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

Enrollment No……………………………

Faculty of Management Studies

End Sem (Odd) Examination Dec-2019

MS3CO10 Quantitative Techniques

Programme: BBA Branch/Specialisation: Management / DM

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. The graph of time series is called: **1**

(a) Histogram (b) Straight line
(c) Ogive (d) None of these

ii. Value of b in the trend line Y = a + bX is: **1**

(a) Always negative (b) Always positive
(c) Always zero (d) Both negative and positive

iii. Index numbers are expressed in: **1**

(a) Ratios (b) Squares
(c) Percentages (d) Combinations

iv. When the prices of rice are to be compared, we compute: **1**

(a) Volume index (b) Value index
(c) Price index (d) Aggregative index

v. The probability that it will rain tomorrow is 0.85. What is the probability that it will not rain tomorrow? **1**

(a) 0.25 (b) 0.145 (c) 3/20 (d) None of these

vi. Probability distribution of discrete random variable is classified as **1**

(a) Probability mass function (b) Posterior mass function
(c) Continuous mass function (d) None of these

vii. In hypothesis testing, the hypothesis which is tentatively assumed to be true is called the **1**

(a) Correct hypothesis (b) Null hypothesis
(c) Alternative hypothesis (d) None of these

viii. A Type II error is the error of **1**

(a) Accepting Ho when it is false
(b) Accepting Ho when it is true
(c) Rejecting Ho when it is false
(d) None of these

P.T.O.

ix. A pessimistic decision-making criterion **1**
(a) Maximax (b) Equally likely
(c) Maximin (d) None of these

x. In decision making under ________, there are several possible outcomes for each alternative, and the decision maker knows the probability of occurrence of each outcome **1**
(a) Risk (b) Probability
(c) Certainty (d) None of these

Q.2 i. Discuss two Models of time series. **4**

ii. The annual production of a company are given below. Find the trend values period using three-yearly Moving average method. **6**

Year	1998	1999	2000	2001	2002	2003	2004	2005	2006
Production	4	8	5	8	11	9	11	14	13

OR iii. Fit a straight line to the following data regarding x as the independent variable: **6**

x	1	2	3	4	5	6
y	1200	900	600	200	110	50

Q.3 i. Define Index Number. Why index numbers are called as economic barometer explain. **4**

ii. A price index of two item A and B is being estimated if two items are assigned weights of 64 and 36 respectively the price index becomes 279 similarly if they are assign weights of 50 the price index turns out to be 265 determine the individual price index numbers of items A and B. **6**

OR iii. From the following data construct price index of 1995 taking 1990 as base by using simple average of price relative method **6**

Commodity	A	B	C	D
Price in 1990 (Rs)	60	45	80	25
Price in 1995 (Rs)	75	50	70	40

Q.4 Attempt any two:

i. A die is rolled, and a coin is tossed, find the probability that the die shows an odd number and the coin shows a head. **5**

ii. Write any five characteristics of Normal distribution. **5**

iii. Ten unbiased coins are tossed simultaneously. Find the probability that there will be **5**
(a) Exactly 5 heads (b) At least 8 heads

Q.5 i. Explain with example: Population, Sample space, Null hypothesis, Type-I error. **4**

ii. The random sample give the following result **6**

Sample	Size	Sample mean	Sum of square of deviation from the mean
1	10	15	90
2	12	14	108

test whether sample come from the same normal population. (Given that $F_{0.05}(11,9) = 3.10$, $F_{0.05}(9,11) = 2.90$)

OR iii. The demand for spare part in a factory was found to vary from day to day in a sample study the following information was obtained **6**

Days	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
Number of parts demanded	1124	1125	1110	1120	1126	1115

Test the hypothesis that the number of parts demanded does not depend on the day of the week. (Given that the values of chi-square significance at 5,6,7 degree of freedom are respectively 11.0 7 ,12.59,14. 07 at the 5% level of significance.

Q.6 i. Explain the steps involve in decision making process. **4**

ii. The following payoff matrix shows the payoff of different course of action E_1, E_2, E_3, E_4 against state of nature A_1, A_2, A_3, A_4 **6**

	A_1	A_2	A_3	A_4
E_1	10	15	24	38
E_2	48	14	36	59
E_3	20	34	47	68
E_4	6	19	8	22

Find the optimum decision with the help of Laplace rule, Max-min rule.

