Total No. of Questions: 6 *Total No. of Printed Pages:3*

Enrollment No.....

Faculty of Management Studies

End Sem Examination Dec 2024

MS5CO21 Statistics for Decision Making

Programme: MBA Branch/Specialisation: Management

Duration: 3 Hrs. **Maximum Marks: 60**

Note: All questions are compulsory. Internal choices, if any, are indicated. Answers of Q.1 (MCQs) should be written in full instead of only a, b, c or d. Assume suitable data if necessary. Notations and symbols have their usual meaning.

			Marks	BL	PO	CO	PSO
Q.1	i.	A function f (x) is said to be continuous at x=a, if: (a) LHL≠RHL≠f(a) (b) LHL = RHL = f(a) (c) LHL= f (a) (d) None of these	**1**	2	1	1	
	ii.	If f(-x) = f (x) then function f (x) is called: (a) Even function (b) Odd function (c) Linear function (d) None of these	**1**	2	1	1	
	iii.	The value of $\frac{d}{dx}x^2$ is: (a) 2x (b) x (c) 3x (d) None of these	**1**	2	1	1	
	iv.	The value of integral $\int e^x\,dx$ is: (a) x + c (b) e^x + c (c) e + c (d) None of these	**1**	2	1	1	
	v.	What is the first stage in statistics? (a) Representation of data (b) Collection of data (c) Analysis of data (d) None of these	**1**	2	1	1	
	vi.	In statistics, a population consists of: (a) All People living in a country (b) All People living in the area under study (c) All subjects or objects whose characteristics are being studied (d) None of these	**1**	2	1	1	

P.T.O.

vii.	In a Binomial Distribution, if p, q and n are probability of success, failure and number of trials respectively then it's variance is given by: (a) np (b) npq (c) np^2q (d) None of these	**1**	2	1	1		
viii.	If 2 coins are tossed then total number of outcomes in a sample space are: (a) 4 (b) 2 (c) 6 (d) None of these	**1**	2	1	1		
ix.	The additive model for the time series is Y = (a) T + S + C + I (b) T*S*C*I (c) TS*C + I (d) None of these	**1**	2	1	1		
x.	Factors responsible for seasonal variations are: (a) Weather (b) Social customs (c) Festivals (d) All of these	**1**	2	1	1		
Q.2 i.	Define following functions with example: (a) Linear Function (b) Quadratic Function	**2**	2	1, 12	1		
ii.	Evaluate : $\lim_{x\to 7}\frac{x^2-49}{x-7}$	**3**	3	1	2		
iii.	A watch company is to produce a cheaper variety of wrist watches. It involves initially a fixed cost Rs. 2.25 lacs and variable cost is of Rs. 175 for each wrist watch. If each watch be sold at Rs. 600, then find: (a) Cost function (b) Revenue function (c) Profit function (d) Break-even point	**5**	3	1, 12	3		
OR iv.	Discuss the continuity of the following function at x = 2 $f(x)=\begin{cases}2-x, & x<2\\ 2+x, & x\geq 2\end{cases}$	**5**	3	1, 12	3		
Q.3 i.	Discuss the applications of differentiation in economic and managerial problems.	**4**	2	1, 12	1		
ii.	Find differentiation of the following with respect to x: (a) $e^x(x^3+1)$ (b) $x^4+7x^3+8x^2+3x+2$	**6**	3	1, 12	3		

OR iii.	Evaluate the following: (a) $\int(3x^2+4x+5)dx$ (b) $\int(2x^{3/4}+\frac{1}{x}-e^x)dx$	**6**	3	1, 12	3		
Q.4 i.	Define population and sample with example.	**4**	2	1, 12	1		
ii.	Write any four applications of statistics in managerial decision making.	**6**	2	1, 12	1		
OR iii.	What is descriptive statistics? Explain any three limitations of statistics in brief.	**6**	2	1, 12	1		
Q.5 i.	Define probability and write its formula.	**2**	2	1, 12	1		
ii.	Write any three characteristics of normal distribution.	**3**	2	1, 12	1		
iii.	Ten coins are tossed simultaneously. Using binomial distribution find the probability of getting (a) Atleast seven heads (b) Exactly seven heads	**5**	3	1, 12	3		
OR iv.	A card is drawn from a peck of 52 cards. Find the probability that the card is a - (a) Diamond or a king (b) King or a red card	**5**	3	1, 12	3		
Q.6 i.	What are the components of time series?	**2**	2	1, 12	1		
ii.	Calculate 3-yearly moving average from the following data:	**3**	4	1, 12	4		

