CHAPTER – I

1. If A=(1 2 3), then the rank of AA^T is

(a) 0 (b) 2 (c) 3 (d) 1

2. The rank of m × n matrix whose elements are unity is

(a) 0 (b) 1 (c) m (d) n

3. If $T = \begin{array}{c} A \\ B \end{array}\begin{pmatrix} 0.4 & 0.6 \\ 0.2 & 0.8 \end{pmatrix}$ is a transition probability matrix, then at equilibrium A is equal to

(a) ¼ (b) 1/5 (c) 1/6 (d) 1/8

4. If $A = \begin{pmatrix} 2 & 0 \\ 0 & 8 \end{pmatrix}$, then ρ(A) is

(a) 0 (b) 1 (c) 2 (d) n

5. The rank of the matrix $\begin{pmatrix} 1 & 1 & 1 \\ 1 & 2 & 3 \\ 1 & 4 & 9 \end{pmatrix}$ is

(a) 0 (b) 1 (c) 2 (d) 3

6. The rank of the unit matrix of order n is

(a) n −1 (b) n (c) n + 1 (d) n2

7. If ρ (A) = r then which of the following is correct?

(a) all the minors of order r which does not vanish

(b) A has at least one minor of order r which does not vanish

(c) A has at least one (r +1) order minor which vanishes

(d) all (r+1) and higher order minors should not vanish

8. If $A = \begin{pmatrix} 1 \\ 2 \\ 3 \end{pmatrix}$ then the rank of AA^T is

(a) 0 (b) 1 (c) 2 (d) 3

9. If the rank of the matrix $\begin{pmatrix} \lambda & -1 & 0 \\ 0 & \lambda & -1 \\ -1 & 0 & \lambda \end{pmatrix}$ is 2. Then λ is

(a) 1 (b) 2 (c) 3 (d) only real number

10. The rank of the diagonal matrix $\begin{pmatrix} \mathbf{1} & & & & & \\ & \mathbf{2} & & & & \\ & & \mathbf{-3} & & & \\ & & & \mathbf{0} & & \\ & & & & \mathbf{0} & \\ & & & & & \mathbf{0} \end{pmatrix}$

(a) 0 (b) 2 (c) 3 (d) 5

11. If $T = \begin{array}{c} A \\ B \end{array}\begin{pmatrix} 0.7 & 0.3 \\ 0.6 & x \end{pmatrix}$ is a transition probability matrix, then the value of x is

(a) 0.2 (b) 0.3 (c) 0.4 (d) 0.7

12. Which of the following is not an elementary transformation?

(a) Ri ↔ Rj (b) Ri → 2 Ri + 2Cj (c) Ri → 2 Ri − 4Rj (d) Ci → Ci + 5Cj

13. If ρ(A) = ρ(A, B) then the system is

(a) Consistent and has infinitely many solutions (b) Consistent and has a unique solution

(c) Consistent (d) inconsistent

14. If ρ(A) = ρ(A, B)= the number of unknowns, then the system is

(a) Consistent and has infinitely many solutions (b) Consistent and has a unique solution

(c) inconsistent (d) consistent

15. If $\rho(A) \neq \rho(A, B)$, then the system is
    (a) Consistent and has infinitely many solutions (b) Consistent and has a unique solution
    (c) inconsistent (d) consistent
16. In a transition probability matrix, all the entries are greater than or equal to
    (a) 2 (b) 1 (c) 0 (d) 3
17. If the number of variables in a non- homogeneous system $AX = B$ is n, then the system possesses a unique solution only when
    (a) $\rho(A) = \rho(A, B) > n$ (b) $\rho(A) = \rho(A, B) = n$
    (c) $\rho(A) = \rho(A, B) < n$ (d) none of these
18. The system of equations $4x + 6y = 5$, $6x + 9y = 7$ has
    (a) a unique solution (b) no solution (c) infinitely many solutions (d) none of these
19. For the system of equations $x + 2y + 3z = 1$, $2x + y + 3z = 2$, $5x + 5y + 9z = 4$
    (a) there is only one solution (b) there exists infinitely many solutions
    (c) there is no solution (d) None of these
20. If $|A| \neq 0$, then A is
    (a) non- singular matrix (b) singular matrix (c) zero matrix (d) none of these
21. The system of linear equations $x + y + z = 2$, $2x + y - z = 3$, $3x + 2y + k = 4$ has unique solution, if k is not equal to
    (a) 4 (b) 0 (c) -4 (d) 1
22. Cramer's rule is applicable only to get an unique solution when
    (a) $\Delta_z \neq 0$ (b) $\Delta_x \neq 0$ (c) $\Delta \neq 0$ (d) $\Delta_y \neq 0$
23. If $\frac{a_1}{x} + \frac{b_1}{y} = c_1$, $\frac{a_2}{x} + \frac{b_2}{y} = c_2$, $\Delta_1 = \begin{vmatrix} a_1 & b_1 \\ a_2 & b_2 \end{vmatrix}$; $\Delta_2 = \begin{vmatrix} b_1 & c_1 \\ b_2 & c_2 \end{vmatrix}$; $\Delta_3 = \begin{vmatrix} c_1 & a_1 \\ c_2 & a_2 \end{vmatrix}$ then (x, y) is
    (a) $\left(\frac{\Delta_2}{\Delta_1}, \frac{\Delta_3}{\Delta_1}\right)$ (b) $\left(\frac{\Delta_3}{\Delta_1}, \frac{\Delta_2}{\Delta_1}\right)$ (c) $\left(\frac{\Delta_1}{\Delta_2}, \frac{\Delta_1}{\Delta_3}\right)$ (d) $\left(\frac{-\Delta_1}{\Delta_2}, \frac{-\Delta_1}{\Delta_3}\right)$
24. $|A_{n\times n}| = 3$ $|adjA| = 243$ then the value n is
    (a) 4 (b) 5 (c) 6 (d) 7
25. Rank of a null matrix is
    (a) 0 (b) -1 (c) ∞ (d) 1