OR iii. Explain following rules under the condition of risk **6**
(a) Expected Monetary Values (EMV).
(b) Expected Opportunity Loss (EOL).
(c) Expected Value of Perfect Information (EVPI).

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Marking Scheme
MS3CO10 Quantitative Technique

Q1.

(i) (i) Histogram. +1

(ii) (ii) both negative & Positive +1

(iii) (c) Percentage +1

(iv) (c) Price index +1

(v) (c) 3/20 +1

(vi) (a) Probability mass f^n. +1

(vii) (b) Null hypothesis +1

(viii) (a) Accepting Ho when it is false +1

(ix) (c) Maximin +1

(x) (a) Risk +1

Q2(i) The two models in time series are.

(a) Additive Model : Sum of the components of time series i.e +1

$\cdot$ $Y = T+S+C+I$

where T = Trend, S = Seasonal, C = Cyclical, I = Irregular.

If data donot contain one component the value for that component is zero. Suppose there is no Cyclical then $Y = T+S+I$

(b) Multiplicative model :- We assume that the data is product of the various components +1

$Y_t = T \times S \times C \times I$ +1

If One of the component is missing then suppose cycle. $Y_t = T \times S \times I$.

4

Q2(i) ~~Given data is~~

x	y
1	1200
2	900
3	600
4	200
5	
6	

Q2(ii)

Year	Production	SUM	Avg
1998	4		
1999	8	4+8+5 = 17	17/3 = 5.66
2000	5	8+5+8 = 21	21/3 = 7
2001	8	5+8+11 = 24	24/3 = 8
2002	11	8+11+9 = 28	28/3 = 9.33
2003	9	11+9+11 = 31	31/3 = 10.33
2004	11	9+11+14 = 34	34/3 = 11.33
2005	14	11+14+13 = 38	38/3 = 12.66
2006	13		

+2 for sum

+2 for Arg

Prev. values are ?

Date
Page 3

(~~1999) = 5.66~~

(1999, 5.66), (2000, 7) (2001, 8) (2002, 9.33) +2 for writing trend values
(2003, 10.33) (2004, 11.33) (2005, 12.66)

Q2(iii) The given data is

x	Y	$X = x - \bar{x}$	X^2	XY
1	1200	1-3.5 = -2.5	6.25	-3000
2	400	2-3.5 = -1.5	2.25	-1350
$\boxed{3}$	600	3-3.5 = -0.5	0.25	-150
$\boxed{4}$	200	4-3.5 = 0.5	0.25	100
5	110	5-3.5 = 1.5	2.25	165
6	50	6-3.5 = 2.5	6.25	125
	$\Sigma Y = 3060$	$\Sigma X = 0$	17.5	-4110

+2

Eq. of straight line is

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

Normal eq. are

$$\Sigma Y = na + b\Sigma X \quad - (2)$$
$$\Sigma XY = a\Sigma X + b\Sigma X^2 \quad - (3)$$ +1

where $a = \frac{\Sigma Y}{n}$ (4) $b = \frac{\Sigma XY}{\Sigma X^2}$ (5) +1

Putting the values

$a = \frac{3060}{6} = 510$ +2

$b = \frac{-4110}{17.5} = -234.857$

So line is $Y = 510 - 234.857x$

Q3(i) Index numbers are called as economic barometers because of following reasons.

a] Index numbers study the change in living standards and are useful in planning and decision-making

b] Index number is very useful in deflation

c] It is use to measure the changes in prices of commodities. They are also use to measure the changes in price

d] It also measures comparative position in production.

+3

Index no :- It is a device used for comparison b/w two quantities. +1

Q3(ii) Price index formula with weight

$P_{01} = \frac{\Sigma P_1 W}{\Sigma P_0 W} \times 100$ Simple Price index no $= \frac{\Sigma P_1}{\Sigma P_0} \times 100$ +1

Let I_1 be index for the first quantity

Let I_2 be index for second Item.