Year	1970	1975	1980	1985	1990	1995	2000
Sales	80	90	70	60	110	50	40

iii.	Calculate seasonal indices for each quarter by using simple average method for the following data:	**5**	4	1, 12	4		

Year	Quarter			
	I	II	III	IV
2004	210	255	270	300
2005	225	275	280	315
2006	305	310	325	350
2007	400	415	420	425

OR iv.	Fit a trend line to the following data by using least square method and estimate production in 1995:	**5**	4	1, 12	4		

Year	1985	1987	1989	1991	1993
Production	18	21	23	27	16

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Faculty of Management Studies
End Sem Exam Dec 2024.
Course Name : Statistics for Decision making
Course Code : MSS C021
Program MBA

Marks

Q1 (i) (b) LHL = RHL = f(a) 1
(ii) (a) Even function 1
(iii) (a) $2x$ 1
(iv) (b) $e^x + c$ 1
(v) (b) Collection of Data 1
(vi) (c) All subjects or objects whose characteristics are being studied. 1
(vii) (b) nPq 1
(viii) (a) 4 1
(ix) (a) T + S + C + I 1
(x) (a) All of these 1

Q2 (i) (a) Linear function: A polynomial function of degree one is called linear function
$y = ax + b$ a, b real $a \neq 0$
graph of linear function is always a straight line +1
(b) Quadratic function: A polynomial function of degree 2 is called quadratic function.
A general quadratic function is expressed in the form
$f(x) = ax^2 + bx + c$ +1
graph is parabolic curve.

(ii) $\lim_{x \to 7} \frac{x^2 - 49}{x - 7} = \lim_{x \to 7} \frac{(x-7)(x+7)}{(x-7)} = 14$ +3

(iii) (a) Cost function = fixed cost + Variable cost +1
$C(x) = 25000 + 175x$ +1

(b) Revenue function $R(x) = 600x$ +1

(c) Profit function $P(x) = R(x) - C(x)$ +1

$600x - \{175x + 225000\}$

$P(x) = 425x - 225000$

(d) Break even point $P(x) = 0$ or $R(x) = C(x)$ +1

$425x = 225000$

$x = 530 \approx (529.411)$

Q2 (iv) Continuity at $x = 2$ Condition LHL = RHL = f(2) +1

when $x < 2$ i.e $f(x) = 2x$

$L.H.L = \lim_{h \to 0} f(2-h)$

$= \lim_{h \to 0} 2(2-h) = 0$

when $x > 2$ $f(x) = 2 + x$ +2

$RHL \lim_{h \to 0} 2 + (2+h) = 4$

Since $L.H.L \neq RHL$ +2

given $f(x)$ is not continuous at $x = 2$

Q3 (i) App^n of differentiation in economic and managerial problems.

The calculus is indispensable tool in business and economics, widely used in production and operations management, financial management +1

In economics we study the concept of marginal cost, marginal revenue, marginal propensity to consumes (MPC), marginal propensity to save (MPS), rate of growth, elasticity of demand, cost elasticity, total tax yield, effect of tax on price, National incomes. Consumption and saving model. +2

In production and operations management we study the concept of inventory model, Dynamic Programming, Shortest route allocations and in many optimization techniques with the help of differentiation. +2

Q3...

(ii) (a) $y = e^x (x^3+1)$

$\frac{dy}{dx} = e^x (3x^2) + (x^3+1) e^x$ +1

$= 3e^x x^2 + e^x (x^3+1)$ +1

$= e^x [3x^2 + x^3 + 1]$ +1

Q3

(iii) (b) $y = x^4 + 7x^3 + 8x^2 + 3x + 2$ +3

$\frac{dy}{dx} = 4x^3 + 21x^2 + 16x + 3.$

Q3...

