ii. From the following data of two groups of students A and B drawn from normal populations, the marks obtained were as follows: **7**

A:	18	20	36	50	49	36	34	49	41
B:	29	28	26	35	30	44	46		

Examine by F-test at 5% level, whether the two populations have the same variance. (Given F (8, 6) = 4.15 at 5% LOS)

OR iii. From the following data, find whether the accidents are uniformly distributed over the week. (given $\chi^2_{0.05}$ at 6 d.f. at 0.05% level of significance is 12.6) **7**

Days	Sun.	Mon.	Tue.	Wed.	Thu.	Fri.	Sat.
No. of accidents	14	16	8	20	11	9	14

******

Total No. of Questions: 6 *Total No. of Printed Pages:4*

Enrollment No......................................

Faculty of Management

End Sem (Odd) Examination Dec-2018

MS3C010 Quantitative Techniques

Programme: BBA 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.

Q.1 i. Sign of both regression coefficient should be **1**
(a) Opposite (b) Same
(c) Both (a) and (b) (d) None of these

ii. The correlation coefficient r lies between **1**
(a) 0 to ∞ (b) -∞ to ∞ (c) 0 to 1 (d) -1 to 1

iii. Irregular variation in a time series are caused by **1**
(a) Lockouts and strikes (b) Floods
(c) Epidemics (d) All of these

iv. Salient factors responsible for seasonal variation are **1**
(a) Weather (b) Social customs
(c) Festivals (d) All of these

v. Index numbers reveal the state of: **1**
(a) Inflation (b) Deflation
(c) Both (a) and (b) (d) Neither (a) nor (b)

vi. Index numbers are expressed in **1**
(a) Percentages (b) Ratios
(c) Terms of absolute value (d) All of these

vii. Probability is expressed as: **1**
(a) Ratio (b) Proportion (c) Percentage (d) All of these

viii. From the word `POSSESSIVE', a letter is chosen at random. The probability of it to be *S* is **1**
(a) $\frac{3}{10}$ (b) $\frac{4}{10}$ (c) $\frac{3}{6}$ (d) $\frac{4}{6}$

ix.	Most of the nonparametric methods utilise measurements on: (a) Interval scale (b) Ratio scale (c) Ordinal scale (d) Nominal scale	**1**
x.	A hypothesis may be classified as: (a) Simple (b) Composite (c) Null (d) All of these	**1**

Q.2 i. Distinguish between correlation and regression analysis. **3**

ii. Obtain the Spearman's rank Correlation Coefficient for the following 10 set of data: **7**

X:	68	64	75	50	64	80	75	40	55	64
Y:	62	58	68	45	81	60	68	48	50	70

OR iii. You are given below the following information about advertisement expenditure and sales: **7**

	Sales (X)	Adv. Exp. (Y)
Mean	50	10
Standard deviation	10	2

Correlation Coefficient = 0.9

(a) Find the two regression lines.

(b) Find the likely sales when advertisement expenditure is Rs.20.

Q.3 i. What is a time series? Discuss about secular trend and seasonal variation. **3**

ii. Calculate the 4-yearly moving averages of the data given below: **7**

Years:	1991	1992	1993	1994	1995	1996	1997	1998
Sales	36	43	43	34	44	54	34	24

OR iii. Determine the equation of a straight line which best fits the following data: **7**

Year:	1984	1985	986	1987	1988
Sales:	35	56	79	80	40

Compute the trend values for all the years from 1984 to 1988.

Q.4 i. From the following data, construct price index number by simple aggregate method: **3**

	Base year prices	Current year prices
Milk per litre	11	12.50
Wheat per kg.	15	16
Apple per kg.	30	35
House Rent 2 rooms	3500	4500

ii. Define Index numbers. Write various characteristics and types of Index numbers? **7**

OR iii. Calculate Fisher's ideal index number for the following data: **7**

	Base year 2009		Current year 2010	
Commodity	Price (Rs.)	Quantity (kg.)	Price (Rs.)	Quantity (Kg.)
A	4.50	20	10.50	22
B	7	40	13	45
C	14	4	32	5
D	16.50	3	28	2
E	5	2	9	1.5

Q.5 i. State the addition theorem of probability for two events: **3**

(a) When they are mutually exclusive

(b) When they are not mutually exclusive.

ii. Define Binomial distribution and state its main characteristics. The mean of a Binomial distribution is 20 and standard deviation 4, calculate Number of trials (n), Probability of success (p), and Probability of failure (q). **7**