First situation : $279 = \frac{64 I_1 + 36 I_2}{64+36}$ —(i) +2

Second situatiation : $265 = \frac{50 I_1 + 50 I_2}{50+50}$ —(ii) +2

From(i) $64 I_1 + 36 I_2 = 27900$ —(iii) +1

From(ii) $I_1 + I_2 = 530$ —(iv)

On solving (iii) & (iv)

We get $I_1 = 315$, $I_2 = 215$ Ans

Q8(iii) Given data is

Commodity	Price (P_0) 1990	Price(P_1) 1995
A	60	75
B	45	50
C	80	70
D	25	40

formula used

$$I_{01} = \frac{100}{n} \sum \frac{P_1}{P_0}$$ +1

n = no of commodities
= 4 (here

~~first~~ ~~fixed~~

$$\text{So } I_{01} = \frac{100}{4} \left[\frac{75}{60} + \frac{50}{45} + \frac{70}{80} + \frac{40}{25} \right]$$ +3

$$I_{01} = 25 \left[1.25 + 1.11 + 0.875 + 1.6 \right]$$

$= 25 \times 4.835$

$= 120.875$

Clearly Index no for 1995 is 20.875 % more than 1990 +2

Q4(i) dice. let E be event getting odd no in rolling of dice. Total no of points in Sample Space in rolling of dice

$S = \{1,2,3,4,5,6\} \Rightarrow n(S) = 6$ +1

Total no of points favourable to event that a dice shows an odd no.

$E = \{1,3,5\} \Rightarrow n(E) = 3$ +1

$P(E) = \frac{3}{6} = \frac{1}{2}$ +0.5

Let F be event of getting head in tossing a coin.

Total no. points in Sample Space in tossing a coin +1

$S = \{H,T\}$ $n(S) = 2$

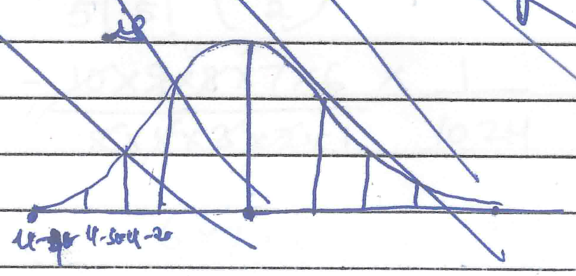
$F = \{H\}$ $= \frac{1}{2}$ $n(F) = 1$ +0.5

Now Probability of getting a odd no in dic and the coin shows a head is +1

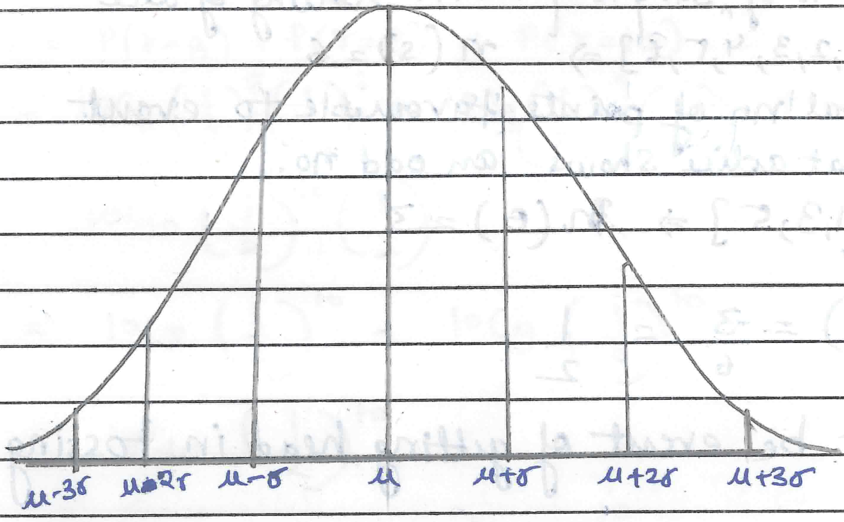
$P(E \cap F) = P(E) \cdot P(F)$ [By multiplication theo]

$= \frac{1}{2} \cdot \frac{1}{2} = \frac{1}{4}$ Ans

Q4(ii) ~~Five Characteristics of Normal Curve~~



Q4 (ii)



1. The curve is bell shaped in appearance. +1
2. The area under curve is 1 +1
3. The curve is symmetric at the center +1
4. The normal curve is unimodal +1
5. Mean, median & mode coincide +1
6. The height of curve declines symmetrically

~~7. It standard deviation =~~

7. It's mean deviation = $\frac{4}{5}$ standard deviation.
8. Quartile deviation = $5/6$ mean deviation

5

Q4 (iii)

no. of coins = 10
Probability of head when single coin is tossed $= \frac{1}{2}$
Probability of tail when single coin is tossed $= \frac{1}{2}$ } +1

