

I. Choose the correct answer:

20x1=20

1. If $A = \begin{pmatrix} 2 & 0 \\ 0 & 8 \end{pmatrix}$ then $p(A)$ is _____.
 - a) 0
 - b) 1
 - c) 2
 - d) n
2. The system of equations $4x+6y=5$, $6x+9y=7$ has _____.
 - a) a unique solution
 - b) no solution
 - c) Infinitely many solution
 - d) none of these
3. $\int \frac{2x^3}{4+x^4} dx$ 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) $\log \left| \frac{2x^3}{4+x^4} \right| + c$
4. $\int_0^4 \left(\sqrt{x} + \frac{1}{\sqrt{x}} \right) dx$
 - a) $\frac{20}{3}$
 - b) $\frac{21}{3}$
 - c) $\frac{28}{3}$
 - d) $\frac{1}{3}$
5. Area bounded by $y=e^x$ between the limits 0 to 1 is _____.
 - a) $(e-1)$ sq.units
 - b) $(e+1)$ sq.units
 - c) $\left(1 - \frac{1}{e}\right)$ sq.units
 - d) $\left(1 + \frac{1}{e}\right)$ sq.units
6. 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) $100+9x^2$
7. The P.I of $(3D^2+D-14)y=13e^{2x}$ is _____.
 - a) $\frac{x}{2} e^{2x}$
 - b) $x e^{2x}$
 - c) $\frac{x^2}{2} e^{2x}$
 - d) $13 x e^{2x}$
8. The integrating factor of $x \frac{dy}{dx} - y = x^2$ is _____.
 - a) $\frac{-1}{x}$
 - b) $\frac{1}{x}$
 - c) $\log x$
 - d) x
9. $E =$ _____.
 - a) $1-\Delta$
 - b) $1+\Delta$
 - c) $1-\nabla$
 - d) $1+\nabla$
10. Lagrange's interpolation formula can be used for _____.
 - a) equal intervals only
 - b) unequal intervals only
 - c) both equal and unequal intervals
 - d) none of these
11. If c is constant then $E(c)$ is _____.
 - a) 0
 - b) 1
 - c) $f(c)$
 - d) c
12. Given $E(x)=5$ and $E(y)=-2$ then $E(x-y)$ is _____.
 - a) 3
 - b) 5
 - c) 7
 - d) -2
13. If $X \sim N(9, 81)$ the standard normal variate z will be _____.
 - a) $Z = \frac{x-81}{9}$
 - b) $Z = \frac{x-9}{81}$
 - c) $Z = \frac{x-9}{9}$
 - d) $Z = \frac{9-x}{9}$
14. If $P(Z > z) = 0.5832$ what is the value of Z (Z has standard distribution)?
 - a) -0.48
 - b) 0.48
 - c) 1.04
 - d) -0.21
15. Errors in sampling are of _____.
 - a) two types
 - b) three types
 - c) four types
 - d) five types
16. 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
17. Most commonly used index number is _____.
 - a) Volume index number
 - b) Value index number
 - c) Price index number
 - d) Simple index number
18. R is calculated using _____.
 - a) $X_{\max} - X_{\min}$
 - b) $X_{\min} - X_{\max}$
 - c) $\bar{x}_{\max} - \bar{x}_{\min}$
 - d) $\bar{x}_{\max} - \bar{x}_{\min}$
19. In a degenerate solution number of allocations is _____.
 - a) equal to $m+n-1$
 - b) not equal to $m+n-1$
 - c) less than $m+n-1$
 - d) greater than $m+n-1$
20. A type of decision-making environment is _____.
 - a) certainty
 - b) uncertainty
 - c) risk
 - d) all of the above

II. Answer any 7 of the following, Q.No.30 is compulsory $7 \times 2 = 14$

21. Find the rank of the matrix $\begin{pmatrix} -5 & -7 \\ 5 & 7 \end{pmatrix}$

22. Evaluate $\int_{-1}^1 \frac{x^5 dx}{a^2 - x^2}$

23. Using Integration, find the area of the region bounded the line $2y+x=8$, the x-axis and the lines $x=2$, $x=4$

24. Solve $\frac{dy}{dx} = e^{x-y} + x^2 e^{-y}$

25. Distinguish between discrete and continuous random variable

26. Define Bernoulli trials.

27. The data shows the sample mean for 5 samples for size 5 each. Find control limits for mean chart. $A_2=0.577$

Sample	1	2	3	4	5
Mean	21	26	23	18	19

28. Given the following pay-off matrix (in rupees) for three strategies and two states of nature.

	State of nature	
Strategy	E_1	E_2
S_1	40	60
S_2	10	-20
S_3	-40	150

Select a strategy using each of the following (i) Maximin

(ii) Minimax

29. The S.D of sample size 50 is 6.3. Determine the standard error whose population S.D is 6.

30. Find $\Delta^2 e^x$

III. Answer any 7 of the following, Q.No.40 is compulsory $7 \times 3 = 21$

31. The total cost of 11 pencils and 3 erasers is ₹ 64 and total cost of 8 pencils and 3 erasers is ₹ 49. Find the cost of each pencil and each eraser by cramer's rule.