OR iii. Define probability. A problem in statistics is given to five students whose chances of solving it are 1/2, 1/3, 1/4, 1/5 and 1/6 respectively. What is the probability that the problem will be solved? **7**

Q.6 i. Differentiate between parametric and non –parametric test. **3**

Faculty of Management
End Sem (odd) Examination DEC - 2018
MS3C010 Quantitative Techniques

Programme: BBA Max. Marks: 60

Answer - 1

Q.1

Ans. (i) (b) same +1
(ii) (d) -1 to 1 +1
(iii) (d) all of these +1
(iv) (d) all of these +1
(V) (c) both (a) and (b) +1
(Vi) (a) percentages +1
(Vii) (d) all of these +1
(Viii) (b) $\frac{4}{10}$ +1
(ix) (c) ordinal scale +1
(X) (d) all of these +1

Answer - 2

Ans. (i) At least three Difference : $\boxed{+1}$ Marks for Each Difference +3

Ans (ii) Here Rank are not given So we give rank to the following data set.

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X	Y	R_x	R_y	$D=R_x-R_y$	D^2
68	62	4	5	-1	1
64	58	6	7	-1	1
75	68	2.5	3.5	-1	1
50	45	9	10	-1	1
64	81	6	1	5	25
80	60	1	6	-5	25
75	68	2.5	3.5	-1	1
40	48	10	9	1	1
55	50	8	8	0	0
64	70	6	2	4	16
					$\Sigma D^2 = 72$

+3

In X-series, 75 repeated 2 times $\therefore m=2$
In X-series, 64 repeated 3 times $\therefore m=3$
In Y-series, 68 repeated 2 times $\therefore m=2$

Spearman's Rank Correlation Coefficient

$$R = 1 - \frac{6\left[\Sigma D^2 + \frac{1}{12}(m^3-m) + \frac{1}{12}(m^3-m) + \frac{1}{12}(m^3-m)\right]}{n^3-n}$$ +2

$$R = 1 - \frac{6\left[72 + \frac{1}{12}(2^3-2) + \frac{1}{12}(3^3-3) + \frac{1}{12}(2^3-2)\right]}{10^3-10}$$

$$R = 1 - \frac{6[72+0.5+2+0.5]}{990}$$ +1

8

$$R = 1 - \frac{6(75)}{990}$$

$$R = 1 - \frac{450}{990}$$

$$\boxed{R = 0.545}$$ Ans +1

or
Ans (iii)

(a) Two Regression lines

Regression line Y on X

$$(Y - \bar{Y}) = r \frac{\sigma_y}{\sigma_x} (X - \bar{X})$$

$$(Y - 10) = 0.9 \times \frac{2}{10} (X - 50)$$

$$Y - 10 = 0.18X - 9$$

$$Y = 0.18X - 9 + 10$$

$$\boxed{Y = 0.18X + 1} \quad \text{— (1)}$$ +3

Regression line X on Y

$$(X - \bar{X}) = r \frac{\sigma_x}{\sigma_y} (Y - \bar{Y})$$

$$(X - 50) = 0.9 \times \frac{10}{2} (Y - 10)$$

$$X - 50 = 4.5(Y - 10)$$

$$X - 50 = 4.5Y - 45$$

$$\boxed{X = 4.5Y + 5} \quad \text{— (2)}$$ +3

(b) Let X = Sales

Y = Advertising Expenditure = 20 crore

Put $Y=20$ in eqⁿ (1)

$$X = 4.5Y + 5$$

$$X = 4.5(20) + 5$$

$$\boxed{X = 95 \text{ crores}}$$ Ans

+1

Answer - 3

Ans (i) Time series: Definition +1 marks
secular Trend: Definition +1 marks
seasonal variation: Definition +1 marks +3

Ans (ii) 4-Yearly moving Averages

→

NOTE:- Student can find Trend or Centred moving of Average by other method also but final centring should be same.

P.T.O.

5

Year	Sales	4-Yearly moving Total (T)	4-Yearly moving Average (A)	4-Yearly moving average Centered (C)
1991	36			
1992	43			
		156	39	
1993	43			$\frac{39+41}{2} = 40$
		164	41	
1994	34			42.375
		175	43.75	
1995	44			42.625
		166	41.5	
1996	54			40.25
		156	39	
1997	34			
1998	24			

+2 +2 +3

or

Ans (iii) Let eqn of straight line Trend be

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

Normal eqn

$$\Sigma Y = na + b\Sigma X \quad -(2)$$

$$\Sigma XY = a\Sigma X + b\Sigma X^2 \quad -(3)$$ +2

n = no. of year = 5

so we shift origin to middle year i.e. 1986

(6)