Applying Binomial distribution formula i.e
$P(X=r) = {}^nC_r\, p^r q^{n-r}$ ... (i) Let here p = probability of head $= \frac{1}{2}$
& q = Probability of tail $= \frac{1}{2}$ } 0.5

Clearly $p+q = 1$ hence Binomial Condition is satisfied & can be applied. & $n = 10$ = no. of trials. } 0.5

(a) Exactly 5 heads i.e $r = 5$
$n = 10$
Put it in (i)

$P(X=5) = {}^{10}C_5 \left(\frac{1}{2}\right)^5 \left(\frac{1}{2}\right)^5$ → 1

$= \frac{10!}{5!\,5!}\left(\frac{1}{2}\right)^{10}$

$= \frac{10 \times 9 \times 8 \times 7 \times 6}{5 \times 4 \times 3 \times 2 \times 1} \times \frac{1}{1024}$

$= \frac{6 \times 7 \times 6}{1024} = \frac{252}{1024} \approx 0.24609$ — 0.5

(b) at least 8 heads

$P(X=r) = P(r=8) + P(r=9) + P(r=10)$

$= {}^{10}C_8\left(\frac{1}{2}\right)^8\left(\frac{1}{2}\right)^2 + {}^{10}C_9\left(\frac{1}{2}\right)^9\left(\frac{1}{2}\right) +$

${}^{10}C_{10}\left(\frac{1}{2}\right)^{10}\left(\frac{1}{2}\right)^0$ — 1

$= {}^{10}C_8\left(\frac{1}{2}\right)^{10} + {}^{10}C_9\left(\frac{1}{2}\right)^{10} +$

${}^{10}C_{10}\left(\frac{1}{2}\right)^{10}$

$= \left({}^{10}C_8 + {}^{10}C_9 + {}^{10}C_{10}\right)\left(\frac{1}{2}\right)^{10}$

$= \left(\frac{\cancel{10}^{5}\times 9}{\cancel{2}\times 1} + 10 + 1\right) \times \frac{1}{1024}$

$= \frac{56}{1024} = 0.0546$ — 0.5

Q5(i)
Population: A set or group of observations relating to a phenomenon under statistical investigation is known as statistical Population. For e.g Population of stars in the universe. 1

(ii) Sample space: Total no of Possible outcomes of a Random experiment.
For e.g In tossing of a Coin we get two possible outcomes 1
$S = \{H, T\}$. It is denoted by S in general & can written in the form of set elements.

~~(iii) Null hypothesis; - Null hypothesis is the Hypothesis which is already Considered as true~~

(iii) Null hypothesis: - Null hypothesis is a hypothesis which is tested for possible rejection under the assumption that it is true. Null hypothesis is denoted by Ho 1
For e.g Suppose there is belief that 70% Students in Certain University get passed
$H_0: \mu = 70\%$

But we are believing that more than 70% get passed then we will test above hypothesis & set another hypothesis
$H_1 : \mu > 70\%$ & carry out further statistical testing.

(iv) Type I Error : When we reject the null hypothesis although that is true, then it is known as error of first kind or Type I error — 1

For eg A guilty prisoner is proved as non guilty in the Court.

H_0 : Guilty ⟶ Rejected

Q5 (ii)
Given data is :

Sample	size	mean	Sum of squares
1	10	15	90
2	12	14	108

Sol : Step I Set up the Hypothesis
$H_0 : \mu_1 = \mu_2$: two samples are drawn from same population — 1
$H_1 : \mu_1 \neq \mu_2$: two samples are not drawn from same population.

