**12TH BM MODEL PAPER 9** Date : 29-Nov-19

12th Standard

Business Maths

Reg.No. : | | | | | | |

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

PART I 20 x 1 = 20

ANSWER ALL

1) If $\rho(A)$ =r then which of the following is correct?

(a) all the minors of order r which does not vanish (b) A has at least one minor of order r which does not vanish (c) A has at least one (r+1) order minor which vanishes (d) all (r+1) and higher order minors should not vanish

2) If the number of variables in a non- homogeneous system AX = B is n, then the system possesses a unique solution only when

(a) $\rho(A) = \rho(A, B) > n$ (b) $\rho(A) = \rho(A, B) < n$ (c) $\rho(A) = \rho(A, B) = n$ (d) none of these

3) $\int \frac{dx}{\sqrt{x^2-36}}$ is

(a) $\sqrt{x^2-36} + c$ (b) $\log\left|x + \sqrt{x^2-36}\right| + c$ (c) $\log\left|x - \sqrt{x^2-36}\right| + c$ (d) $log\left|x^2 + \sqrt{x^2-36}\right| + c$

4) 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

5) $\int (x-1)e^{-x}$ dx = _____ +c

(a) $-xe^x$ (b) $xe^x$ (c) $-xe^{-x}$ (d) $xe^{-x}$

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) For a demand function p, if $\int \frac{dp}{p}$ = k $\int \frac{dx}{x}$ then k is equal to

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

8) The value of $\int_{-3}^{2} |x+1|\,dx$ is_____.

(a) 4 (b) $\frac{1}{4}$ (c) 8 (d) 2

9) If y=cx + c– $c^3$ then its differential equation is

(a) $y = \frac{dy}{dx} + \frac{dy}{dx} - \left(\frac{dy}{dx}\right)^3$ (b) $y = \left(\frac{dy}{dx}\right)^3 = x\frac{dy}{dx} - \frac{dy}{dx}$ (c) $\frac{dy}{dx} + y = \left(\frac{dy}{dx}\right)^3 - x\frac{dy}{dx}$ (d) $\frac{d^3y}{dx^3} = 0$

10) The differential equation of all circles with centre at the origin is

(a) xdy +ydx = 0 (b) xdy - ydx = 0 (c) xdx + ydy = 0 (d) xdx - ydy = 0

11) 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.

12) A listing of all the outcomes of an experiment and the probability associated with each outcome is called

(a) probability distribution (b) probability density function (c) attributes (d) distribution function

13) The probability density function p(x) cannot exceed

(a) zero (b) one (c) mean (d) infinity

14) A manufacturer produces switches and experiences that 2 per cent switches are defective. The probability that in a box of 50 switches, there are atmost two defective is :

(a) $2.5\ e^{-1}$ (b) $e^{-1}$ (c) $2e^{-1}$ (d) none of the above

15) 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

16) Errors in sampling are of

(a) Two types (b) three types (c) four types (d) five types

17) The standard error of sample mean is

(a) $\frac{\sigma}{\sqrt{2n}}$ (b) $\frac{\sigma}{n}$ (c) $\frac{\sigma}{\sqrt{n}}$ (d) $\frac{\sigma^2}{\sqrt{n}}$

18) Another name of consumer's price index number is:

(a) Whole-sale price index number (b) Cost of living index (c) Sensitive (d) Composite

19) The terms prosperity, recession, depression and recovery are in particular attached to

(a) Secular trend (b) Seasonal fluctuation! (c) Cyclic movements (d) irregular variation

20) Number of basic allocation in any row or column in an assignment problem can be

(a) Exactly one (b) at least one (c) at most one (d) none of these

PART II 7 x 2 = 14

ANSWER ANY SIX QUESTIONS AND QUESTION NUMBER 30 IS COMPULSORY.

21) Solve the following equation by using Cramer's rule

$5x + 3y = 17$; $3x + 7y = 31$

22) Integrate the following with respect to x. $\frac{8x+13}{\sqrt{4x+7}}$

23) Using second fundamental theorem, evaluate the following:

$\int_1^e \frac{dx}{x(1+\log x)^3}$

24) A firm's marginal revenue function is $MR = 20e^{-x/10}\left(1 - \frac{x}{10}\right)$. Find the corresponding demand function.

25) Find the area of the region bounded by the curve between the parabola $y = 8x^2 - 4x + 6$ the y-axis and the ordinate at $x = 2$.

26) Solve the following differential equations $(4D^2 + 16D + 15)y = 4e^{-\frac{3}{2}x}$

27) Using interpolation estimate the output of a factory in 1986 from the following data

| Year | 1974 | 1978 | 1982 | 1990 |
|---|---|---|---|---|
| Output in 1000 tones | 25 | 60 | 80 | 170 |

28) If $f(x) = e^{ax}$ then show that $f(0), \Delta(0), \Delta^2$ are in G.P

29) Find the expected value for the random variable of an unbiased die

30) A pair of dice is thrown 4 times. If getting a doublet is considered a success, find the probability of 2 successes.

