

Enrollment No.....



Faculty of Commerce  
 End Sem (Odd) Examination Dec-2017  
 CM3CO08 Business Statistics  
 Programme: B.Com.(Hons) Branch/Specialisation: Commerce  
**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.

- |     |   |   |
|-----|---|---|
| Q.1 | i. Random Sampling is also known as   | 1 |
|     | (a) Probability Sampling      (b) Deliberate sampling   |   |
|     | (c) Cluster Sampling      (d) Census method   |   |
|     | ii. The data collected by investigator himself is called  | 1 |
|     | (a) Primary    (b) Secondary    (c) Both (a) and (b)    (d) None of these                         |   |
|     | iii. Algebraic sum of deviation from mean is  | 1 |
|     | (a) Negative      (b) Positive  |   |
|     | (c) 0      (d) Different for each cases   |   |
|     | iv. If arithmetic mean is 25 and standard deviation is 6.25 then coefficient of variation will be | 1 |
|     | (a) 50%    (b) 20%    (c) 25%    (d) 30%  |   |
|     | v. The limit of Karl Pearson's coefficient of Correlation is                                      | 1 |
|     | (a) $\pm 1$ (b) $\pm 2$ (c) $\pm 3$ (d) $\pm 4$   |   |
|     | vi. Two regression lines coincide if  | 1 |
|     | (a) $r=0$ (b) $r=1/2$ (c) $r=-1/2$ (d) $r=\pm 1$  |   |
|     | vii. Seasonal variation repeat during a period of   | 1 |
|     | (a) 5 years    (b) 1 year    (c) 7 years    (d) None of these                                     |   |
|     | viii. Moving average is method of   | 1 |
|     | (a) Correlation    (b) Regression    (c) Time Series    (d) None of these                         |   |
|     | ix. In the computation of price index number, the price of the base is assumed as                 | 1 |
|     | (a) 100    (b) 200    (c) 300    (d) 400  |   |
|     | x. Fisher's ideal index number satisfies  | 1 |
|     | (a) Time Reversal test only    (b) Factor Reversal test only                                      |   |
|     | (c) Time and Factor Reversal tests    (d) None of these   |   |

P.T.O.

[2]

Q.2

- i. Attempt any two:
- State a suitable definition of Statistics.Explain its characteristics and limitations.
  - Write in brief various methods of collecting statistical data (Primary)? Which of these is most reliable and why?
  - Explain various methods of statistical sampling.

5

Q.3

- i. Find out missing frequency in the following table if mean is 7.5.

x	3	5	7	9	11	13
f	6	8	15	?	8	4

- ii. Find standard deviation and its coefficient from the following data:

Age (in years)	5-7	8-10	11-13	14-16	17-19
Frequency	7	12	19	10	2

4

OR

- iii. Calculate the mode from the following distribution:

Size (x)	4	5	6	7	8	9	10	11	12	13
Frequency	2	5	8	9	12	14	14	15	11	13

6

Q.4

- i. Explain the concept of regression.How does it differ from correlation?
- ii. Calculate the number of items for which  $r=+0.8$ ,  $\sum xy=200$ , standard deviation of  $y=5$  and,  $\sum x^2=100$  where  $x$  and  $y$  denotes deviation of items from actual mean.(where  $\sum x = 0 = \sum y$ )

4

OR

- iii. A research found the following data

Age	5	6	7	8	9	10	11
Weight	30	40	42	48	50	51	52

6

Q.5

- i. What is Time Series? Describe its components.
- ii. Given below are the figures of production of a sugar factory:

4

6

Year	95	96	97	98	99	2000	2001
Production (in '000tons)	40	45	46	42	47	49	46

Fit a straight line trend by method of least squares and estimate its value for 2004.

[3]

OR

- iii. Calculate 3-yearly moving average of production in given figure and draw the trend:

Years	96	97	98	99	2000
Production	21	30	36	42	46
Years	2001	02	03	04	05
Production	50	56	63	70	74

6

Q.6

- i. Define index number.Write its characteristics.

- ii. Construct index number by using Fisher's Formula

Commodities	VALUE In Rs		Base year	Current year
	Base Year	Current year		
A	300	560	50	10
B	200	240	100	2
C	240	360	60	6
D	300	288	30	12
E	320	432	40	12

4

OR

- iii. From the following data prepare a price index number for 1995 based upon 1990 by weighted aggregative method:

Items	Weight	Price	
		1990	1995
A	40	16	20.00
B	25	40	60.00
C	5	0.50	0.50
D	20	5.12	6.25
E	10	2.00	1.50

6

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(1)

# Faculty of Commerce

END SEM (ODD) Examination Dec-2017

CM3C008 BUSINESS STATISTICS

Programme : B.Com (Hons)

Max. Mark : 60

## Answer-1

(i)	(a) Probability Sampling	+1
(ii)	(a) Primary	+1
(iii)	(c) 0	+1
(iv)	(c) 25%	+1
V)	(a) $\pm 1$	+1
vi)	(a) $r=0$	+1
vii)	(b) 1 year	+1
viii)	(c) Time-series	+1
ix)	(a) 100	+1
x)	(c) Time and Factor Reversal tests	+1

