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12BM HALF YEARLY MODEL PAPER 2 Date : 21-Oct-19

12th Standard

Business Maths

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

Exam Time : 02:30:00 Hrs Total Marks : 90

20 x 1 = 20

1) The rank of m×n matrix whose elements are unity is

(a) 0 (b) 1 (c) m (d) n

2) if $|A| \neq 0$, then A is

(a) non- singular matrix (b) singular matrix (c) zero matrix (d) none of these

3) $\int \frac{sin5x-sinx}{cos3x}$ dx

(a) −cos2x + c (b) −cos2x + c (c) $-\frac{1}{4}$ cos2x c (d) −4cos2x + c

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

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

5) $\int e^x$ f(x) + f' (x) dx = _____ +c

(a) e^x f(x) (b) e^x + f(x) (c) $2e^x$ f(x) (d) e^x - f(x)

6) Area bounded by the curve $y = e^{-2x}$ between the limits $0 \leq x \leq \infty$ is

(a) 1 sq.units (b) $\frac{1}{2}$ sq.unit (c) 5 sq.units (d) 2 sq.units

7) When $x_0 = 2$ and $P_0 = 12$ the producer's surplus for the supply function $P_s = 2x^2 + 4$ is

(a) $\frac{31}{5}$ units (b) $\frac{31}{2}$ units (c) $\frac{32}{3}$ units (d) $\frac{30}{7}$ units

8) 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) $\frac{d^3y}{dx^3}=0$

9) 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

10) E f (x)=

(a) f(x− h) (b) f (x) (c) f(x+ h) (d) f(x+ 2h)

11) For the given data find the value of $\Delta^3 y_0$ is

x	5	6	9	11
y	12	13	15	18

(a) 1 (b) 0 (c) 2 (d) -1

12) If X is a discrete random variable and p x ( ) is the probability of X , then the expected value of this random variable is equal to

(a) $\sum f(x)$ (b) $\sum [x + f(x)]$ (c) $\sum f(x) + x$ (d) $\sum xp(x)$

13) A probability density function may be represented by:

(a) table (b) table (c) mathematical equation (d) both (b) and (c)

14) The height of persons in a country is a random variable of the type

(a) discrete random variable (b) continuous random variable (c) both (a) and (b) (d) neither (a) nor (b)

15) If X ~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) $Z=\frac{9-X}{9}$

16) Cape town is estimated to have 21% of homes whose owners subscribe to the satelite service, DSTV. If a random sample of your home in taken, what is the probability that all four home subscribe to DSTV?

(a) 0.2100 (b) 0.5000 (c) 0.8791 (d) 0.0019

17) Let z be a standard normal variable. If the area to the right of z is 0.8413, then the value of z must be:

(a) 1.00 (b) -1.00 (c) 0.00 (d) -0.41

18) Errors in sampling are of

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

19) The component of a time series attached to long term variation is trended as

(a) Cyclic variation (b) Secular variations (c) Irregular variation (d) Seasonal variations

20) The Penalty in VAM represents difference between the first _____

(a) Two largest costs (b) Largest and Smallest costs (c) Smallest two costs (d) None of these

ANY 7 7 x 2 = 14

21) A total of Rs 8,600 was invested in two accounts. One account earned $4\frac{3}{4}$ % annual interest and the other earned $6\frac{1}{2}$ % annual interest. If the total interest for one year was Rs 431.25, how much was invested in each account? (Use determinant method).

22) If f ' (x) = $8x^3 - 2x$ and f (2)= 8, then find f (x)

23) The marginal cost function of a product is given by $\frac{dC}{dx} = 100 - 10x + 0.1x^2$ where x is the output. Obtain the total and the average cost function of the firm under the assumption, that its fixed cost is Rs. 500.

24) Solve the following differential equations

$(D^2+2D+3)y = 0$

25) Find the missing entry in the following table

x	0	1	2	3	4
y_x	1	3	9	-	81

26) The length of time (in minutes) that a certain person speaks on the telephone is found to be random phenomenon, with a probability function specified by the probability density function f(x) as f(x)=$\{Ae^{-x/5}, \quad for \quad x \geq 0$
$0 \quad , \quad otherwise$

27) Consider a random variable X with p.d.f

f(x)=$\{3x^2, \quad if 0 < x < 1$
$0, \quad otherwise$

Find E(X) and V(3X-2)

28) State any three merits of stratified random sampling.

