

INDIAN MARITIME UNIVERSITY
(A Central university, Government of India)
December 2017 End Semester Examination
M. Tech (Marine Engineering & Management)
First Semester

Statistics for Business Managers (PG13T1106)

Date: 09.12.2017

Time: 3 Hrs

Maximum Marks: 100

Pass Marks: 50

Note: Answer any five questions. All questions carry equal marks.
(5 x 20 Marks = 100)

1 (a) Answer each question by selecting the right choice. 1 X 10 =10

a.1 A student's overall performance is measured in the scale : **very poor , poor, fair, good, very good and excellent**. Identify correctly the scale of measurement for the overall performance.

- A. Nominal
- B. Interval
- C. Ratio
- D. Ordinal

a.2 When data are not available from existing sources, attempts are made to collect data from primary sources by controlling variables of interest. Such studies are known as :

- A. Population studies
- B. Categorical studies
- C. Experimental studies
- D. Observational studies

a.3 The Pareto law is a "80-20 law". It states :

- A. Only 20 percent of categories dictates 80 per cent sample
- B. Only 80 percent of categories dictates 80 per cent sample
- C. Only 20 percent of categories dictates 20 per cent sample
- D. None of the above

a.4 The median value of 88, 72, 33.29,70, 86,54,91,61, and 57 is given by :

- A. 61
- B. 70
- C. 65.5
- D. 66

a.5 The heights of 50 students are measured in inch. The sample variance of their heights is found to be 1.8402 sq. inch . Given that 1 inch = 2.54 cm, the sample variance of their heights in sq. cm is :

- A. 1.8402 sq cm
- B. 4.6741 sq. Cm
- C. 11.8722 sq.cm
- D. 2.9328 sq.cm

a.6 The best measure to compare the reliability of two brands of CFL lamps is to compare their respective

- A. Mean lengths of life of two samples
- B. Sample standard deviations of lengths of life of two samples
- C. Mode lengths of life of two samples
- D. Coefficient of variations in lengths of life of two samples

a.7 It is a good idea to check for outliers in the sample observations before making any data analysis. Outliers are best identified by Z-scores of sample observations which fall in one of the following categories.

- A. Z- scores ≥ -3 and Z- scores ≤ 3
- B. Z- scores ≤ -3 and Z- scores ≤ 3
- C. Z- scores ≤ -3 and Z- scores ≥ 3
- D. Z- scores ≥ -3 and Z- scores ≥ 3

a.8 The following data are obtained at OPD of a hospital.

Number of patients waiting at 9 AM for OPD service	0	1	2	3	4
Number of days	2	5	6	4	3

The probability that at most three patients waiting at OPD is given by

- A. 3/20

- B. 4/20
- C. 13/20
- D. 17/20

a.9 A lot of spare parts contains 10 items of which 3 are defective. Three items are chosen from the lot at random one after another without replacement. The probability that all the items chosen are defective is given by :

- A. 1/20
- B. 3/10
- C. 2/9
- D. 1/8

a.10 Let X and Y be the number of workers getting injured at Site A and Site B respectively where X and Y are independent and binomially distributed respectively with Bin (n, p) and Bin (m,p) , $0 \leq p \leq 1$. The expected value of X+Y i.e E(X+Y) is given by :

- A. mnp
- B. (m/n)p
- C. (m+n)p
- D. (m-n)p

1 (b)

b.1 It is known that 40% of the students in a certain college are girls and 50% of the students are above the median height. If 2/3 of the boys are above the median height, what is the probability that a randomly selected student who is below the median height is a girl? 5

b.2 Discuss with examples applications of statistics in business and economy. 5

2 (a) In a manufacturing facility , there are three plants producing 50%, 30% and 20% respectively of total production. Out of the items produced by Plant 1, 4% are defective. Similar percentages for Plant 2 and Plant 3 are 5% and 3 % respectively. An item is picked up at random from the production line. Find the probability that the item picked up is defective. Given that this item is defective, what is the probability that that the item has been produced by the Plant 2? 10

2 (b) The annual fest is arranged on a particular day. The weather forecast suggests that there is a 70% chance of rain on that day. If it

rains, the probability of good fest is 0.2 while if it does not, probability is 0.9 .

(A) What is the probability that the fest will be good ?

