(i) **Printed Pages : 3** **Roll No. .....**

(ii) **Questions : 9** **Sub. Code : 0 8 7 4**

Exam. Code : 0 0 1 9

B.C.A. 1st Semester

1125

MATHEMATICS IN COMPUTER SCIENCE-I

Paper— B.C.A. -103

Time Allowed : Three Hours] **[Maximum Marks : 90**

Note :— Attempt **five** questions in all, including Question No. **9** in Section-E which is compulsory and taking **one** each from Section-A to Section-D.

SECTION—A

1. (a) There are 6 boys and 4 girls and a group of 5 people must be formed. How many groups are possible consisting of 2 girls and 3 boys?

   (b) Find the constant term in the expansion of $\left(2x + \frac{1}{x}\right)^{2n}$. 9,9

2. (a) Three consecutive coefficients in the expansion of $(1+x)^n$ are $\binom{n}{r}$, $\binom{n}{r+1}$ and $\binom{n}{r+2}$ respectively & are in the ratio 6:3:1. Show that $2n - 3r = 1$ and $3n - 4r = 5$.

   (b) Find the value of r if the coefficients of x^r and x^{r+1} are equal in the binomial expansion of $(2 + 3x)^{19}$. 9,9

SECTION—B

3. (a) Prove that $\cos(\alpha + \beta) = \cos\alpha\cos\beta - \sin\alpha\sin\beta$.

(b) Prove that $\tan(\alpha - \beta) = \dfrac{\tan\alpha - \tan\beta}{1 + \tan\alpha\tan\beta}$. 9,9

4. (a) Find the sin, cos, and tan of $240° + e$ in terms of sin e, cos e, and tan e.

(b) Prove that $\dfrac{\sin A + \cos A}{\sin A - \cos A} + \dfrac{\sin A - \cos A}{\sin A + \cos A} = \dfrac{2}{\sin^2 A - \cos^2 A}$. 9,9

SECTION—C

5. (a) Expand $\cos^6\theta - \sin^6\theta$ in terms of the cosines of multiples of θ.

(b) Prove that $\dfrac{\sec 8A - 1}{\sec 4A - 1} = \dfrac{\tan 8A}{\tan 2A}$. 9,9

6. (a) Angle x is in quadrant 3, approximate sin 2x if $\cos x = -0.2$. Round your answer to two decimal places.

(b) If x and y are angles in quadrant 1 & 3 respectively and $\cos x = a$ and $\sin y = b$. Find $\cos(x + y)$ in terms of a, b. 9,9

SECTION—D

7. Evaluate the following:

(a) $\lim\limits_{x\to 1} \dfrac{x^3 + x^2 - x - 1}{x^2 + 2x - 8}$.

(b) $\lim\limits_{x\to 0} \dfrac{x + \sin x}{x^2 + x}$. 9, 9

8. (a) For what value of 'k' is the following function continuous at $x = 1$?

$$f(x) = \begin{cases} \dfrac{x^2 - 1}{x - 1}, & x \neq 1 \\ k, & x = 1 \end{cases}.$$

(b) A function is defined by $f(x) = \begin{cases} \dfrac{x - 3}{x - 1}, & x \leq 0 \\ x^2, & x > 0 \end{cases}$

Prove that the function is discontinuous at $x = 0$. 9,9

SECTION—E

(Compulsory Question)

9. (a) Define Binomial Theorem for any index.

(b) Estimate 0.97^3 using Binomial Theorem.

(c) Find sec 210° and tan 210°.

(d) The expression $\dfrac{(\sin x)\ (\sec x)}{\cot x}$ is equivalent to _____.

(e) Reduce the power of the following trigonometric expression $4\sin^3 x + 4\cos^3 x$.

(f) Define continuity in an interval. 6×3=18