29) Find the trend of production by the method of a five-yearly period of moving average for the following data:

Year	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
Production('000)	126	123	117	128	125	124	130	114	122	129	118	123

30) Write mathematical form of transportation problem.

ANY 7 7 X 3 = 21

31) Akash bats according to the following traits. If he makes a hit (S), there is a 25% chance that he will make a hit his next time at bat. If he fails to hit (F), there is a 35% chance that he will make a hit his next time at bat. Find the transition probability matrix for the data and determine Akash's long- range batting average.

32) Evaluate $\int x^3 \log x \, dx$

33) Find the area bounded by y = 4x + 3 with x- axis between the lines x = 1 and x = 4

34) Find the differential equation of the family of curves $y = e^x (a\cos x + b\sin x)$ where a and b are arbitrary constants.

35) Find the differential equation of the family of straight lines y=mx + c when

(i) m is the arbitrary constant

(ii) c is the arbitrary constant

(iii) m and c both are arbitrary constants.

36) Construct a forward difference table for $y = f(x) = x^3+2x+1$ for x = 1,2,3,4,5

37)

Construct the distribution function for the discrete random variable X whose probability distribution is given below. Also draw a graph of p(x) and F(x).

X = x	1	2	3	4	5	6	7
P(x)	0.10	0.12	0.20	0.30	0.15	0.08	0.05

38) The marks obtained in a certain exam follow normal distribution with mean 45 and SD 10. If 1,300 students appeared at the examination, calculate the number of students scoring

(i) less than 35 marks and

(ii) more than 65 marks.

39) The following data gives the readings for 8 samples of size 6 each in the production of a certain product. Find the control limits using mean chart.

Sample	1	2	3	4	5	6
Mean	300	342	351	319	326	333
Range	25	37	20	28	30	22

Given for n = 6, $A_2 = 0.483$,

40) Consider the following pay-off (profit) matrix Action States

Action	States			
	(s_1)	(s_2)	(s_3)	(s_4)
A_1	5	10	18	25
A_2	8	7	8	23
A_3	21	18	12	21
A_4	30	22	19	15

Determine best action using maximin principle.

ANY 7 7 X 3 = 35

41) a) An automobile company uses three types of Steel S_1, S_2 and S_3 for providing three different types of Cars C_1, C_2 and C_3. Steel requirement R (in tonnes) for each type of car and total available steel of all the three types are summarized in the following table.

Types of Steel	Types of Car			Total Steel available
	C_1	C_2	C_3	
S_1	3	2	1	28
S_2	1	1	2	13
S_3	2	2	2	14

Determine the number of Cars of each type which can be produced by Cramer's rule.

(OR)

b) The elasticity of demand with respect to price p for a commodity is $\eta_d = \frac{p+2p^2}{100-p-p^2}$. Find demand function where price is Rs. 5 and the demand is 70.

42) a) Solve $(x2 + 1)\frac{dy}{dx} + 2xy = 4x^2$

(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

43) a) Determine the mean and variance of a discrete random variable, given its distribution as follows.

X=x	1	2	3	4	5	6
$F_x(x)$	$\frac{1}{6}$	$\frac{2}{6}$	$\frac{3}{6}$	$\frac{4}{6}$	$\frac{5}{6}$	1

(OR)

b) A manufacturer of ball pens claims that a certain pen he manufactures has a mean writing life of 400 pages with a standard deviation of 20 pages. A purchasing agent selects a sample of 100 pens and puts them for test. The mean writing life for the sample was 390 pages. Should the purchasing agent reject the manufactures claim at 1% level?

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

(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

45) a) Using determinants, find the quadratic defined by fix) = $ax^2 + bx + c$ if f(1) = 0,f(2) = - 2 and f(3) = -6.

(OR)

b) The probability density function of a random variable X is

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

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

46) a) Evaluate $\int e^{2x}\left[\frac{2x-1}{4x^2}\right]$ dx

(OR)

b) Calculate Fisher's price index number and show that it satisfies both Time Reversal Test and Factor Reversal Test for data given below.

Commodities	Price		Quandity	
	2003	2009	2003	2009
Rice	10	13	4	6
Wheat	125	18	7	8
Rent	25	29	5	9
Fuel	2511	14	8	10
Miscellaneous	14	17	6	7

47) 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) 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.

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