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CAIS-N 121 B-14
B.C.A. Ist Semester Degree Examination
Computer Science
(Foundation Course in Mathematics for Computing-I)
Paper - BCA 1.4
(New)

Time : 3 Hours

Maximum Marks : 80

Section-A

I Answer all the questions (10x2=20)

- a) What is a monotonic sequence?
- b) Test for convergence $\left\{ \frac{3n-1}{1+2n} \right\}$
- c) Find the modulus and amplitude of $1+i$
- d) State remainder theorem
- e) What is a scalar matrix? Give an example

- f) If $A = \begin{bmatrix} 2 & 3 \\ 4 & 6 \end{bmatrix}$ and $B = \begin{bmatrix} 5 & 3 \\ 4 & 7 \end{bmatrix}$ find $A+B$

- g) Evaluate $\lim_{x \rightarrow 5} \left\{ \frac{x^3 - 125}{x - 5} \right\}$
- h) Differentiate $x \sin x$ w.r.t.x
- i) Evaluate $\int \sin(ax+b) dx$

- j) Evaluate $\int_0^{\frac{\pi}{2}} \sin^2 x dx$

Section -B

Answer any four questions

(4 x 5 = 20)

2. Verify whether the following series is convergent or not?

$$\frac{1+2^2}{2!} + \frac{3^2}{3!} + \frac{4^2}{4!} + \dots$$

3. If $x + \frac{1}{x} = 2 \cos \alpha$ and $y + \frac{1}{y} = 2 \cos \beta$ then prove that $\frac{x^m}{y^n} + \frac{y^n}{x^m} = 2 \cos(m\alpha - n\beta)$

4. Show that $\begin{vmatrix} 1+x & y & z \\ x & 1+y & z \\ x & y & 1+z \end{vmatrix} = 1+x+y+z$

5. Verify Rolle's theorem for the function $f(x) = x^2 - 5x + 4$ on $[1, 4]$

6. Find the G.C.D. of two polynomials $x^3 - 7x^2 + 14x - 8$ and $x^3 - 6x^2 + 11x - 6$

7. Evaluate $\int_0^{\frac{\pi}{2}} \log \tan x \, dx$

Section - C

Answer any four questions

(4 x 10 = 40)

8. a) Find the inverse of $A = \begin{bmatrix} 1 & 2 & 2 \\ 2 & 3 & 4 \\ 5 & 2 & 0 \end{bmatrix}$ (6)
 b) Solve by Cramer's rule (4)

$$x + 2y - 3z = -4$$

$$2x + 3y + 2z = 2$$

$$3x - 3y - 4z = 11$$

9. State and prove De-Moivre's theorem (10)

10. a) Simplify $\frac{(\cos \theta + i \sin \theta)^3 (\cos \theta - i \sin \theta)^{-8}}{(\cos 4\theta + i \sin 4\theta)^5 (\cos \theta + i \sin \theta)^2}$ (6)

- b) If $A = \begin{bmatrix} 1 & 3 & 1 \\ 2 & 6 & 0 \\ 3 & 7 & 9 \end{bmatrix}$ prove that $(A')' = A$. (4)

11. a) If $y = (\tan^{-1} x)^2$ prove that $(1 - x^2)y_{n-2}(2n+1)y_{n+1} - n^2 y_n = 0$ (6)
- b) Find the third order derivative of $y = e^{-x} \cos x$ (4)
12. a) Evaluate $\int \frac{x+2}{(x-1)(x+3)} dx$ (5)
- b) Evaluate $\int x^2 e^{3x} dx$ (5)
13. a) Evaluate
$$\int_0^{\pi/2} \frac{2\sin x + 3\cos x}{\sin x + \cos x} dx$$
 (6)
- b) Evaluate
$$\iint_0^1 xy \, dx \, dy$$
 (4)
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