12. Attempt any two

- (i) For Definition +1 mark  
 At least four characteristics +2 marks  
 At least four limitations +2 marks +5
- (ii) For each method gives +1 mark  
 (At least five methods) +5
- (iii) At least five methods +1 marks for each + 5

(2)

Q.3

(i)

x	f	$fx$
3	6	18
5	8	40
7	15	105
9	a	9a
11	8	88
13	4	52

$$\sum f = 41+a \quad \sum fx = 303 + 9a$$

+2

$$\bar{x} = \frac{\sum fx}{\sum f}$$

+1

$$\bar{x} = \frac{303 + 9a}{41 + a}$$

$$4.5 = 1.5a$$

$$a = 3$$

so missing frequency  
is 3.

+1

(ii)

Class	f	mid-value	$d = x - 12$	$fd$	$fd^2$	$fd^3$
5-7	7	6	-6	-42	36	252
8-10	12	9	-3	-36	9	108
11-13	19	12	0	0	0	0
14-16	10	15	3	30	9	90
17-19	2	18	6	12	36	72
	$\sum f = 50$			$\sum fd = -36$		$\sum fd^2 = 522$
	= N					

+2

W.K.T.

S.D. by shortcut method

$$S.D. = \sigma = \sqrt{\frac{\sum fd^2}{\sum f} - \left(\frac{\sum fd}{\sum f}\right)^2}$$

+1

$$S.D. = \sigma = \sqrt{\frac{522}{50} - \left(\frac{-36}{50}\right)^2}$$

$$S.D. = \sqrt{10.44 - 0.5184} = \sqrt{9.9216}$$

$$S.D. = 3.14 \quad \text{Ans}$$

Now, mean,  $\bar{x} = A + \frac{\sum fd}{\sum f}$

$$\bar{x} = 12 + \frac{(-36)}{50}$$

$$\bar{x} = 12 - 0.72$$

$$\boxed{\bar{x} = 11.28}$$

Coefficient of variation, C.V. =  $\frac{S.D.}{\text{mean}} \times 100$

$$C.V. = \frac{3.14}{11.28} \times 100$$

$$\boxed{C.V. = 27.83}$$

Ans

+1

+1

Q.3  
 iii) Here difference between maximum and second maximum frequency is minimum so we use grouping method.

x	f(I)	II	III	IV	V	VI
4	2	7		15		
5	5		13			
6	8				22	
7	9	17	.	35		29
8	12	26	21			
9	14				40	
10	16	(29)	(28)	(40)	.	(43)
11	(15)					
12	11	24	26		39	
13	13					

+3

(4)

Analysis Table

Column No.	frequency maximum	value or combination of values
I	15	11
II	29	10, 11
III	28	9, 10
IV	40	10, 11, 12
V	40	8, 9, 10
VI	43	9, 10, 11

Value 10 is repeated maximum no. of times i.e. 5 (max. frequency).

So mode = 10

+2

+1

Q.4

(i)

For Concept +1 mark

For three Difference +1 mark for each difference. (total +3) +4

(ii)

W.b.T.

$$\gamma = \frac{\sum xy}{\sqrt{\sum x^2 \times \sum y^2}} \quad \text{where } x = x - \bar{x} \quad y = y - \bar{y}$$

+1

or

$$\gamma = \frac{\sum (x-\bar{x})(y-\bar{y})}{\sqrt{\sum (x-\bar{x})^2 \times \sum (y-\bar{y})^2}}$$

+1

$$0.8 = \frac{200}{\sqrt{16 \times 25}} \quad (\because \sigma_y = 5) +2$$

$$0.64 = \frac{40000}{\sum (x-\bar{x})^2 \times 25}$$

$$n = \frac{400}{16}$$

$$16 \sum (x-\bar{x})^2 = 40000$$

$$16 [100n] = 40000$$

$$n = 25 \quad \underline{+2}$$

P.Y.  
III)

(a) w.k.t.

$$b_{xy} = \frac{n \sum uv - \sum u \sum v}{n \sum v^2 - (\sum v)^2}$$

$$b_{yx} = \frac{n \sum uv - \sum u \sum v}{n \sum u^2 - (\sum u)^2}$$

$x$ (Age)	$y$ (weight)	$u = x - 8$	$v = y - 48$	$u^2$	$v^2$	$uv$
5	30	-3	-18	9	324	-54
6	40	-2	-8	4	64	16
7	42	-1	-6	1	36	6
8	48	0	0	0	0	0
9	50	1	2	1	4	2
10	51	2	3	4	9	6
11	52	3	4	9	16	12
$\sum x = 56$		$\sum y = 313$	$\sum u = 0$	$\sum v = -23$	$\sum u^2 = 28$	$\sum v^2 = 453$
						$\sum uv = 96$

