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12TH BM MODEL PAPER 6 Date : 29-Nov-19

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

PART I 20 x 1 = 20

ANSWER ALL THE QUESTIONS

1) 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

2) 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

3) Rank of a null matrix is

(a) 0 (b) -1 (c) ∞ (d) 1

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

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

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

(a) $\frac{1}{12}$ (b) $\frac{-7}{12}$ (c) $\frac{7}{12}$ (d) $\frac{-1}{12}$

6) $\int_0^\infty x^4 e^{-x}$ dx is

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

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

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

8) 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

9) The differential equation formed by eliminating a and b from $y=ae^x + be^{-x}$ is

(a) $\frac{d^2y}{dx^2} - y = 0$ (b) $\frac{d^2y}{dx^2} - \frac{dx}{dy} = 0$ (c) $\frac{d^2y}{dx^2} = 0$ (d) $\frac{d^2y}{dx^2} - x = 0$

10) The differential equation formed by eliminating A and B from $y = e^{-2x}(A \cos x + B \sin x)$ is

(a) $y_2 - 4y_1 + 5 = 0$ (b) $y_2 + 4y - 5 = 0$ (c) $y_2 - 4y_1 - 5 = 0$ (d) $y_2 + 4y_1 + 5 = 0$

11) The solution of the differential equation $\frac{dy}{dx} = \frac{y}{x} + \frac{f\left(\frac{y}{x}\right)}{f'\left(\frac{y}{x}\right)}$ is

(a) $f\left(\frac{y}{x}\right) = k.x$ (b) $xf\left(\frac{y}{x}\right) = k$ (c) $f\left(\frac{y}{x}\right) = ky$ (d) $yf\left(\frac{y}{x}\right) = k$

12) ∇ f(a) =

(a) f (a) + f(a−h) (b) f (a) − f(a + h) (c) f (a) − f(a − h) (d) f (a)

13) A formula or equation used to represent the probability distribution of a continuous random variable is called

(a) probability distribution (b) distribution function (c) probability density function (d) mathematical expectation

14) If we have f(x)=2x, $0 \leq x \leq 1$, then f (x) is a

(a) probability distribution (b) probability density function (c) distribution function (d) continuous random variable

15) An expected value of a random variable is equal to it's

(a) variance (b) standard deviation (c) mean (d) covariance

16) In turning out certain toys in a manufacturing company, the average number of defectives is 1%. The probability that the sample of 100 toys there will be 3 defectives is

(a) 0.0613 (b) 0.613 (c) 0.00613 (d) 0.3913

17) The starting annual salaries of newly qualified chartered accountants (CA's) in South Africa follow a normal distribution with a mean of Rs.180,000 and a standard deviation of Rs. 10,000. What is the probability that a randomly selected newly qualified CA will earn between Rs.165,000 and Rs.175,000 per annum?

(a) 0.819 (b) 0.242 (c) 0.286 (d) 0.533

18) If P(Z > z) = 0.8508 what is the value of z (z has a standard normal distribution)?

(a) –0.48 (b) 0.48 (c) -1.04 (d) 1.04

19) In simple random sampling from a population of units, the probability of drawing any unit at the first draw is

(a) $\frac{n}{N}$ (b) $\frac{1}{N}$ (c) $\frac{N}{n}$ (d) 1

20) 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.

PART II 7 x 2 = 14

ANSWER ANY 7 QUESTIONS AND QUESTION NUMBER 30 IS COMPULSORY

21) Find the rank of the matrix $A = \begin{pmatrix} -2 & 1 & 3 & 4 \\ 0 & 1 & 1 & 2 \\ 1 & 3 & 4 & 7 \end{pmatrix}$

22) Integrate the following with respect to x.

$\frac{x^3}{x+2}$

23) Find the area of the region lying in the first quadrant bounded by the region $y = 4x^2$, x = 0, y = 0 and y = 4

24) Solve: $\frac{dy}{dx} = ae^y$

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

26) Define random variable.

27) Derive the mean and variance of binomial distribution.

28) Explain in detail about non-sampling error.

29) Explain cyclic variations.

