 Voc(Sem-II) — BCA
(GE – 2) Math

Mathematics

2022

Time : 3 hours

Full Marks : 70

Candidates are required to give their answers in their own words as far as practicable.

The figures in the margin indicate full marks.

*Answer from **all** the Parts as directed.*

Part – A

1. Choose correct answer in each of the following : $1 \times 5 = 5$

(a) The area of the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ is :

(i) πab

(ii) $\pi a^2 b$

(iii) πab^2

(iv) $\pi a^2 b^2$

(b) $\int (x+2)\sqrt{2x+1}\,dx$ is equal to :

(i) $\frac{1}{5}(x+3)(2x+1)^{1/2}+C$

(ii) $\frac{1}{5}(x+3)^{3/2}(2x+1)+C$

(iii) $\frac{1}{5}(x+3)(2x+1)^{3/2}+C$

(iv) None of these

(c) The volume of a right circular cone of height 'h' and radius 'a' is :

(i) $\frac{1}{2}\pi a^2 h$

(ii) $\frac{1}{3}\pi a^2 h$

(iii) $\frac{1}{2}\pi h^2 a$

(iv) $\frac{1}{3}\pi h^2 a$

(d) The orthogonal trajectories of the rectangular hyperbola $xy = a^2$ is :

(i) $x - y = c^2$

(ii) $x^2 - y = c^2$

(iii) $x - y^2 = c^2$

(iv) $x^2 - y^2 = c^2$

(e) If A and B are two convex sets, then which of the following is also a convex set ?

(i) $A \cap B$

(ii) $A \cup B$

(iii) $A - B$

(iv) All of these

2. Fill in the blanks : $1 \times 5 = 5$

(a) DES is an example of a block cipher.

(b) The solution of differential equation $x\frac{dy}{dx} + \frac{y^2}{x} = y$ is $3xy^2 - 2xy^3 + 6 = c$.

(c) The moment of inertia of a thin uniform circular plate about an axis through its centre perpendicular to its plate is $Mr^2/2$.

(d) The set of feasible solutions of a LPP is a convex set.

(e) The objective function of a LPP is necessarily a linear function.

Part – B

Answer any **four** questions of the following :

$5 \times 4 = 20$

3. Evaluate : $\int (2x^2 + 3)\sqrt{x+4}\, dx$

4. Obtain the reduction formula for $\int \tan^n x\, dx$ and evaluate $\int_0^{\pi/4} \tan^5 x\, dx$.

5. Solve : $\log\left(\frac{dy}{dx}\right) = ax + by$

6. Solve : $\frac{dy}{dx} = \frac{y}{x} + \tan\left(\frac{y}{x}\right)$

7. Write short notes on stream cipher and block cipher.

8. Solve the following LPP graphically :

   Max $Z = 5x + 3y$

   Subject to the constraints :

   $3x + 5y \leq 15$

   $5x + 2y \leq 10$

   $x, y \geq 0$

Part – C

Answer any **four** questions of the following :

$10 \times 4 = 40$

9. Find the perimeter of the curve $x^{2/3} + y^{2/3} = a^{2/3}$.

10. Solve : $p(p + x) = y(x + y)$; $p = \frac{dy}{dx}$

11. Solve : $\frac{d^2y}{dx^2} + 3\frac{dy}{dx} + 2y = e^{2x}$

12. Solve : $\frac{dy}{dx} + xy = x^3$

13. Describe the RSA algorithm with an example.

14. Solve the following LPP by Simplex method :

Max $Z = 3x + 7y + 6z$

subject to the constraints,

$3x + 2y + 3z \leq 8$

$x + y \leq 3$

$y + z \leq 6$

$x, y, z \geq 0$