Using Lagrangian interpolation formula, find f(5), given f(1) = 3, f(3) = 0, f(4) = 30, f(6) = 132.
12. Evaluate $\int_0^1 x^3\,dx$ using trapezoidal rule considering five sub intervals.
13. By Euler's method solve $y' = x + y$, $y(0) = 0$, when $x = 1$, by choosing $h = 0.2$.
14. Solve $y' = y$, $y(0) = 1$, $h = 0.1$ by improved Euler method (3 steps).
15. If $x\sqrt{1+y} + y\sqrt{1+x} = 0$, find $\frac{d^2y}{dx^2}$ as a function of x given, $x \neq y$.

16. Find $\frac{dy}{dx}$ if $(\sin x)^y = (\sin y)^x$.

17. Evaluate $\lim_{x \to \infty} \frac{e^x}{x^3}$.

18. If $I_n = \int \sec^n x \, dx$, show that

$(n-1) I_n = \sec^{n-2} x \tan x + (n-2) I_{n-2}$.

19. Evaluate $\int_0^{\pi/2} \sin^4 x \, dx$.

20. By changing the order of integration evaluate $\int_0^1 \int_{x^2}^{2-x} xy\,dx\,dy$. **(Wt. 7× 2=14)**

Answer **any three** from the following (weightage **3 each**).

21. If $y = \sin(a \sin^{-1}x)$, show that

$(1-x^2)y_{n+2} - (2n+1)y_{n+1} - (n^2 - a^2)y_n = 0$

22. Evaluate $\iiint_V (x+y+z+1)^2 \, dx\,dy\,dz$ where v is the volume bounded by $x, y, z \geq 0$, $x + y + z \leq 1$.

23. Using Gauss elimination method, solve

$-x_1 + x_2 + 2x_3 = 2$

$3x_1 - x_2 + x_3 = 6$

$-x_1 + 3x_2 + 4x_3 = 4$

24. Using Runge-Kutta method find y(0.8) with h = 0.2, given $\frac{dy}{dx} = x + y$, $y(0) = 0$.

25. Find the inverse of the matrix

$\begin{bmatrix} -1 & 1 & 2 \\ 3 & -1 & 1 \\ -1 & 3 & 4 \end{bmatrix}$ by Gauss Jordan method. **(Wt. 3×3=9).**

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