

**THIRD REVISION EXAMINATION - 2023**Reg. No. 

--	--	--	--	--	--	--	--

**XII - BUSINESS MATHEMATICS & STATISTICS**

Time Allowed : 3.00 Hrs.

Maximum Marks: 90

- INSTRUCTIONS :** 1. Check the question paper for fairness of printing.  
If there is any lack of fairness, inform the Hall Supervisor immediately.  
2. Use **Blue** or **Black** ink to write and underline and **Pencil** to draw diagrams.

**PART - I**

- Note** i) Answer all the questions  
ii) Choose the most appropriate answer from the given four alternatives and write the option code and the corresponding answer. (20×1=20)

- If  $|A| = 13$  and  $|\text{Adj } A| = \begin{vmatrix} 4 & x \\ 5 & 7 \end{vmatrix}$ , then the value  
a) 3                      b) 4                      c) 2                      d) -5
- The system of equations  $2x - y = 1$ ,  $3x + 2y = 12$  has  
a) No solution                      b) Unique solution  
c) Infinitely many solution                      d) None of these
- 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
- The marginal cost function is  $MC = 100\sqrt{x}$ . Find AC, given that  $TC = 0$  when the output is zero  
a)  $\frac{200}{3}x^{1/2}$                       b)  $\frac{200}{3}x^{3/2}$                       c)  $\frac{200}{3x^{3/2}}$                       d)  $\frac{200}{3x^{1/2}}$
- The producer's surplus when supply function is  $p = 3 + x$  and  $x_0 = 3$  is  
a)  $\frac{5}{2}$                       b)  $\frac{9}{2}$                       c)  $\frac{3}{2}$                       d)  $\frac{7}{2}$
- $\int_0^{\infty} e^{-5x} x^7 dx =$  \_\_\_\_\_  
a)  $\frac{5!}{7^6}$                       b)  $\frac{7!}{5^8}$                       c)  $\frac{5!}{6^7}$                       d)  $\frac{7!}{(-5)^8}$
- If  $m$  and  $n$  are positive integers the  $\Delta^m \Delta^n f(x) =$   
a)  $\Delta^{m+n} f(x)$                       b)  $\Delta^m f(x)$                       c)  $\Delta^n f(x)$                       d)  $\Delta^{m-n} f(x)$
- The complementary function of  $\frac{d^2y}{dx^2} - \frac{dy}{dx} = 0$  is  
a)  $A + Be^x$                       b)  $(A + B) e^x$                       c)  $(Ax + B) e^x$                       d)  $Ae^x + Bx$
- North west corner refers to \_\_\_\_\_  
a) top left corner                      b) top right corner  
c) bottom right corner                      d) bottom left corner
- A finite subset of statistical individuals in a population is called  
a) sample                      b) a population                      c) universe                      d) census
- The differential equation formed by eliminating  $a$  and  $b$  from  $y = ae^x + be^{-x}$  is  
a)  $(D^2 - 1)y = 0$                       b)  $(D^2 - D) y = 0$                       c)  $D^2y = 0$                       d)  $D^2y - x = 0$

12. If  $\sec^2 x$  is an integrating factor of the differential equation  $\frac{dy}{dx} + Py = Q$  then  $P =$
- a)  $\sec x$                       b)  $2 \tan x$                       c)  $\cos^2 x$                       d)  $\tan^2 x$
13. A type of decision - making environment is
- a) certainty                      b) uncertainty                      c) risk                      d) all of the above
14. Errors in sampling are of
- a) two types                      b) three types                      c) four types                      d) five types
15. The LCL for R chart is given by
- a)  $D_2 \bar{R}$                       b)  $D_2 \bar{\bar{R}}$                       c)  $D_3 \bar{\bar{R}}$                       d)  $D_3 \bar{R}$
16. In a parametric distribution, the mean is equal to variance is
- a) binomial                      b) normal                      c) poisson                      d) all the above
17. The multiplicative model of the timeseries with the components T, S, C and I is
- a)  $y = T + S \times C \times I$                       b)  $y = T \times S \times C \times I$
- c)  $y = T + S \times C + I$                       d)  $y = T + S + C + I$
18. Type II error is
- a) Accept  $H_0$  when it is false                      b) Reject  $H_0$  when it is false
- c) Reject  $H_0$  when it is true                      d) Accept  $H_0$  when it is true
19. Factor responsible for seasonal variation are
- a) weather                      b) festival                      c) social custom                      d) all the above
20. The quantity that can be numerically measured can be plotted on a
- a) p - chart                      b) c - chart                      c) X - bar chart                      d) np - chart

### PART - II

**Answer any seven questions. Question Number 30 is compulsory.**

**(7x2=14)**

21. Find the rank of  $A = \begin{bmatrix} 1 & 4 \\ 2 & 8 \end{bmatrix}$
22. Evaluate :  $\int x e^x dx$
23. Define Alternative hypothesis.
24. The discrete random variable X has the probability function.