CHAPTER - II

1. $\int \frac{1}{x^3}dx$ is

(a) $\frac{-3}{x^2}+c$ (b) $\frac{-1}{2x^2}+c$ (c) $\frac{-1}{3x^2}+c$ (d) $\frac{-2}{x^2}+c$

2. $\int 2^x dx$ is

(a) $2^x \log 2 + c$ (b) $2^x + c$ (c) $\frac{2^x}{\log 2}+c$ (d) $\frac{\log 2}{2^x}+c$

3. $\int \frac{\sin 2x}{2\sin x}dx$ is

(a) $\sin x + c$ (b) $\frac{1}{2}\sin x + c$ (c) $\cos x + c$ (d) $\frac{1}{2}\cos x + c$

4. $\int \frac{\sin 5x - \sin x}{\cos 3x}dx$ is

(a) $-\cos 2x + c$ (b) $-\cos 2x + c$ (c) $-\frac{1}{4}\cos 2x + c$ (d) $-4\cos 2x + c$

5. $\int \frac{\log x}{x}dx$, $x > 0$ is

(a) $\frac{1}{2}(\log x)^2 + c$ (b) $-\frac{1}{2}(\log x)^2$ (c) $\frac{2}{x^2}+c$ (d) $\frac{2}{x^2}+c$

6. $\int \frac{e^x}{\sqrt{1+e^x}}dx$ is

(a) $\frac{e^x}{\sqrt{1+e^x}}+c$ (b) $2\sqrt{1+e^x}+c$ (c) $\sqrt{1+e^x}+c$ (d) $e^x\sqrt{1+e^x}+c$

7. $\int \sqrt{e^x}\,dx$ is

(a) $\sqrt{e^x}+c$ (b) $2\sqrt{e^x}+c$ (c) $\frac{1}{2}\sqrt{e^x}+c$ (d) $\frac{1}{2\sqrt{e^x}}+c$

8. $\int e^{2x}[2x^2+2x]dx$

(a) $e^{2x}x^2+c$ (b) $xe^{2x}+c$ (c) $2x^2e^2+c$ (d) $\frac{x^2e^x}{2}+c$

9. $\int \frac{e^x}{e^x+1}\,dx$ is

(a) $\log\left|\frac{e^x}{e^x+1}\right|+c$ (b) $\log\left|\frac{e^x+1}{e^x}\right|+c$ (c) $\log|e^x|+c$ (d) $\log|e^x+1|+c$

10. $\int \left[\frac{9}{x-3}-\frac{1}{x+1}\right]dx$ is

(a) $\log|x-3|-\log|x+1|+c$ (b) $\log|x-3|+\log|x+1|+c$

(c) $9\log|x-3|-\log|x+1|+c$ (d) $9\log|x-3|+\log|x+1|+c$

11. $\int \frac{2x^3}{4+x^4}dx$ is

(a) $\log|4+x^4|+c$ (b) $\frac{1}{2}\log|4+x^4|+c$ (c) $\frac{1}{4}\log|4+x^4|+c$ (d) $\log\left|\frac{2x^3}{4+x^4}\right|+c$

12. $\int \frac{dx}{\sqrt{x^2-36}}$ is

(a) $\sqrt{x^2-36}+c$ (b) $\log\left|x+\sqrt{x^2-36}\right|+c$ (c) $\log\left|x-\sqrt{x^2-36}\right|+c$ (d) $\log\left|x^2+\sqrt{x^2-36}\right|+c$

