FIRST SEMESTER B.C.A. DEGREE EXAMINATION, NOVEMBER 2017

(Supplementary/Improvement)

(CUCBCSS-UG)

CC15U BCA1 C01- MATHEMATICAL FOUNDATIONS OF COMPUTER APPLICATIONS

(Mathematics - complementary Course)

(2015 Admission onwards)

Time: Three Hours   Maximum: 80 Marks

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

1. If $A = \begin{bmatrix} 2 & 1 \\ 1 & 7 \end{bmatrix}$. Find $A - A^T$

2. If $\vec{a} = [1, 2, 0]$ and $\vec{b} = [3, -2, 1]$. Find $\vec{a}.\vec{b}$

3. Find the order of the differential equation $y''' = e^x$.

4. Verify that $y = x^2$ is the solution of $xy' = 2y$ for all x.

5. Evaluate $(D^2 + 2D + 2)x^3$.

6. Find the derivative of $f(x) = 2x^2 + 3x - 5$ at $x = -1$.

7. Differentiate the function $f(x) = x \cos x$.

8. If $\int_1^4 f(x)dx = 7$ and $\int_1^2 f(x)dx = 3$ then $\int_2^4 f(x)dx = \ldots\ldots$

9. Evaluate $\int \frac{1}{\cos^2 x} dx$.

10. Define partial differential equation.

(10 × 1 = 10 marks)

II. Answer *all* questions. Each question carries 2 marks

11. Are the following vectors linearly independent or dependent?

   $[1, 0, 0]$, $[1, 1, 0]$, $[1, 1, 1]$

12. Differentiate the function $f(x) = \frac{\cos x}{1 + \sin x}$

13. Evaluate $\int \sin^3 x \cos^2 x\, dx$.

14. Solve the differential equation $y' = 1 + y^2$.

15. Find the general solution of the differential equation $y'' + 8y' + 16y = 0$

(5 × 2 = 10 marks)

III. Answer *any five* questions. Each question carries 4 marks

16. Find the inverse of the matrix $A = \begin{bmatrix} 2 & 0 & -1 \\ 5 & 1 & 0 \\ 0 & 1 & 3 \end{bmatrix}$

17. If $\vec{a} = [1, 2, 0]$, $\vec{b} = [-3, 2, 0]$ and $\vec{c} = [2, 3, 4]$. Find $(\vec{a} + \vec{b}) \times \vec{c}$.

18. Form the differential equation of the family of curves $y = e^{3x}(ax + b)$

19. Differentiate the function $f(x) = \tan(\sqrt{x + 2})$

20. Evaluate $\int \dfrac{x^2}{(x^2 + 1)(x^2 + 4)} dx$ using partial fraction.

21. Integrate the function $f(x) = x^2 \sin x$.

22. Solve the initial value problem $y' = -\dfrac{y}{x}$, $y(1) = 1$

23. Solve the differential equation $y'' + 4y = 8x^2$

(5 × 4 = 20 marks)

IV. Answer *any five* questions. Each question carries 8 marks

24. Solve the system of equations by Gauss elimination method

25. Find the characteristic equation and eigen values of the matrix $\begin{bmatrix} -2 & 2 & -3 \\ 2 & 1 & -6 \\ -1 & -2 & 0 \end{bmatrix}$

26. Using first principle find the derivative of $y = \cot x$

27. Find the derivative of the function $f(x) = \dfrac{\sin 3x \cos x}{\sin x - \cos x}$

28. Evaluate $\int_{-1}^{2} |x^3 - x| \, dx$

29. Evaluate $\int_{0}^{\pi} \dfrac{x \sin x}{1 + \cos^2 x} dx$

30. Solve $(x^3 + 3xy^2)dx + (3x^2 y + y^3)dy = 0$

31. Solve the differential equation $xy' = 2y + x^3 e^x$.

(5 × 8 = 40 marks)

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