Put this value in eqn ①

$$b_{xy} = \frac{7(96) - 0(-23)}{7(453) - (-23)^2}$$

$$b_{xy} = \frac{672}{3171 - 529} = \frac{672}{2642}$$

$$\boxed{b_{xy} = 0.25}$$

+1

$$b_{yx} = \frac{7(96) - 0(-23)}{7(28) - 0}$$

$$b_{yx} = \frac{672}{196}$$

$$\boxed{b_{yx} = 3.42}$$

+1

(6)

(b) Straight line Y on X

$$(Y - \bar{Y}) = b_{yx} (X - \bar{X})$$

From table

$$\bar{X} = \frac{\sum X}{n} = \frac{56}{7} = 8$$

$$\bar{Y} = \frac{\sum Y}{n} = \frac{313}{7} = 44.71$$

$$\therefore (Y - 44.71) = 3.42(X - 8)$$

$$Y = 3.42X - 27.36 + 44.71$$

$$\boxed{Y = 3.42X + 17.35}$$

Ans

+1

(c)

Expected weight (Y) = ?

$$\text{age}(X) = 20$$

∴ Put  $X=20$  in above eqn

$$Y = 3.42(20) + 17.35$$

$$Y = 85.75$$

Ans

+1

Q.5

(i) Definition

+1 marks

Components

+3 marks

+4

Q.5

(ii) Let eqn of straight line tend be

$$Y = a + bX \quad \text{--- (1)}$$

Normal eqn

$$\sum Y = na + b \sum X \quad \text{--- (2)}$$

$$\sum XY = a \sum X + b \sum X^2 \quad \text{--- (3)}$$

+1

Shift origin to middle year 1998.

$$\therefore X = \text{Year} - 1998$$

(7)

Year	Production (Y)	$X = \text{Year} - 1998$	$X^2$	$XY$
95	40	-3	9	-120
96	45	-2	4	-90
97	46	-1	1	-46
98	42	0	0	0
99	47	1	1	47
2000	49	2	4	108
2001	46	3	9	138

$$\sum Y = 315$$

$$\sum X = 0$$

$$\sum X^2 = 28$$

$$\sum XY = 37$$

+2

Put value from table in eqn (2) and (3)  
from eqn (2)

$$315 = 7a + 0$$

$$a = \frac{315}{7} = 45$$

from eqn (3)

$$37 = 0 + 28b$$

$$b = 1.32$$

Put a and b in eqn (1)

$$Y = a + bx$$

$$Y = 45 + 1.32x$$

- (4)

which is straight line trend, ✓

+2

Estimate production for 2004

$$X = \text{Year} - 1998$$

$$X = 2004 - 1998 = 6$$

Put  $X = 6$  in (4)

$$Y = 45 + 1.32(6)$$

$$Y_{2004} = 52.92$$

g2

+1

Q5

iii)

## 3-Yearly moving Average

Year	Production	3-Yearly moving Total	3-Yearly moving Average	
96	21	-	-	
97	30	87	29	
98	36	108	36	
99	42	124	41.33	
2000	46	138	46	
2001	50	152	50.66	+4
2002	56	169	56.33	marks
2003	63	189	63	
2004	70	207	69	
2005	74	-	-	

for drawing trend

+2 marks

+2

Q6

i)

Definition of Index No.  
characteristics(at least) 2+2 marks

+4

ii)

Computation of Fisher's Index No.

Item	$P_o$	$P_o q_o$ (Total value)	$P_n$	$P_n q_n$ (Total value)	$q_o$	$q_n$	$q_n P_o$	$q_o P_n$
A	6	300	10	560	50	56	500	336
B	2	200	2	240	100	120	200	240
C	4	240	6	360	60	60	360	240
D	10	300	12	288	30	24	360	240
E	8	320	12	432	40	36	480	288
Total		1360		1880			1900	1344

+3

9

$$\text{Price Index} = \sqrt{\frac{\sum P_n q_o}{\sum P_o q_o} \times \frac{\sum P_n q_n}{\sum P_o q_n}} \times 100 = \sqrt{\frac{1900}{1360} \times \frac{1880}{1344}} \times 100$$

+3

$$= 139.79$$

08

$$\text{Quantity Index} = \sqrt{\frac{\sum q_n p_o}{\sum q_o p_o} \times \frac{\sum q_n p_n}{\sum q_o p_n}} \times 100 = \sqrt{\frac{1344}{1360} \times \frac{1880}{1900}} \times 100$$

$$= 98.89$$

Both are Correct

Q.6

(iii)

Item	$P_o$	$q_{o_0}$	$P_L$	$P_o q_o$	$P_L q_o$
A	16	40	16	640	800
B	40	25	60	1000	1500
C	0.50	5	0.50	2.5	2.5
D	5.12	20	6.25	32	125
E	2	10	1.5	3	15
Total				1677.5	2442.5

+3

Laspeyres weighted Aggregate method

$$P_{oL} = \frac{\sum P_L q_o}{\sum P_o q_o} \times 100$$

+2

$$P_{oL} = \frac{2442.5}{1677.5} \times 100$$

$P_{oL} = 145.60$

Ans

+1