13. $\int \frac{2x+3}{\sqrt{x^2+3x+2}}dx$ is

(a) $\sqrt{x^2+3x+2}+c$ (b) $2\sqrt{x^2+3x+2}+c$ (c) $\log(x^2+3x+2)+c$ (d) $\frac{2}{3}(x^2+3x+2)^{\frac{3}{2}}+c$

14. $\int_0^1 (2x+1)\,dx$ is

(a) 1 (b) 2 (c) 3 (d) 4

15. $\int_2^4 \frac{dx}{x}$ is

(a) log 4 (b) 0 (c) log 2 (d) log 8

16. $\int_0^\infty e^{-2x}\,dx$ is

(a) 0 (b) 1 (c) 2 (d) ½

17. $\int_{-1}^{1} x^3 e^{x^4} dx$ is

(a) 1 (b) $2\int_0^1 x^3 e^{x^4} dx$ (c) 0 (d) e^{x^4}

18. If f(x) is a continuous function and a < c < b , then $\int_a^c f(x)\,dx + \int_c^b f(x)\,dx$ is

(a) $\int_a^b f(x)\,dx - \int_a^c f(x)\,dx$ (b) $\int_a^c f(x)\,dx - \int_a^b f(x)\,dx$ (c) $\int_a^b f(x)\,dx$ (d) 0

19. The value of $\int_{-\frac{\pi}{2}}^{\frac{\pi}{2}} \cos x\,dx$ is

(a) 0 (b) 2 (c) 1 (d) 4

20. $\int_0^1 \sqrt{x^4(1-x)^2}\,dx$ is

(a) 1 /12 (b) −7 /12 (c) 7 /12 (d) −1 /12

21. If $\int_0^1 f(x)\,dx = 1$, $\int_0^1 x\,f(x) = a$ and $\int_0^1 x^2 f(x)dx = a^2$, $\int_0^1 (a-x)^2 f(x)dx$ is

(a) 4a² (b) 0 (c) 2a² (d) 1

22. The value of $\int_2^3 f(5-x)dx - \int_2^3 f(x)\,dx$ is

(a) 1 (b) 0 (c) −1 (d) 5

23. $\int_0^4 \left(\sqrt{x} + \frac{1}{\sqrt{x}}\right) dx$ is

(a) 20/3 (b) 21/3 (c) 28/3 (d) 1/3

24. $\int_0^{\frac{\pi}{3}} \tan x\,dx$ is

(a) log 2 (b) 0 (c) log $\sqrt{2}$ (d) 2 log 2

25. Using the factorial representation of the gamma function, which of the following is the solution for the gamma function Γ(n) when n = 8

(a) 5040 (b) 5400 (c) 4500 (d) 5540

26. Γ(n) is

(a) (n – 1)! (b) n! (c) nΓ(n) (d) (n – 1)Γ(n)

27. Γ(1) is

(a) 0 (b) 1 (c) n (d) n!

28. If n > 0, then Γ(n) is

(a) $\int_0^1 e^{-x}x^{n-1}\,dx$ (b) $\int_0^1 e^{-x}x^{n}\,dx$ (c) $\int_0^\infty e^{x}x^{-n}\,dx$ (d) $\int_0^\infty e^{-x}x^{n-1}\,dx$

29. $\Gamma\left(\frac{3}{2}\right)$

(a) $\sqrt{\pi}$ (b) $\frac{\sqrt{\pi}}{2}$ (c) $2\sqrt{\pi}$ (d) $\frac{3}{2}$

30. $\int_0^\infty x^4 e^{-x} dx$ is

(a) 12 (b) 4 (c) 4! (d) 64

CHAPTER - III

1. Area bounded by the curve $y = x(4 - x)$ between the limits 0 and 4 with x − axis is

   (a) 30/3 sq.units (b) 31/2 sq.units (c) 32/3 sq.units (d) 15/2 sq.units

2. Area bounded by the curve $y = e^{-2x}$ between the limits $0 \le x \le \infty$ is

   (a) 1 sq.units (b) ½ sq.unit (c) 5 sq.units (d) 2 sq.units

3. Area bounded by the curve $y = \frac{1}{x}$ between the limits 1 and 2 is

   (a) log2 sq.units (b) log5 sq.units (c) log3 sq.units (d) log 4 sq.units

4. If the marginal revenue function of a firm is $MR = e^{\frac{-x}{10}}$, then revenue is

   (a) $-10e^{\frac{-x}{10}}$ (b) $1 - e^{\frac{-x}{10}}$ (c) $10\left(1 - e^{\frac{-x}{10}}\right)$ (d) $e^{\frac{-x}{10}} + 10$

