

COMMON HALF YEARLY EXAMINATION - 2024

Reg. No.

**XII - BUSINESS MATHS & STATISTICS**

Time Allowed : 3-00 Hrs.

Maximum Marks: 90

**PART - I**

I. Choose the correct answer:

20 x 1 = 20

- Which of the following is not an elementary transformation?  
a)  $R_i \leftrightarrow R_j$       b)  $R_i \rightarrow 2R_i + 2C_j$       c)  $R_i \rightarrow 2R_i - 4R_j$       d)  $C_i \rightarrow C_i + 5C_j$
- If  $O(A) = 3 \times 3$  and  $\rho(A) = 2$  then  $\rho(\text{adj } A)$  is \_\_\_\_\_.  
a) 1      b) 2      c) 3      d) 0
- $\int \frac{e^x}{e^x+1} dx$  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)  $\log |e^x+1| + c$
- $\Gamma(n)$  is  
a)  $n\Gamma(n)$       b)  $n\Gamma(n), n > 0$       c)  $(n-1)\Gamma(n-1), n > 0$       d)  $n-1\Gamma(n-1), n > 1$
- Area bounded by the curve  $y = \frac{1}{x}$  between the limit 1 and 2 is  
a) log 2 sq.units      b) log 5 sq.units      c) log 3 sq.units      d) log 4 sq.units
- The first three terms in Newton's method will be a \_\_\_\_\_ interpolation.  
a) linear      b) parabolic      c) second      d) maximum
- If  $P(X) = \frac{1}{10}, x = 10$ , then  $E(X) =$  \_\_\_\_\_.  
a) zero      b)  $\frac{6}{8}$       c) 1      d) -1
- Solution of  $\frac{dy}{dx} + px = 0$   
a)  $x = ce^{py}$       b)  $x = ce^{-py}$       c)  $x = py + c$       d)  $x = cy$
- If the area to the left of a value of Z is 0.0793. What is the value of Z?  
a) -1.41      b) 1.41      c) -2.25      d) 2.25
- A type of decision making environment is  
a) certainty      b) uncertainty      c) risk      d) all these
- Type I error is  
a) Accept  $H_0$  when it is true      b) Accept  $H_0$  when it is false  
c) Reject  $H_0$  when it is true      d) Reject  $H_0$  when it is false
- Rank of null matrix  
a) 0      b) -1      c)  $\infty$       d) 1
- The standard error of sample mean is  
a)  $\frac{\sigma}{\sqrt{2n}}$       b)  $\frac{\sigma}{n}$       c)  $\frac{\sigma}{\sqrt{n}}$       d)  $\frac{\sigma^2}{\sqrt{n}}$

14. The probability density function  $P(x)$  cannot exceed \_\_\_\_\_.
- a) zero                      b) one                      c) mean                      d) infinity
15. In a binomial distribution, the probability of success is twice as that failure. Then out of 4 trials, the probability of no success is \_\_\_\_\_.
- a)  $\frac{16}{81}$                       b)  $\frac{1}{16}$                       c)  $\frac{2}{27}$                       d)  $\frac{1}{81}$
16.  $\Delta f(x) =$  \_\_\_\_\_.
- a)  $f(x+h)$                       b)  $f(x) - f(x+h)$                       c)  $f(x+h) - f(x)$                       d)  $f(x) - f(x-h)$
17.  $E(X - E(X))^2 =$  \_\_\_\_\_.
- a)  $E(X)$                       b)  $E(X^2)$                       c)  $V(X)$                       d) S.D(X)
18. The value of 'b' in the trend line  $y = a + bx$  is
- a) always positive                      b) always negative
- c) either positive or negative                      d) zero
19.  $\int x e^x dx$
- a)  $x - 1$                       b)  $e^x(x+1) + c$                       c)  $e^x(x-1) + c$                       d)  $x e^x - x + c$
20. In an assignment problem involving four workers and three jobs, total number of assignments possible are
- a) 4                      b) 3                      c) 7                      d) 12

### PART - II

II. Answer any 7 questions. (Q.No.30 is compulsory)

7 x 2 = 14

21. Find the rank of  $\begin{bmatrix} 2 & -1 & 1 \\ 3 & 1 & -5 \\ 1 & 1 & 1 \end{bmatrix}$

22. Evaluate:  $\int \frac{dx}{\sqrt{x^2 - 3x + 2}}$

23. If  $MR = 20 - 5x + 3x^2$ , then find total revenue function.

24. Mention the properties of Poisson distribution (any two)

25. Let  $X$  be a continuous random variable with p.d.f

$$f(x) = \begin{cases} 2x & 0 \leq x \leq 1 \\ 0 & \text{Otherwise} \end{cases} \text{ Find the expected value of } X.$$