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Year	Sales (Y)	X = Year - 1986	X^2	XY
1984	35	-2	4	-70
1985	56	-1	1	-56
1986	79	0	0	0
1987	80	1	1	80
1988	40	2	4	80
	$\Sigma Y = 290$	$\Sigma X = 0$	$\Sigma X^2 = 10$	$\Sigma X^2 = 34$

+2

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

$$290 = 5a$$
$$\boxed{a = 58}$$ +1

$$34 = 10b$$
$$\boxed{b = 3.4}$$ +1

Put value of a and b in (1) we get eqn of Straight line Trend.

$$\boxed{Y = 58 + 3.4X} \quad — (4)$$

Ans

Trend values from 1984 to 1988

Year	X	Y = 58 + 3.4(X) [Trend values]
1984	-2	Y = 51.2
1985	-1	Y = 54.6
1986	0	Y = 58
1987	1	Y = 61.4
1988	2	Y = 64.8

+1

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Answer-4

Ans-(i)

	P_0	P_1
milk	11	12.5
wheat	15	16
Apple	30	35
House Rent	3500	4500
	$\Sigma P_0 = 3556$	$\Sigma P_1 = 4563.5$

+1

Simple Aggregate method

$$P_{01} = \frac{\Sigma P_1}{\Sigma P_0} \times 100$$ +1

$$P_{01} = \frac{4563.5}{3556} \times 100$$

$\boxed{P_{01} = 128.33}$ Ans +1

Ans-(ii) Index-number : Definition — +1 marks

Types : Three Types definition — +1 for each type def.

Characteristics : At least three characteristics described. — +1 marks for each

+7

or
Ans(iii)

	P_0	q_0	P_1	q_1	P_0q_0	P_0q_1	P_1q_0	P_1q_1
A	4.5	20	10.5	22	90	99	210	231
B	7	40	13	45	280	315	520	585
C	14	4	32	5	56	70	128	160
D	16.5	3	28	2	49.5	33	84	56
E	5	2	1	1.5	10	7.5	18	13.5
					$\Sigma P_0q_0 = 485.5$	$\Sigma P_0q_1 = 524.5$	$\Sigma P_1q_0 = 960$	$\Sigma P_1q_1 = 1045.5$

+4

Fisher's Ideal Index number

$$P_{01} = \sqrt{\frac{\Sigma P_1 q_0}{\Sigma P_0 q_0} \times \frac{\Sigma P_1 q_1}{\Sigma P_0 q_1}} \times 100$$ +2

$$P_{01} = \sqrt{\frac{960}{485.5} \times \frac{1045.5}{524.5}} \times 100$$

$$\boxed{P_{01} = 198.34}$$ Ans +1

Answer- 5

Ans (i) (a) Addition Theorem when events are mutually Exclusive

$P(A \cup B) = P(A) + P(B)$ $\boxed{+1.5}$

(b) Addition Theorem when events are not mutually Exclusive

$P(A \cup B) = P(A) + P(B) - P(A \cap B)$ $\boxed{+1.5}$ +3

Ans (ii) Binomial Distribution : Definition $\boxed{+2}$ +2

Characteristics : Atleast four $\boxed{+0.5}$ for each $= 4 \times 0.5 = \boxed{2}$ +2

Given mean, $np = 20$ —(1)

S.D., $\sqrt{npq} = 4$ —(2)

On squaring both sides of eq^n (2)

$npq = 16$ —(3)

divide eq^n (3) by eq^n (1) we get

$$\frac{npq}{np} = \frac{16}{20}$$

$$\boxed{q = 0.8}$$ +1

W.K.T

$$p + q = 1$$

$$p + 0.8 = 1$$

$$p = 1 - 0.8$$

$$\boxed{p = 0.2}$$ +1

$\because np = 20$ from (1)

$\therefore n(0.2) = 20$

$$\boxed{n = 100}$$ +1

$n = 100, \quad p = 0.2, \quad q = 0.8$

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Ans(iii) Let A, B, C, D, E be the event that problem solved by five students respectively.