PART II 7 x 3 =21

ANSWER ANY SIX QUESTIONS AND QUESTION NUMBER 0 IS COMPULSORY.

31) Find k, if the equations $x+2y-3z = -2, 3x-y-2z=1, 2x+3y-5z=k$ are consistent.

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

33) Determine the cost of producing 3000 units of commodity if the marginal cost in rupees per unit is $C'(x)=\frac{x}{3000} + 2.50$

34) If the marginal cost of producing x shoes is given by $(3xy + y^2)dx + (x^2 + xy)dy = 0$ and the total cost of producing a pair of shoes is given by Rs. 12. Then find the total cost function.

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

36) Alpha particles are emitted by a radio active source at an average rate of 5 in a 20 minutes interval. Using Poisson distribution find the probability that there will be atleast 2 emission in a particular 20 minutes interval ($e^{-5} = 0.0067$).

37) The standard deviation of a sample of size 50 is 6.3. Determine the standard error whose population standard deviation is 6?

38) A random sample of marks in mathematics secured by 50 students out of 200 students showed a mean of 75 and a standard deviation of 10. Find the 95% confidence limits for the estimate of their mean marks.

39) The following data gives readings of 10 samples of size 6 each in the production of a certain product. Draw control chart for mean and range with its control limits.

| Sample | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|---|
| Mean | 383 | 508 | 505 | 582 | 557 | 337 | 514 | 614 | 707 | 753 |
| Range | 95 | 128 | 100 | 91 | 68 | 65 | 148 | 28 | 37 | 80 |

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

| Ware houses | Stores | | | | |
|---|---|---|---|---|---|
| | I | II | III | IV | Availability ($a_i$) |
| $A$ | 5 | 1 | 3 | 3 | 34 |
| $B$ | 3 | 3 | 5 | 4 | 15 |
| $C$ | 6 | 4 | 4 | 3 | 12 |
| $D$ | 4 | 1 | 4 | 5 | 19 |
| Requirement ($b_j$) | 21 | 25 | 17 | 17 | |

PART IV 7 x 5 = 35

ANSWER ALL

41) a) Construct Fisher's price index number and prove that it satisfies both Time Reversal Test and Factor Reversal Test for data following data.

| Commodities | Base Year | | Current Year | |
|---|---|---|---|---|
| | Price | Quantity | Price | Quantity |
| Rice | 40 | 5 | 48 | 4 |
| Wheat | 45 | 2 | 42 | 3 |
| Rent | 90 | 4 | 95 | 6 |
| Fuel | 85 | 3 | 80 | 2 |
| Transport | 50 | 5 | 65 | 8 |
| Miscellaneous | 65 | 1 | 72 | 3 |

**(OR)**

b) 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 |

42) a) 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?

**(OR)**

b) Measurements of the weights of a random sample of 200 ball bearings made by certain machine during one week showed a mean of 0.824 newtons and a S.D. of 0.042 newton's. Find a) 95% and b) 99% confidence limits for the mean weight of all the ball bearings.

43) a)

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.

**(OR)**

b) From the following table of half- yearly premium for policies maturing at different ages. Estimate the premium for policies maturing at the age of 63.

| Age | 45 | 50 | 55 | 60 | 65 |
|---|---|---|---|---|---|
| Premium | 114.84 | 96.16 | 83.32 | 74.48 | 63.48 |

44) a) 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.

**(OR)**

b) Marks in an aptitude test given to 800 students of a school was found to be normally distributed 10% of the students scored below 40 marks and 10% of the students scored above 90 marks. Find the number of students scored between 40 and 90?

45) a) The demand and supply curves are given by $P_d = \frac{16}{x+4}$ and $P_s = \frac{x}{2}$ . Find the Consumer's surplus and producer's surplus at the market equilibrium price.

**(OR)**

b) From the following table, estimate the premium for a policy maturing at the age of 58.

| Age (x) | 40 | 45 | 50 | 55 | 60 |
|---|---|---|---|---|---|
| Premium (y) | 114.84 | 96.16 | 83.32 | 74.48 | 68.48 |

46) a) Evaluate $\int_1^4 f(x)dx$ , where $\begin{cases} 7x + 3, if 1 \le x \le 3 \\ 8x, if 3 \le x \le 4 \end{cases}$

**(OR)**

b) The marginal cost and marginal revenue with respect to commodity of a firm are given by C'(x) = 8 + 6x and R'(x)= 24. Find the total Profit given that the total cost at zero output is zero.

47) a) Evaluate $\int_1^2 \frac{1}{(x+1)(x+2)} dx$

**(OR)**

b) Sketch the graph of y = Ix - 5|. Evaluate $\int_0^1 |4x - 5| \, dx$

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