(i) Construct a decision tree to help analyse the problem.

(ii) What action should the marketing manager take?

20. (a) Ten samples each of size 5, are drawn at regular intervals from a manufacturing process. The sample means and their ranges are given below :

Sample no.	1	2	3	4	5	6	7	8	9	10
$\bar{x}$:	49	45	48	53	39	47	46	39	51	45
R :	7	5	7	9	5	6	8	6	7	6

What are the upper and lower control limits for $\bar{x}$ - chart and R-chart? Do you think that the process is under control? Given are $n = 5$, $A_2 = 0.577$, $D_4 = 2.115$ and $D_3 = 0$.

Or

(b) The following table gives the number of defects observed in 9 carpets passed as satisfactory. Construct the control charts for the number of defects.

No. of carpet :	1	2	3	4	5	6	7	8	9
No. of defects :	2	3	5	4	5	4	5	6	3

Reg. No. : .....

Code No. : 8765 **Sub. Code : HKCM 12**

M.Com. (CBCS) DEGREE EXAMINATION, NOVEMBER 2015.

First Semester

Commerce

QUANTITATIVE TECHNIQUES

(For those who joined in July 2012 and afterwards)

Time : Three hours Maximum : 75 marks

PART A — (10 × 1 = 10 marks)

Answer ALL questions.

Choose the correct answer :

1. Multiplication theorem is applicable to ———— events.

(a) Mutually exclusive

(b) Partially overlapping

(c) Independent

(d) Dependent.

2. Which one of the following is a discrete probability distribution?

(a) Binomial (b) Normal

(c) Uniform (d) Exponential.

3. The probability of committing Type I error is known as

(a) Beta (b) Confidence level

(c) Significance level (d) Test Statistic.

4. Which one of the following is not a property of a good estimator?

(a) Minimum variance

(b) Biasedness

(c) Efficiency

(d) Consistency.

5. Non-parametric tests in comparison with parametric tests are

(a) more efficient

(b) easier to compute

(c) less accurate

(d) none of these.

6. The number of degrees of freedom for a 3×4 contingency table in a Chi-square test is

(a) 11 (b) 8

(c) 12 (d) 6.

7. Which of the following criterion is not used under conditions of uncertainty?

(a) Maximax

(b) Maximin

(c) Minimax regret criterion

(d) Utility criterion.

8. EPPI is equal to

(a) EVPI +EOL (b) EOL + EMV

(c) EVPI + EMV (d) None of these.

9. A process is said to be out of control, when the points in a $\overline{X}$ - chart are

(a) above LCL

(b) below UCL

(c) between LCL and UCL

(d) above UCL and below LCL

10. R-chart and $\overline{X}$ - chart are

(a) charts for attributes

(b) charts for number of defects

(c) charts for variables

(d) none of these.

PART B — ($5 \times 5 = 25$ marks)

Answer ALL questions choosing either (a) or (b).

Each answer should not exceed 250 words.

11. (a) Mention the important properties of Binomial distribution.

Or

(b) Find the probability that the value of an item drawn at random from a normal distribution with mean 20 and standard deviation 10 will be between

(i) 10 and 15 and

(ii) Between 10 and 20.

Given : $P(0 \le z \le 1) = 0.3413$ and $P(0 \le z \le 0.5) = 0.1915$.

12. (a) Explain Type I and Type II errors.

Or

(b) A company manufacturing CFL bulbs claims that the average life of its bulbs is 1600 hours. 100 CFL bulbs selected at random were tested and the mean was found to be 1570 hours with a standard deviation of 120 hours. Should we accept the claim of the company? Given : critical value of z = 1.96.

13. (a) Explain the two-way ANOVA table.

Or

(b) Test the hypothesis that the mean value of a continuous distribution is 20 against the alternative hypothesis $\mu \neq 20$ using one sample sign test. The following results were obtained from 15 observations :

18, 19, 25, 21, 16, 15, 19, 22, 24, 21, 18, 17, 15, 26, 24.

Calculate binomial probabilities or use normal approximation to binomial distribution.

14. (a) What do you mean by criterion of realism? Explain with an example.

Or

(b) A physician purchases a particular vaccine on Monday of each week. The vaccine must be used in the current week, otherwise it loses its utility and has to be discarded. The vaccine costs Rs. 3 per dose and the physician charges Rs. 5 per dose. In the past 30 weeks, the physician has administered in the following quantities :

Doses per week :	16	20	30	40
No. of weeks :	5	10	8	7

How many doses should the physician buy every week?

15. (a) What is acceptance sampling?

Or

(b) On inspection of a large sample of a product, it was found the proportion of defective product in the sample output was 0.2. Compute the upper and lower control limits for a lot size $n = 400$.

PART C — ($5 \times 8 = 40$ marks)

Answer ALL questions choosing either (a) or (b).

Each answer should not exceed 600 words.

16. (a) Tickets are numbered from 1 to 100. These tickets are well shuffled and a ticket is drawn at random. What is the probability that the drawn ticket has

(i) an even number

(ii) a number is which is a multiple of 5

(iii) a number which is greater than 75

(iv) a number which is a square and

(v) a prime number.

Or

(b) Fit a Poisson distribution to the following data :

No. of errors per page :	0	1	2	3	4
No of pages :	109	65	22	3	1

Given : $e^{-0.61} = 0.543$.

17. (a) In a simple random sample of 600 men taken form a big city, 400 are found to be smokers. In another random sample of 900 men taken from another city, 450 are found to be smokers. Is there a significant difference between the two cities regarding smoking? Given $z_{0.05} = 1.96$.

Or

(b) A foreman claims that a machine produces 40 article per hour. A sample of 10 output during 10 random hours showed the production as 40, 42, 38, 37, 39, 40, 42, 39, 37 and 36. Test the claim of the foreman at 5% level of significance. Given $t_{0.05}(9) = 1.833$ for a single tailed test.

18. (a) A certain drug was administered to 500 people to test its efficacy against typhoid out of a total of 800. The results are given below :

	Typhoid	No typhoid	Total
Drug	200	300	500
No drug	280	20	300
	480	320	800

Test the hypothesis that the drug is not effective in preventing typhoid. Given : $\chi^2_{0.05}(1) = 3.84$.

Or

(b) The following data indicate the life time in hours of samples of two kinds of light bulbs :

Brand A : 603 625 641 622 585 593 660 600 633 580 615 648

Brand B : 620 640 646 620 652 639 590 646 631 669 610 619

Use Mann-Whitney U test to compare the lifetimes of two brands. Given critical value of U at 5% level of significance = 37.

19. (a) A decision maker is faced with three decision alternatives and four states of nature as shown below :

	State of nature			
Acts	S_1	S_2	S_3	S_4
A_1	16	10	12	7
A_2	13	12	9	9
A_3	11	14	15	14

Assuming that he has no knowledge of the probabilities of the state of nature, find the decision to be made under each of the following criteria :

(i) Maximin

(ii) Maximax

(iii) Minimax regret.

Or

(b) A marketing manager has to decide between advertising his product on a national level and not advertising it. If the advertisement is successful the company will gain Rs. 5 crore. But if the advertisement is not successful, the company will incur a loss of Rs. 3 crore. No cost is attached for not taking a decision. He thinks that there is a 0.6 probability for the advertisement to become successful.