$\therefore P(A) = \frac{1}{2}$, $P(B) = \frac{1}{3}$, $P(C) = \frac{1}{4}$, $P(D) = \frac{1}{5}$

$P(E) = \frac{1}{6}$ +1

Prob. that A fails to solve the problem

$P(\bar{A}) = 1 - P(A) = 1 - \frac{1}{2} = \frac{1}{2}$

Prob. that B fails to solve the problem

$P(\bar{B}) = 1 - P(B) = 1 - \frac{1}{3} = \frac{2}{3}$

prob. that C fails to solve the problem

$P(\bar{C}) = 1 - P(C) = 1 - \frac{1}{4} = \frac{3}{4}$

Prob. that D fails to solve the problem

$P(\bar{D}) = 1 - P(D) = 1 - \frac{1}{5} = \frac{4}{5}$

prob. that E fails to solve the problem

$P(\bar{E}) = 1 - P(E) = 1 - \frac{1}{6} = \frac{5}{6}$ +2

$\therefore$ prob that none of them will able to solve problem

$= \frac{1}{2} \times \frac{2}{3} \times \frac{3}{4} \times \frac{4}{5} \times \frac{5}{6}$

$= \frac{1}{6}$ +1

Problem will be solved if any of them will solve it

i.e. $P(A \cup B \cup C \cup D \cup E) = 1 - P$ (None of them will solve)

$= 1 - \frac{1}{6}$

$\boxed{P(A \cup B \cup C \cup D \cup E) = \frac{5}{6}}$ +3

Answer-6

Ans(i) Difference between Parametric and non-parametric test

[+1 for each difference

Atleast three differences +3

Ans(ii)

First group (A)			Second Group (B)		
X_1	$(X_1-\bar{X}_1)$	$(X_1-\bar{X}_1)^2$	X_2	$X_2-\bar{X}_2$	$(X_2-\bar{X}_2)^2$
18	-19	361	29	-5	25
20	-17	289	28	-6	36
36	-1	1	26	-8	64
50	13	169	35	1	1
49	12	144	30	-4	16
36	-1	1	44	10	100
34	-3	9	46	12	144
49	2	144			
42	4	16			
$\Sigma X_1 = 333$	$\Sigma(X_1-\bar{X}_1) = 0$	$\Sigma(X_1-\bar{X}_1)^2 = 1134$	$\Sigma X_2 = 238$	$\Sigma(X_2-\bar{X}_2) = 0$	$\Sigma(X_2-\bar{X}_2)^2 = 386$

+3

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Mean of A, $\bar{X}_1 = \frac{\Sigma X_1}{n_1} = \frac{333}{9} = 37$

Mean of B, $\bar{X}_2 = \frac{\Sigma X_2}{n_2} = \frac{238}{7} = 34$

Variance of A, $S_1^2 = \frac{\Sigma (X_1 - \bar{X}_1)^2}{n_1 - 1}$

$$\boxed{S_1^2 = \frac{1134}{9-1} = 141.75}$$ +1

degree of freedom $(d.f._1) = n_1 - 1 = 9-1 = 8$

Variance of B, $S_2^2 = \frac{\Sigma (X_2 - \bar{X}_2)^2}{n_2 - 1}$

$$\boxed{S_2^2 = \frac{386}{7-1} = 64.34}$$ +1

$d.f._2 = n_2 - 1 = 7 - 1 = 6$

$\therefore$ F-test $= \frac{S_1^2}{S_2^2}$ $\because S_1^2 > S_2^2$

$$\boxed{F_{(8,6)} = \frac{141.75}{64.34} = 2.20}$$ +2

Given Tabulated $F_{(8,6)} = 4.15$

Here Calculated F is less than tabulated F.

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So we accept null hypotheses.
$\therefore$ population have same variance.

Ans(iii) Let us set up null hypothesis that accidents are uniformly distributed over the week.

Under null hypothesis Expected frequencies is given by $= \frac{14+16+8+20+11+9+14}{7}$

$= \frac{92}{7} = 13.14$

Calculation of χ^2

No. of accidents f_o	Expected freq. f_e	$f_o - f_e$	$(f_o-f_e)^2$	$(f_o-f_e)^2/f_e$
14	13.14	0.86	0.7396	0.0563
16	13.14	2.86	8.1796	0.6225
8	13.14	-5.14	26.4196	2.0106
20	13.14	6.86	47.0596	3.5814
11	13.14	-2.14	4.5796	0.3485
9	13.14	-4.14	17.1396	1.3044
14	13.14	0.86	0.7396	0.0563
				$\Sigma(f_o-f_e)^2/f_e = 7.98$

+2

$\chi^2 = \Sigma(f_o-f_e)^2/f_e = 7.98$ +3

d.f. $= n-1 = 7-1 = 6$

Given

~~Calculated~~ Tabulated

$\chi^2 = 12.6$ at 6 d.f.

Here χ^2 Calculated is less than χ^2 tabulated,

So we accept null hypothesis.

$\therefore$ accidents are uniformly distributed.