(iii)

(a) $\int (3x^2 + 4x + 5)\, dx$

$\frac{3x^3}{3} + \frac{4x^2}{2} + 5x + c$ +2

$= x^3 + 2x^2 + 5x + c$ +1

(b) $\int \left(2x^{3/4} + \frac{1}{x} - e^x\right) dx$

$2 \cdot \frac{x^{\frac{3}{4}+1}}{\frac{7}{4}} + \log x - e^x + c$ +2

$\frac{8}{7} x^{7/4} + \log x - e^x + c$ +1

Q4 (i) Population:-
All subjects or objects whose characteristics are being studied. The It is a set of similar items / unit which is of interest for some question or experiment. Population may be finite, infinite, hypothetical. +2

Sample:- Sample is part or subset of population. It should be real, existent finite. +2

Ex 5 student among 5000 student.
A group of 10 plants from 200 plants.

Q4 (ii) four applications of statistics in managerial decision making.
Statistics guides us in formulating policies in social, economic, business sphere, import-export policies, price policy and many other policies of great economic importance are decided in view of result of the analysis of data collected. +2
Elaboration of above point with two line each topic +2

Q4 (iii) Descriptive Statistics:
In Descriptive Statistics we are describing our data with the help of various representative methods using charts, graphs, tables etc. Some measures that are used to describe a data set are measures of central tendency and measures of variability +3

three limitation
1) It does not study qualitative data like honesty, beauty +1

2. It does not study individual measurement A single or isolate figure cannot be regarded as Statistic. +1

3. Only Experienced Statisticians can make use of statistical methods. +1

Q5 (i) Probability – It is a numerical measure of uncertainty. range $0 \leq P \leq 1$ +1

$$P(A) = \frac{m}{n} = \frac{\text{number of favourable cases.}}{\text{Total number of Cases.}}$$ +1

$P(A) + P(\bar{A}) = 1$ $P(A)$ = happening of an event

$P(\bar{A})$ = not happening of an event

Q5 (ii) (Any three) characteristic of Normal dist^n.

(1) The Normal curve is symmetrical about the mean.
(2) curve is bell shaped. +1
(3) The mean, median and mode of the dist^n coincide
(4) The mean deviation is $\frac{4}{5}\sigma$ +1
(5) x-axis is an asymptotes to the curve +1
(6) The height of Normal curve is maximum at mean.

Q5 (iii) (a) $P(x \geq 7)$ $n = 10$

$p, q = \frac{1}{2}, \frac{1}{2}$

$= P(x=7) + P(x=8) + P(x=9) + P(x=10)$ +1

$= \left[P(x) = {}^{n}C_x \, p^x \, q^{n-x}, \; x = 0, 1, 2, \ldots 10 \right]$ +1

(c)

$P(x=7) + P(x=8) + P(x=9) + P(x=10)$

$${}^{10}C_7\left(\frac{1}{2}\right)^7\left(\frac{1}{2}\right)^3 + {}^{10}C_8\left(\frac{1}{2}\right)^8\left(\frac{1}{2}\right)^2 + {}^{10}C_9\left(\frac{1}{2}\right)^9\left(\frac{1}{2}\right)^1 + {}^{10}C_{10}\left(\frac{1}{2}\right)^{10}$$

$${}^{10}C_3\left(\frac{1}{2}\right)^{10} + {}^{10}C_2\left(\frac{1}{2}\right)^{10} + 10\left(\frac{1}{2}\right)^{10} + \left(\frac{1}{2}\right)^{10}$$

$$\left(\frac{1}{2^{10}}\right)\left[\frac{10.9.8}{3.2.1} + \frac{10.9}{2.1} + 10 + 1\right]$$

$$\frac{1}{2^{10}}(120 + 45 + 11) = \frac{1}{1089} = \frac{176}{1024} = \frac{11}{64} \quad +1$$

(b) $P(x=7)$ $P(x) = {}^nC_x\, p^x q^{n-x}$; $x = 0, 1, 2, 10$ $+1$

$$= {}^{10}C_7\left(\frac{1}{2}\right)^7\left(\frac{1}{2}\right)^3 = 120 \times \frac{1}{2^{10}} = \frac{120}{1024} = \frac{15}{128} \quad +1$$

5(a)(iv)