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

PART III 7 x 3 = 21

ANSWER ANY 7 QUESTIONS AND QUESTION NUMBER 40 IS COMPULSORY

31) Find k, if the equations x+y+z=7,x+2y+3z=18,y+kz=6 are inconsistent

32) Evaluate $\int \frac{1}{x-\sqrt{x^2-1}}$ dx

33) Solve the differential equation $\frac{dy}{dx} = \frac{x-y}{x+y}$

34)

Solve: $(D^2+1)y=0$ when x=0, y=2 and when $x=\frac{\pi}{2}$, y=-2.

35) Using Lagrange's formula and y(x) from the following table.

x	6	7	10	12
y	13	14	15	17

36) If $p(x)\begin{cases} x, \\ \frac{}{20}\ x = 0,1,2,3,4,5 \\ 0, \end{cases}$

Find (i) P(X< 3) and (ii) $P(2 \leq 4)$

37) The sum and product of the mean and variance of a binomial distribution are 24 and 128. Find the distribution.

38) Using the following random number table (Kendall-Babington Smith)

23	15	75	48	59	01	83	72	59	93	76	24	97	08	86	95	23	03	67	44
05	54	55	50	43	10	53	74	35	08	90	61	18	37	44	10	96	22	13	43
14	87	16	03	50	32	40	43	62	23	50	05	10	03	22	11	54	36	08	34
38	97	67	49	51	94	05	17	58	53	78	80	59	01	94	32	42	87	16	95
97	31	26	17	18	99	75	53	08	70	94	25	12	58	41	54	88	21	05	13

Draw a random sample of 10 four- figure numbers startingfrom 1550 to 8000.

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) Determine an initial basic feasible solution to the following transportation problem using North West corner rule.

	D_1	D_2	D_3	D_4	Availability
O_1	6	4	1	5	14
O_2	8	9	2	7	16
O_3	4	3	6	2	5
Requirement	6	10	15	4	35

Here O_i and D_j represent ith origin and jth destination.

PART IV

7 x 5 = 35

ANSWER ALL THE QUESTIONS

41) a) The marginal cost function of a commodity in a firm is $2 + e^{3x}$ where X is the output. Find the total cost and average cost function if the fixed cost is Rs. 500.

(OR)

b) Consider the problem of assigning five jobs to five persons. The assignment costs are given as follows. Determine the optimum assignment schedule.

		Job 1	2	3	4	5
Person	A	8	4	2	6	1
	B	0	9	5	5	4
	C	3	8	9	2	6
	D	4	3	1	0	3
	E	9	5	8	9	5

42) a)

Solve : x - y $\frac{dx}{dy} = a\left(x^2 + \frac{dx}{dy}\right)$

(OR)

b) An insurance company has discovered that only about 0.1 per cent of the population is involved in a certain type of accident each year. If its 10,000 policy holders were randomly selected from the population, what is the probability that not more than 5 of its clients are involved in such an accident next year? (e^{-10}=.000045)

43) a) The population of a certain town is as follows

Year : x	1941	1951	1961	1971	1981	1991
Population in lakhs:y	20	24	29	36	46	51

Using appropriate interpolation formula, estimate the population during the period 1946.

(OR)

b) The mean weekly sales of soap bars in departmental stores were 146.3 bars per store. After an advertising campaign the mean weekly sales in 400 stores for a typical week increased to 153.7 and showed a standard deviation of 17.2. Was the advertising campaign successful?

44) a) Solve by Cramer's rule x+y+z=4,2x−y+3z=1,3x+2y−z = 1

(OR)

b) Using integrals as limit of sums, evaluate $\int_2^4 (2x - 1)dx$

45) a) Solve: $x^2\frac{dy}{dx} = y^2+2xy$ given that y =1, when x=1

(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) Evaluate $\int \frac{3x^2+6x+1}{(x+3)\left(x^2+1\right)}dx$

(OR)

b) Consider a random variable X with probability density function f(x)={$4x^2$, *if* $0 < x < 10$, *otherwise*
Find E(X) and V(X)

47) a) The rate of new product is given by f (x) = 100 − 90 e^{-x} where x is the number of days the product is on the market. Find the total sale during the first four days. (e^{-4} = 0.018)

(OR)

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

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