26. What is Standard error?

27. Evaluate  $\Delta^2\left(\frac{1}{x}\right)$  by taking '1' as the interval of differencing.

28. Find the missing term of the following.

X	1	2	3	4
Y	100	-	126	157

29. Find the area bounded by the curve  $y^2 = x^3$  and the lines  $x = 0$ ,  $y = 1$ ,  $y = 2$

30. The discrete random variable  $X$  has the following probability function, prove that  $k = 0.1$

X	1	2	3	4
P(X)	k	2k	3k	4k

**PART - III****III. Answer any 7 questions. (Q.No.40 is compulsory)****7 x 3 = 21**

31. Integrate  $x^n \log x$  with respect to  $x$
32. Solve :  $\frac{dy}{dx} - \frac{y}{x} = x^2$
33. Consider the matrix of transition probabilities of a product available in the market in two brands A and B
- A    B
- A  $\begin{bmatrix} 0.9 & 0.1 \\ 0.3 & 0.7 \end{bmatrix}$ . Determine the market share of each brand in equilibrium position.
34. Two coins are tossed simultaneously. Getting a head is termed as success. Find the probability distribution of number of successes.
35. The S.D of a sample size of 50 is 6.3. Determine the standard error whose population S.D. is 6?
36. A die is thrown 120 times and getting 1 or 5 is considered a success. Find the mean and variance.
37. If  $f'(x) = \frac{1}{x}$  and  $f(1) = \frac{\pi}{4}$ , then find  $f(x)$
38. If  $h = 1$ , prove that  $f(4) = f(3) + \Delta f(2) + \Delta^2 f(1) + \Delta^3 f(1)$
39. Determine the standard error of population for a random sample of 500 pineapples was taken from a large consignment of 65 were found to be bad.
40. The marginal cost function given by  $MC = 3 - e^x$ , find (i) Cf if  $C(0) = 10$  ii) Average cost

**PART - IV****IV. Answer all the questions.****7 x 5 = 35**

41. a) 80% of students who do Maths work during one study period, will do the Maths work at the next study period. 30% of students who do English work during one study period, will do the English work at the next study period.
- i) The transition probability matrix
- ii) The number of students who do Maths work, English work for the next five subsequent 2 study periods.

**(OR)**

- b) Evaluate the integral as the limit of a sum  $\int_1^2 (2x+1)dx$

42. a) The marginal cost and marginal revenue with respect of a firm or given by  $C'(x) = 8 + 6x$  and  $R'(x) = 24$ . Find the total profit given that the total cost at zero output is zero.

**(OR)**

- b) Solve :  $x \frac{dy}{dx} - y = \sqrt{x^2 + y^2}$

43. a) Solve  $(D^2 - 3D + 2)y = e^{4x}$  given  $y = 0$  when  $x = 0$  and  $x = 1$

**(OR)**

b)

X	1	2	3	4	5	6	7	8
Y	1	8	27	64	125	216	343	512

Calculate  $y$  when  $x = 7.5$  from above table.

44. a) A random variable X has the following probability function.

X	0	1	2	3	4	5	6	7
P(X)	0	a	2a	2a	3a	a <sup>2</sup>	2a <sup>2</sup>	7a <sup>2</sup> +a

- i) find a Evaluate (ii)  $P(X < 3)$  (iii)  $P(X > 2)$  (iv)  $P(2 < X \leq 5)$   
(OR)

b) Evaluate : (i)  $\int_0^{\infty} \frac{e^{-\tan^{-1}x}}{1+x^2} dx$  (ii)  $\int \frac{x+2}{(x^2+4x-5)^4} dx$

45. a) If the height of 500 students are normally distributed with mean 68 inches and S.D. 3 inches, how many students have height

- (i) Greater than 72 inches  
(ii) Less than or equal to 64 inches  
(iii) Between 65 and 71 inches

(OR)

b) Solve:  $\frac{2}{x} + \frac{3}{y} + \frac{4}{z} = 14$ ,  $\frac{3}{x} - \frac{2}{y} + \frac{1}{z} = 3$ ,  $\frac{1}{x} + \frac{1}{y} + \frac{1}{z} = 5$

46. a) Under perfect competition for a commodity the demand and supply laws are

$P_d = \frac{8}{x+1} - 2$  and  $P_s = \frac{x+3}{2}$ . Find the consumer's and producer's surplus.

(OR)

b) Evaluate:  $\int_0^{\pi/2} \frac{\sin^3 x}{\sin^3 x + \cos^3 x} dx$

47. a) Determine initial basic feasible solution using Vogel's approximation method.

	D <sub>1</sub>	D <sub>2</sub>	D <sub>3</sub>	D <sub>4</sub>	Availability
Q <sub>1</sub>	5	8	3	6	30
Q <sub>2</sub>	4	5	7	4	50
Q <sub>3</sub>	6	2	4	6	20

Requirement 30 40 20 10

(OR)

- b) Compute (i) Laspeyre's (ii) Paasche's (iii) Fisher's index number for the year 2010 from the following data.

Commodity	Price		Quantity	
	2000	2010	2000	2010
A	12	14	18	16
B	15	16	20	15
C	14	15	24	20
D	12	12	29	23