$X = x$	1	2	3	4
$P(X = x)$	k	2k	3k	4k

show that  $K = 0.1$

25. Solve :  $y'' + y' = 0$
26. If the marginal revenue function for a commodity is  $MR = 2x^2 + 6x - 5$ , find the demand function.
27. What is the probability of getting atleast 8 marks in the test of 10 questions of type True or False.
28. Given  $u_0 = 1, u_1 = 11, u_2 = 21, u_3 = 28, u_4 = 29$  find  $D^4 u_0$ .
29. What are the components of the time series.
30. Find the area bounded by  $y + 4x + 3$  with x - axis,  $x = 1$  and  $x = 4$ .

**PART - III**

**Answer any seven questions. Question Number 40 is compulsory. (7x3=21)**

31. Solve the differential equation  $x \frac{dy}{dx} = x + y$ .

32. Find the expected value for the random variable of an unbiased die.

x	1	2	3	4	5	6
f(x)	1/6	1/6	1/6	1/6	1/6	1/6

33. Find the sample size for the given S.D. 10 and the standard error with respect to sample mean is 3.

34. What are the differences between Transportation and Assignment problem?

35. Assuming one in 80 births in a case of twins. Calculate the probability of exactly 2 set of twins on a day of 30 births occur. ( $e^{-0.375} = 0.6873$ )

36. A die is thrown 9000 times and a throw of 3 or 4 is observed 3240 times. Find the standard error of the proportion for an unbiased die.

37. Calculate four-yearly moving average of number of students studying in a higher secondary school in a particular city from the following data.

Year	2001	2002	2003	2004	2005	2006	2007	2008	2009
Number of students	124	120	135	140	145	158	162	170	175

38. Evaluate.  $\int_1^2 \frac{x-1}{x^2} dx$

39. What are the properties of mathematical expectation.

40. Calculate the cost of living index by aggregate expenditure method

Commodity	Weights		Price	
	2010	2010	2010	2015
P	80	22	25	
Q	30	30	45	
R	25	42	50	
S	40	25	35	
T	50	36	52	

**PART - IV**

**IV. Answer all the questions**

**(7x5=35)**

41. a. The cost of 2kg of wheat and 1kg of sugar is Rs. 100. The cost of 1kg of wheat and 1kg of rice is Rs. 80. The cost of 3kg of wheat, 2kg of sugar and 1kg of rice is Rs. 200. Find the cost of each per kg using Cramer's rule.

**(OR)**

b. The marginal cost  $C'(X)$  and marginal revenue  $R'(x)$  are given by  $c'(x) = 50 + \frac{x}{50}$  and  $R'(x) = 60$ . The fixed cost is Rs. 200. Determine the maximum profit.

42. a. The mean score of 500 students for an examination is 40 and S.D is 25. Determine the limit of the marks of the central 60% of the candidates.  
 $(P(0 < z < 0.84) = 0.30)$  **(OR)**
- b. Using Newton's forward interpolation formula, find  $f'(x)$  from the following table.

x	0	1	2	3
f(x)	2	4	8	20

43. a. Solve :  $(3D^2 + D - 14)y = 4 - 13e^{-7x/3}$  **(OR)**
- b. Using integration find the area of circle of radius 'r' units and the centre at the origin.

44. a. Using Lagrange's formula for interpolation, find the value of  $f(15)$

x	4	7	10	17
y(x)	30	33	37	40

**(OR)**

- b. Wages of the factory workers are assumed to be normally distributed with variance 25. A random sample of 50 workers gives the total wages equal to Rs. 2500. Test the hypothesis  $\mu = 52$ , against the alternative hypothesis  $\mu = 49$  at 1% level of significance..
45. a. Obtain the initial basic feasible solution to the following transportation problem using Vogel's approximation method..

	<b>I</b>	<b>II</b>	<b>III</b>	<b>IV</b>	Supply
A	5	1	3	3	34
B	3	3	5	4	15
C	6	4	4	3	12
D	4	1	4	5	19
Demand	21	25	17	17	

**(OR)**

- b. Evaluate :  $\int \frac{x}{2x^4 - 3x^2 - 2} dx$
46. a. Calculate the seasonal index by the method of simple average for the following data.

Year	I Quarter	II Quarter	III Quarter	IV Quarter
1985	65	60	61	63
1986	68	55	66	61
1987	68	60	63	67

**(OR)**

- b. The demand and supply function for a commodity are  $p_d = 16 - 2x$  and  $p_s = x^2 + 1$ . Find the consumer's surplus and producer's surplus at market equilibrium price. **(OR)**
47. a. Determine the equation of a straight line which best fits the following data

Year	2000	2001	2002	2003	2004
Sales (Rs. 1000)	35	36	79	80	40

**(OR)**

- b. Let X be a continuous random variable with p.d.f.  $f(x) = \begin{cases} \frac{1}{2} & -1 < x < 1 \\ 0 & \text{otherwise} \end{cases}$

Find (i)  $E(X)$

(ii)  $E(X^2)$

(iii)  $\text{Var}(X)$