5. If MR and MC denotes the marginal revenue and marginal cost functions, then the profit functions is

   (a) $P = \int (MR - MC)\,dx + k$ (b) $P = \int (MR + MC)\,dx + k$

   (c) $P = \int (MR)(MC)\,dx + k$ (d) $P = \int (R - C)\,dx + k$

6. The demand and supply functions are given by $D(x) = 16 - x^2$ and $S(x) = 2x^2 + 4$ are under perfect competition, then the equilibrium price x is

   (a) 2 (b) 3 (c) 4 (d) 5

7. The marginal revenue and marginal cost functions of a company are $MR = 30 - 6x$ and $MC = -24 + 3x$ where x is the product, then the profit function is

   (a) $9x^2 + 54x$ (b) $9x^2 - 54x$ (c) $54x - \frac{9x^2}{2}$ (d) $54x - \frac{9x^2}{2} + k$

8. The given demand and supply function are given by $D(x) = 20 - 5x$ and $S(x) = 4x + 8$ if they are under perfect competition then the equilibrium demand is

   (a) 40 (b) 41/2 (c) 40/3 (d) 41/5

9. If the marginal revenue $MR = 35 + 7x - 3x^2$, then the average revenue AR is

   (a) $35x + \frac{7x^2}{2} - x^3$ (b) $35 + \frac{7x}{2} - x^2$ (c) $35 + \frac{7x}{2} + x^2$ (d) $35 + 7x + x^2$

10. The profit of a function p(x) is maximum when

    (a) MC − MR = 0 (b) MC=0 (c) MR=0 (d) MC+MR=0

11. For the demand function p(x), the elasticity of demand with respect to price is unity then

    (a) revenue is constant (b) cost function is constant

    (c) profit is constant (d) none of these

12. The demand function for the marginal function $MR = 100 - 9x^2$ is

    (a) $100 - 3x^2$ (b) $100x - 3x^2$ (c) $100x - 9x^2$ (d) $100 + 9x^2$

13. When $x_0 = 5$ and $p_0 = 3$ the consumer's surplus for the demand function $p_d = 28 - x^2$ is

    (a) 250 units (b) 250/3 units (c) 251/2 units (d) 251/3 units

14. When $x_0 = 2$ and $p_0 = 12$ the producer's surplus for the supply function $p_s = 2x^2 + 4$ is

    (a) 31/5 units (b) 31/2 units (c) 32/3 units (d) 30/7 units

15. Area bounded by $y = x$ between the lines $y = 1$, $y = 2$ with y = axis is

    (a) 1/2 sq.units (b) 5/2 sq.units (c) 3/2 sq.units (d) 1 sq.unit

16. The producer's surplus when the supply function for a commodity is $P = 3 + x$ and $x_0 = 3$ is

    (a) 5/2 (b) 9/2 (c) 3/2 (d) 7/2

17. The marginal cost function is $MC = 100\sqrt{x}$. find AC given that TC =0 when the out put is zero is

(a) $\frac{200}{3}x^{\frac{1}{2}}$ (b) $\frac{200}{3}x^{\frac{3}{2}}$ (c) $\frac{200}{3x^{\frac{3}{2}}}$ (d) $\frac{200}{3x^{\frac{1}{2}}}$

18. The demand and supply function of a commodity are $P(x) = (x - 5)^2$ and $S(x) = x^2 + x + 3$ then the equilibrium quantity x_0 is

(a) 5 (b) 2 (c) 3 (d) 19

19. The demand and supply function of a commodity are $D(x) = 25 - 2x$ and $S(x) = \frac{10+x}{4}$ then the equilibrium price P0 is

(a) 5 (b) 2 (c) 3 (d) 10

20. If MR and MC denote the marginal revenue and marginal cost and $MR - MC = 36x - 3x^2 - 81$, then the maximum profit at x is equal to

(a) 3 (b) 6 (c) 9 (d) 5

21. If the marginal revenue of a firm is constant, then the demand function is

(a) MR (b) MC (c) C (x) (d) AC

22. For a demand function p, if $\int \frac{dp}{p} = k \int \frac{dx}{x}$ then k is equal to

(a) η_d (b) $-\eta_d$ (c) $\frac{-1}{\eta_d}$ (d) $\frac{1}{\eta_d}$

23. Area bounded by $y = e^x$ between the limits 0 to 1 is

(a) $(e - 1)$ sq.units (b) $(e + 1)$ sq.units (c) $(1 - \frac{1}{e})$ sq.units (d) $(1 + \frac{1}{e})$ sq.units

24. The area bounded by the parabola $y^2 = 4x$ bounded by its latus rectum is

(a) 16/3 sq.units (b) 8/3 sq.units (c) 72/3 sq.units (d) 1/3 sq.units

25. Area bounded by $y = |x|$ between the limits 0 and 2 is

(a) 1sq.units (b) 3 sq.units (c) 2 sq.units (d) 4 sq.units