(a) A → diamond

B → king

$P(A \cup B) = P(A) + P(B) - P(A \cap B)$

$$= \frac{13}{52} + \frac{4}{52} - \frac{1}{52}$$

$$= \frac{17}{52} - \frac{1}{52} = \frac{16}{52} = \frac{4}{13} \quad +3$$

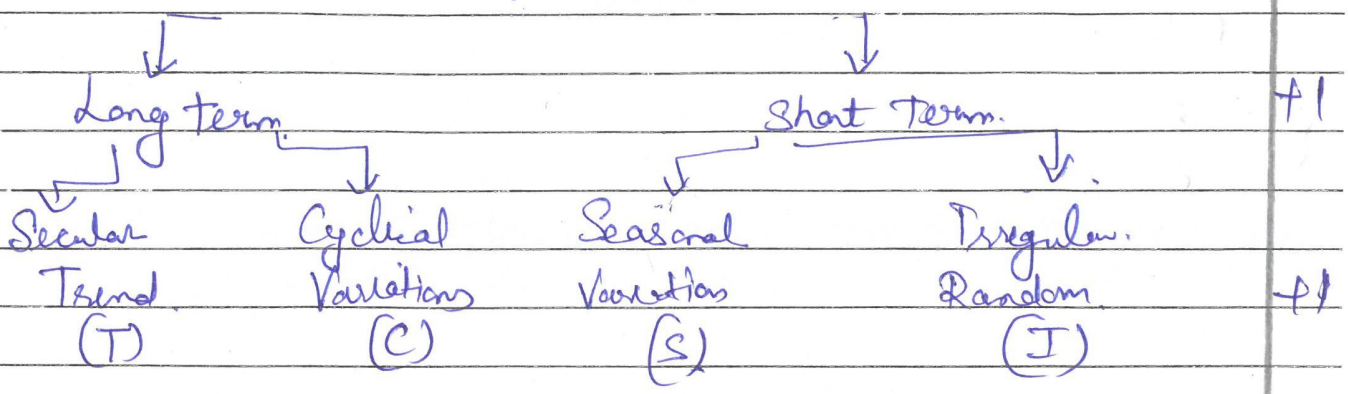
(b) A → king B → Red

$P(A \cup B) = P(A) + P(B) - P(A \cap B)$ $+2$

$$= \frac{4}{52} + \frac{26}{52} - \frac{2}{52} = \frac{28}{52} = \frac{7}{13}$$

Q6 (i) four component of Time series

Components of Time Series



+1

+1

Q6 (ii) 3 yearly moving average for:

Year.	Sales	3 year moving total	3-yearly. moving average
1970	80		
1975	90	80+90+70=240	80
1980	70	90+70+60=220	73.33
1985	60	70+60+110=240	80.
1990	110	60+110+50=220	73.33
1995	50	110+50+40=200	66.67
2000	40		

+1

+2

Q6 (iii) Computation of Seasonal indices

Year	Quarter			
	I	II	III	IV
2004	210	255	270	300
2005	225	275	280	315
2006	305	310	325	350
2007	400	415	420	425
Total	1140	1255	1295	1390
Average	285	313.75	323.75	347.5
Seasonal Index	89.76377	98.8188	101.968	109.448

+2

Seasonal Index has been calculated as follows.

Avg of qtly avg $= \frac{285 + 313.75 + 323.75 + 347.5}{4} = 317.50$ +1

Seasonal Index for I st qtr $= \frac{\text{Avg of I qtr}}{\text{Avg of qtly avg}} \times 100$

$= \frac{285}{317.50} \times 100 = 89.76377$

SI for II qtr $= \frac{313.75}{317.50} \times 100 = 98.818897$

S.I for III qtr $= \frac{323.75}{317.50} \times 100 = 101.9685$ +2

S.I of IV qtr $= \frac{347.50}{317.50} \times 100 = 109.4488189.$

6 (iv) Let st line be $y = a + bx$

Now Normal equation by least square method is given by

$$\Sigma y = na + b\Sigma x$$
$$\Sigma xy = a\Sigma x + b\Sigma x^2$$ +2

here $n = 5$

here we shift origin for time Let Year of origin 1989

prepare table for calculation

Year (t)	Production Y	$X = t - 1989$	$XX = X^2$	XY
1985	18	-4	16	-72
1987	21	-2	4	-42
1989	23	0	0	0
1991	27	2	4	54
1993	16	4	16	64
total	105	0	$\Sigma X^2 = 40$	$\Sigma XY = 4$

+2

as $\Sigma x = 0$

$$a = \frac{\Sigma y}{n} = \frac{105}{5} = 21$$

$$b = \frac{\Sigma XY}{\Sigma X^2} = \frac{4}{40} = 0.1$$

for $t = 1995$ $X = 1995 - 1989$

$X = 6$