12th Standard

Business Maths   Reg.No. :

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.

Exam Time : 03:00:00 Hrs   Total Marks : 90

<div align="center">

PART I   20 x 1 = 20

ANSWER ALL THE QUESTIONS.

</div>

1) If A=(1 2 3), then the rank of AA^T is
   (a) 0   (b) 2   (c) 3   (d) 1

2) Which of the following is not an elementary transformation?
   (a) $R_i \leftrightarrow R_j$ (b) $R_i \to 2R_i + 2c_j$ (c) $R_i \to 2R_i - 4R_i$ (d) $C_i \to C_i + 5C_j$

3) $\int \frac{logx}{x}$ 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) $\frac{2}{x^2} + c$

4) 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

5) Area bounded by the curve y = x (4 − x) between the limits 0 and 4 with x − axis is
   (a) $\frac{30}{3}$ sq.units   (b) $\frac{31}{3}$ sq.units   (c) $\frac{32}{3}$ sq.units   (d) $\frac{15}{2}$ sq.units

6) 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

7) 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

8) If $\sec^2$ x is an integrating factor of the differential equation $\frac{dy}{dx}$ + Py Q then P =
   (a) 2 tan x   (b) sec x   (c) $\cos^2$ x   (d) $\tan^2$ x

9) The complementary function of $\frac{d^3y}{dx^3} - \frac{dy}{dx} = 0$ is
   (a) A + Be^x (b) (A + B)e^x (c) (Ax + B)e^x (d) Ae^x + B

10) $\Delta^2 y_0 =$
   (a) $y_2 - 2y_1 + y_0$ (b) $y_2 + 2y_1 - y_0$ (c) $y_2 + 2y_1 + y_0$ (d) $y_2 + y_1 + 2y_0$

11) If f (x)=x^2 + 2x + 2 and the interval of differencing is unity then Δf (x)
   (a) 2x −3   (b) 2x +3   (c) x + 3   (d) x − 3

12) A variable that can assume any possible value between two points is called
   (a) discrete random variable   (b) continuous random variable   (c) discrete sample space   (d) random variable

13) If c is a constant in a continuous probability distribution, then p(x = c) is always equal to
   (a) zero   (b) one   (c) negative   (d) does not exist

14) A variable which can assume finite or countably infinite number of values is known as
   (a) continuous   (b) discrete   (c) qualitative   (d) none of them

15) If X ~N(μ, σ^2), the maximum probability at the point of inflexion of normal distribution is
   (a) $\left(\frac{1}{\sqrt{2\pi}}\right)e^{\frac{1}{2}}$ (b) $\left(\frac{1}{\sqrt{2\pi}}\right)e^{\left(-\frac{1}{2}\right)}$ (c) $\left(\frac{1}{\sigma\sqrt{2\pi}}\right)e^{\left(\frac{1}{2}\right)}$ (d) $\left(\frac{1}{\sqrt{2\pi}}\right)$

16) A statistical analysis of long-distance telephone calls indicates that the length of these calls is normally distributed with a mean of 240 seconds and a standard deviation of 40 seconds. What proportion of calls lasts less than 180 seconds?
   (a) 0.214   (b) 0.094   (c) 0933   (d) 0.067

17) If $P(Z > z) = 0.5832$ what is the value of z (z has a standard normal distribution)?

   (a) -0.48   (b) 0.48   (c) 1.04   (d) -0.21

18) A finite subset of statistical individuals in a population is called _____

   (a) a sample   (b) a population   (c) universe   (d) census

19) An estimator is said to be _____ if it contains all the information in the data about the parameter it estimates.

   (a) efficient   (b) sufficient   (c) unbiased   (d) consistent

20) Least square method of fitting a trend is

   (a) Most exact   (b) Least exact   (c) Full of subjectivity   (d) Mathematically unsolved

PART – II   7 X 2 = 14

ANSWER ANY SIX QUESTIONS AND QUESTION NUMBER 30 IS COMPULSORY.

21) A commodity was produced by using 3 units of labour and 2 units of capital, the
   total cost is Rs 62. If the commodity had been produced by using 4 units of labour
   and one unit of capital, the cost is Rs 56. What is the cost per unit of labour and
   capital? (Use determinant method).

22) Integrate the following with respect to x. $\sqrt{x}\,(x^3 - 2x + 3)$

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: $\frac{dy}{dx} = y \sin 2x$

25) If $h = 1$ then prove that $(E^{-1}\Delta)x^3 = 3x^2 - 3x + 1$.

26) In an investment, a man can make a profit of Rs.5,000 with a probability of 0.62 or a loss of Rs. 8,000 with a probability of
   0.38. Find the expected gain.

27) A sample of 1000 students whose mean weight is 119 lbs(pounds) from a school in Tamil Nadu State was taken and their
   average weight was found to be 120 lbs with a standard deviation of 30 lbs. Calculate standard error of mean.

28) The following table gives the number of small-scale units registered with the Directorate of Industries between 1985 and 1991.
   Show the growth on a trend line by the free hand method.