Var. of Sample $= \frac{\sum(x-\bar{x})^2}{n-1}$

Var of first Sample 1 $= \frac{90}{10-1} = \frac{90}{9} = 10$ 2

Var of second Sample 2 $= \frac{108}{12-1} = \frac{108}{11} = 9.82$

Var of first Sample > Var of Second Sample 1

So Sample I variance $= S_1^2$ let

Sample II variance $= S_2^2$

Clearly $S_1^2 > S_2^2$ always

Calculate $F = \frac{S_1^2}{S_2^2} = \frac{10}{9.82} = 1.018$ 1

Tabulated $F_{0.05}(\underset{\text{nu}}{9}, \underset{\text{den.}}{11}) = 2.90$

Since Fcal < Ftab Hence Null hypothesis is accepted. 1

Q(iii)

P.T.O

Given data is

Days	No. of parts demanded (o_i)	e_i	$\frac{(o_i-e_i)^2}{e_i}$
Mon	1124	1120	0.014
Tue	1125	1120	0.022
Wed	1110	1120	0.089
Thus	1120	1120	0
Friday	1126	1120	0.032
Saturday	1115	1120	0.022
	$\Sigma f = 6720$		0.179

2

Set the hypothesis: H_0: number of parts does not depend on the weeks

H_1: no. of parts depends on the weeks. Clearly $\Sigma f > 50$ so we can perform Chi square test — 1 — 1

$$\chi^2_t = \sum \frac{(o_i - e_i)^2}{e_i}$$ o_i = observed frequencies, e_i = expected frequencies — 0.5

here e_i

$$= \frac{1}{6}\left[\frac{\text{Sum of all frequencies}}{\text{Total no. of term}}\right]$$

$$= \frac{1}{6}[6720]$$ — 0.5

$$= 1120$$

$\chi^2_{cal} = 0.179$ degrees of freedom $= n-1 = 6-1 = 5$

$\chi^2_{tab(0.05)}$ at 5 df $= 11.07$ given

$x^2_{cal} < x^2_{tab}$ — 1

Null hypothesis is accepted

Q6(i) Steps involved are

a] Defining the Problem – Problem must be defined into a Category — 1

b] Gather data : Gather data from source related to problem — 1

c] Identify the alternatives – Identify the alternatives to solve the problem — 1

d] Establish Solution Criteria → Solution Criteria should be Established — 1

e] Select the best alternative

→ Best alternative is chosen.

Q6(ii) Here state are A_1, A_2, A_3, A_4 & Acts are E_1, E_2, E_3, E_4

State / Acts	E_1	E_2	E_3	E_4
A_1	10	48	20	6
A_2	15	14	34	19
A_3	24	36	47	8
A_4	38	59	68	22

Laplace rule

(i) Assume probability of each state is $\frac{1}{4}$ — 0.5

(ii) Multiply value of each Act by $\frac{1}{4}$ & add

for

E_1: $\left[10 \times \frac{1}{4} + \frac{15}{4} + \frac{24}{4} + \frac{38}{4}\right]$

$= 2.5 + 3.75 + 6 + 9.5 = 21.75$

E_2: $\left[\frac{48}{4} + \frac{14}{4} + \frac{36}{4} + \frac{59}{4}\right]$

$= 12 + 3.5 + 9 + 14.75$

$= 39.25$

E_3: $\left[\frac{20}{4} + \frac{34}{4} + \frac{47}{4} + \frac{68}{4}\right]$

$= 5 + 8.5 + 11.75 + 17 = \boxed{42.25}$

E_4: $\left[\frac{6}{4} + \frac{19}{4} + \frac{8}{4} + \frac{22}{4}\right]$

$= 1.5 + 4.75 + 2 + 5.5$

$= 13.75$

So best decision according to Laplace rule is maximum value — 0.5

i.e E_3.

2

Max Min rule

Find Min value of each alt

E_1 : 10
E_2 : 14
E_3 : 20
E_4 : 6

2

Find Max of All these

So (Max Min) = E_3 = 20 } 0.5

So Best decision is E_3 — 0.5

Q6(iii)

(a) Expected monetary values :

According to this Criteria,
→ Construct the payoff listing the different Course of action
→ Also list state of nature with corresponding probabilities.
→ EMV is Calculated by multiplying the probabilities with payoff and add these values for each course
→ Determining the best course of action or strategy on basis of these expected values

2

b] EOL : (Expected Opportunity Loss)
→ Construct payoff matrix
→ First find regret table
→ Multiplying each value by probability of occurrence of State.
→ Add all the values according to acts
→ Min value ~~of~~ ~~ee~~ is best strategy according to EOL

2

c] EVPI (Expected value of perfect information)

1] Under this it is assumed that the decision maker has authentic & perfect information.

EVPI = EPPI − EMV
EPPI = Expected Profit with perfect information

EPPI = [Best outcome for Ist event × Prob of Ist event + Best outcome for IInd event × Prob of IInd event + . . .]

2