32. The marginal cost function is $MC=300x^{\frac{2}{5}}$ and fixed cost is zero. Find out the total cost and average cost function.

33. Solve: $(x^2+1) \frac{dy}{dx} + 2xy = 4x^2$

34. Following are population of a district

Year (x)	1881	1891	1901	1911
Population (y) Thousands	363	-	391	421

Find the population of the year 1891.

35. Suppose the probability mass function of the discrete random variable is

$X = x$	0	1	2	3
$P(x)$	0.2	0.1	0.4	0.3

What is the value of $E(3x+2x^2)$?

36. Assume the mean height of children to be 69.25cm with a variance of 10.8cm. How many children in a school of 1,200 would you expect to be over 74cm tall?

37. A sample of 100 measurements at breaking strength of cotton thread gave a mean of 7.4 and S.D of 1.2 gms. Find 95% confidence limits for the mean breaking strength of cotton thread.

38. Compute (i) Laspeyre's (ii) Paasche's for the 2010 from the following data:

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

39. Solve the following assignment problem:

		Men		
		1	2	3
Task	P	9	26	15
	Q	13	27	6
	R	35	20	15
	S	18	30	20

40. Evaluate $\int_1^4 f(x) dx$, where

$$f(x) = \begin{cases} 7x+3, & \text{if } 1 \leq x \leq 3 \\ 8x, & \text{if } 3 \leq x \leq 4 \end{cases}$$

IV. Answer the following:

$$7 \times 5 = 35$$

41. a) The subscription department of a magazine sends out a letter to a large mailing list inviting subscriptions for the magazine. Some of the people receiving this letter already subscribe to the magazine while others do not. From this mailing list, 45% of those who already subscribe will subscribe again while 30% of those who do not now subscribe will subscribe. On the last letters, it was found that 40% of those receiving it ordered a subscription. What percent of those receiving the current letter can be expected to order a subscription?

(or)

b) Evaluate as limit of sum $\int_0^1 x^2 dx$

42. a) The demand supply function of a commodity are $P_d = 18 - 2x - x^2$ and $P_s = 2x - 3$. Find the consumer surplus and producer's surplus at equilibrium price.

(or)

b) Solve the differential equation $y^2 dx + (xy + x^2) dy = 0$

43. a) Obtain an initial basic feasible solution to the following transportation problem using Vogel's approximation method.

Ware houses	Stores				Availability (a_i)
A	5	1	3	3	34
B	3	3	5	9	15
C	6	4	4	3	12
D	4	1	4	5	19
Requirement	21	25	17	17	

(b_j)

(or)

b) Compute the average seasonal movement for the following sums.

Year	Quarterly Production			
	I	II	III	IV
2002	3.5	3.8	3.7	3.5
2003	3.6	4.2	3.4	4.1
2004	3.4	3.9	3.7	4.2
2005	4.2	4.5	3.8	4.4
2006	3.9	4.4	4.2	4.6

44. a) (i) A sample of 900 members has a mean 3.4 cm and SD 2.61cm. Is the sample taken from a large population with mean 3.25cm and SD 2.62 cm?

(ii) If the population is normal and its mean is unknown, find the 95% and 98% confidence limits of true mean.

(or)

b) Derive the mean and variance of binomial distribution.

45. a) The probability density function of a random variable x is

$$f(x) = Ke^{-|x|}, \quad -\infty < x < \infty$$

Find the value of k and also find mean and variance for the random variable.

(or)

b) The following data are taken from the steam table.

Temperature C ⁰	140	150	160	170	180
Pressure Kg f/cm ³	3.685	4.854	6.302	8.076	10.225

Find pressure at t=175⁰

46. a) Suppose that the quantity demanded $Q_d=13-6p+\frac{2dp}{dt}+\frac{d^2p}{dt^2}$ and quantity supplied $Q_s=-3+2p$ where p is the price. Find the equilibrium price for market clearance.

(or)

b) Calculate Fisher's Price Index number and show that its satisfies both Time Reversal Test and Factor Reversal Test for data given below.

Commodities	Base Year		Current Year	
	Price	Quantity	Price	Quantity
Rice	10	5	11	6
Wheat	12	6	13	4
Rent	14	8	15	7
Fuel	16	9	17	8
Transport	18	7	19	5
Miscellaneous	20	4	21	3

47. a) A sample of 125 dry battery cells tested to find the length of life produced the following resulted with mean 12 and SD 3 hours.

Assuming that the data to be normal distributed, what percentage of battery cells are expected to have life

i) more than 13 hours ii) less than 5 hours

iii) between 9 and 14 hours

Z	0.333	2.333	1	0.667
Area	0.1293	0.4901	0.3413	0.2486

(or)

b) Evaluate $\int \frac{xe^x}{(1+x)^2} dx$