Years	1985	1986	1987	1988	1989	1990	1991	1992
No. of units (in'000)	10	22	36	62	55	40	34	50

29) The following data show the values of sample means and the ranges for ten samples of size 4 each. Construct the control chart
   for mean and range chart and determine whether the process is in control

Sample number	1	2	3	4	5	6	7	8	9	10
$\bar{X}$	29	26	37	34	14	45	39	20	34	23
R	39	10	39	17	12	20	05	21	23	15

30) what is feasible solution and non degenerate solution in transportation problem?

PART – III   7 X 3 = 21

ANSWER ANY SIX QUESTIONS AND QUESTION NUMBER 40 IS COMPULSORY.

31) Show that the equations $2x+y+z=5, x+y+z=4, x-y+2z = 1$ are consistent
   and hence solve them.

32) Evaluate $\int \frac{x+2}{\sqrt{2x+3}}dx$

33) Sketch the graph $y = |x + 3|$ and evaluate $\int_{-6}^{0} |x + 3|\ dx$.

34) Solve: $(3D2 + D - 14)y = 4 - 13e^{\frac{-7}{3}x}$

35) From the following table find the missing value

x	2	3	4	5	6
f(x)	45.0	49.2	54.1	-	67.4

36) A continuous random variable X has p.d.f

$f(x)=5x^4, 0 \le x \le 1$

Find a_1 and a_2 such that i) $P[X \le a_1]=P[X > a_1]$ ii) $P[X > a_2]=0.05$

37) If the chance of running a bus service according to schedule is 0.8, calculate the probability on a day schedule with 10 services :

(i) exactly one is late

(ii) atleast one is late

38) 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 .

39) Calculate three-yearly moving averages of number of students studying in a higher secondary school in a particular village from the following data.

Year	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Number of students	332	317	357	392	402	405	410	427	435	438

40) Obtain the initial solution for the following problem

Destination

		A	B	C	Supply
Sources	1	2	7	4	5
	2	3	3	1	8
	3	5	4	7	7
	4	1	6	2	14
Demand		7	9	18	

<center>PART IV</center> <div align="right">7 X 5 = 35</div>
<center>ANSWER ALL THE QUESTIONS</center>

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

<center>(OR)</center>

b)   Solve the following assignment problem. Cell values represent cost of assigning job A, B, C and D to the machines I, II, III and IV.

machines

		I	II	III	IV
	A	10	12	19	11
	B	5	10	7	8
jobs	C	12	14	13	11
	D	8	15	11	9

42) a)   From the data, find the number of students whose height is between 80 cm and 90 em

Height in cm (x)	40-60	60-80	80 - 100	100-120	120-140
No. of. students (y) :	250	120	100	70	50

<center>(OR)</center>

b)   Construct the Laspeyre's , Paasche's and Fisher's price index number for the following data. Comment on the result.

Commodities	Base Year		Current Year	
	Price	Quantity	Price	Quantity

Rice	15	5	16	8
Wheat	10	6	18	9
Rent	8	7	15	8
Fuel	9	5	12	6
Transport	11	4	11	7
Miscellaneous	16	6	15	10

43) a) The elasticity of demand with respect to price P for a commodity is $\frac{x-5}{x}$,x > 5, When the demand is x. Find demand function if the price is 2 when the demand is 7. Also, find the revenue function.

(OR)

b) Using Newton's formula for interpolation estimate the population for the year 1905 from the table:

Year	1891	1901	1911	1921	1931
Population	98.752	1,32,285	1,68,076	1,95,670	2,46,050

44) a) For what values of k, the system of equations kx+ y+z = 1,x+ ky+z= 1,x+ y+kz= 1 have

(I) Unique solution

(ii) More than one solution

(iii) no solution

(OR)

b) Solve: $(D^2 + 14D + 49)y = e^{-7x} + 4$.

45) a) A new transit system has just gone into operation in a city. Of those who use the transit system this year, 10% will switch over to using their own car next year and 90% will continue to use the transit system. Of those who use their cars this year, 80% will continue to use their cars next year and 20% will switch over to the transit system. Suppose the population of the city remains constant and that 50% of the commuters use the transit system and 50% of the commuters use their own car this year,

(i) What percent of commuters will be using the transit system after one year?

(ii) What percent of commuters will be using the transit system in the long run?

(OR)

b) Using Lagrange's formula find the value of y when x = 4 from the following table.

x	0	3	5	6	8
y	276	460	414	343	110

46) a) 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

(OR)

b) Suppose that the quantity needed Q_d = 42 -4p-4$\frac{dp}{dt}$ + $\frac{d^2p}{dt^2}$ and quantity supplied Q_s=-6+8p where p is the price. Find the s equilibrium price for market clearance.

47) a) The demand and supply functions under pure competition are P_d = 16 - x^2 and p_s = 2x^2 + 4. Find the consumer's surplus and producer's surplus at the market equilibrium price.

(OR)

b) If the probability that an individual suffers a bad reaction from injection of a given serum is 0.001, determines the probability that out of 2,000 individuals (a) exactly 3, and (b) more than 2 individuals will suffer a bad reaction.

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