

- (b) Find the n th order derivative of $e^{ax} \sin(bx + c)$. 7

Unit III

6. (a) Obtain the differential equation of all circles of radius r . 7

- (b) Solve : 7

$$x^2 y dx - (x^3 + y^3) dy = 0$$

7. (a) Solve : 7

$$y dx - (x + 2y^2) dy = 0$$

- (b) Solve the differential equation : 7

$$\left(1 + e^{x/y}\right) dx + e^{x/y} \left(1 - \frac{x}{y}\right) dy = 0$$

Unit IV

8. (a) Show that : 7

$$\frac{1}{D - \alpha} X = e^{\alpha x} \int (e^{-\alpha x} X) dx$$

Subject Code—51692

B.C.A. EXAMINATION

(Batch 2018-19)

(First Semester)

MATHEMATICAL FOUNDATIONS-I

BCA-115

Time : 3 Hours

Maximum Marks : 70

Note : Attempt *Five* questions in all. Q. No. 1 is compulsory. All questions carry equal marks.

1. (a) What is symmetric difference of two sets ? 2
- (b) Define Boolean algebra. 2
- (c) Show that :

$$\lim_{x \rightarrow 0} \frac{e^{\frac{1}{x}} - 1}{e^{\frac{1}{x}} + 1}$$

does not exist. 2

- (d) Define discontinuity of first and second kind. 2
- (e) Explain degree and order of a differential equation. 2
- (f) Prove that $\frac{1}{f(D)}e^{ax} = \frac{1}{f(a)}e^{ax}$ provided $f(a) \neq 0$. 2
- (g) Define general solution and particular solution. 2

Unit I

2. (a) For any two sets A and B, prove that : 7
 $P(A \cap B) = P(A) \cap P(B)$
 where P(A) is the power set of A.
- (b) How many words can be formed by taking 4 letters at a time out of the letters of the word 'MATHEMATICS' ? 7
3. (a) If R is a partial order relation on set A, then prove that the inverse relation R^{-1} is also a partial order relation. 7

- (b) Define lattices. Let $S = \{a, b, c\}$ and P(S) be its power set. Then show that $(P(S), \subseteq)$ is a lattice, where the relation ' $\subseteq$ ' represents 'set inclusion'. Also draw Hasse diagram of $(P(S), \subseteq)$. 7

Unit II

4. (a) Find the value of the constant k so that the function given below is continuous at $x = 0$: 7

$$f(x) = \begin{cases} \frac{1 - \cos 2x}{2x^2}; & x \neq 0 \\ k; & x = 0 \end{cases}$$

- (b) Differentiate $\log \sqrt{\frac{1 + \sin x}{1 - \sin x}}$ w.r.t. x . 7

5. (a) If $y = (\sqrt{x})^{(\sqrt{x})^{(\sqrt{x})^{\dots\infty}}}$, show that : 7

$$\frac{dy}{dx} = \frac{y^2}{x(2 - y \log x)}$$

(b) Solve the differential equation : 7

$$\frac{d^3 y}{dx^3} + y = 3 + e^{-x} + 5e^{2x}$$

9. (a) Solve : 7

$$\frac{d^3 y}{dx^3} - 3 \frac{dy}{dx} + 2y = x^2 e^{2x}$$

(b) Solve the differential equation : 7

$$(x+a)^2 \frac{d^2 y}{dx^2} - 4(x+a) \frac{dy}{dx} + 6y = x$$