(B) If the fest is good, what is the probability that it does not rain on that day ? 10

3 (a)

a.1 In a box there are 50 envelopes of which 20 are airmail and 16 are stamped. Moreover, there are 15 envelopes, which are ordinary and unstamped. One envelope is drawn at random from the box. Find the probability that it is a stamped airmail envelope. 5

a.2. There are two boxes, 1st containing 3 white and 7 black balls and 2nd containing 7 white and 3 black balls. One ball is chosen at random from the 1st box and placed in the 2nd box. Then one ball is chosen at random from the 2nd box. Given that this ball is white, find the conditional probability that the ball drawn from the 1st box is also white. 5

3 (b) The following data have been collected from the last National Election based on random sample:

Voting pattern	Age		
	→ Young	Middle-aged	Old
Right of Centre	12	55	31
Centrist	25	52	23
Left of Centre	33	47	22

Test at 5% level of significance to decide if the age and voting pattern are independent. It is given that 5% value of Chi-square for 4 and 9 degrees of freedom are 9.488 and 16.919 respectively. 10

4 (a)

a.1 The number of ships arriving at a dock per day follows a Poisson distribution with $\lambda = 2$. The dock on the other hand handles at most 3 ships per day. Find the expected number of ships handled by the dock on a randomly selected day. 5

a.2 A manufacturer claims that 95% of the equipment manufactured by the company conforms to the specifications. An examination of a sample of 200 pieces of equipment reveals that 18 are faulty. Test his claim at a significance level of 5% [$Z_{0.05} = 1.645$]. 5

4 (b) IQ scores of 10 students before they are subjected to a change of diet and after a lapse of 6 months are recorded below. Test whether there has been any significant change in IQ scores as a result of the diet.

IQ scores before diet :	59	62	48	64	52	47	38	51	39	41
IQ scores after diet :	65	70	49	67	55	48	41	49	43	39

[$t_{9,0.05} = 1.833$; $t_{9,0.025} = 2.262$] 10

5 (a) Estimate the regression parameters α and β in the linear model $Y = \alpha + \beta X + e$, using the Ordinary Least Square method (OLS), where X and Y are bi-variate samples of size n and e's are independent and having a normal distribution with mean 0 and variance σ^2 . 10

5 (b)

(b.1) Define the Pearson correlation coefficient. 2

(b.2) Define the Spearman rank correlation coefficient. 2

(b.3) Estimate the linear regression line Y on X with R^2 and standard error for the following data. 6

Restaurant	1	2	3	4	5	6	7	8	9	10
Student Population ('000s) (X)	2	6	8	8	12	16	20	20	22	26
Sales of Pizzas ('000s) (Y)	58	105	88	118	117	137	157	169	149	202

6. Write short notes on any three of the following: 20

(a) Forecasting and important methods,

(b) Consumer price index in India,

(c) Exponential smoothing- measurement of trends,

(d) Stratified random sampling and cluster sampling

7 (a) An experiment was conducted to determine whether any significant differences existed in the strength of parachutes which were woven by four suppliers. Five sample parachutes were manufactured by each of Supplier 1, Supplier 2, Supplier 3 and Supplier 4. The strength of the parachutes is measured on a tensile-strength scale where the larger the value, the stronger the parachute. The data are given below.

Test if the population mean tensile strength are same for the parachutes woven by the four suppliers with the help of ANOVA.

SUPPLIER 1	SUPPLIER 2	SUPPLIER 3	SUPPLIER 4
18.5	26.3	20.6	25.4
24.0	25.3	25.2	19.9
17.2	24.0	20.8	22.6
19.9	21.2	24.7	17.5
18.0	24.5	22.9	20.4

[$F_{3,16;0.05} = 3.2389$]

10

7 (b) In an examination, scores out of 100 marks are having normal distribution. It is known that 10% of students get 80% or more. While 20% of them fail, i.e score below 40. [Given $P(Z\text{-score} \geq 1.81) = 0.4649$]

(A) Find mean and standard deviation of the distribution of scores,

(B) Find the percentage of students who obtained 90 or more.

10

8 (a) ABC manufacturing company must decide whether to manufacture a component part at its plants or purchase the component from suppliers. The resulting profit depends upon the demand for the component part. The following pay off table shows the projected profit in some units.

Decision Alternatives	State of nature		
	Low demands S_1	Medium demands S_2	High demands S_3
Manufacture d_1	-20	40	100
Purchase d_2	10	45	70
Probabilities	$P(S_1) = 0.35$	$P(S_2) = 0.35$	$P(S_3) = 0.30$

a.1 Draw a decision tree and compute expected values to recommend a decision.

5

8 (b) Further, a test market study of the potential demand for the component part is expected to report either a favourable report (F) or unfavourable report (UF) condition. The relevant conditional probabilities are given below.

$$P(F | s_1) = 0.10 ; P(F | s_2) = 0.40 ; P(F | s_3) = 0.60 ;$$

$$P(UF | s_1) = 0.90 ; P(UF | s_2) = 0.60 ; P(UF | s_3) = 0.40 ;$$

b.1 Compute posterior branch probabilities under favourable and unfavourable market conditions separately using Bayes' theorem and also indicate the probabilities of favourable market and unfavourable market report. 4

b.2 Draw a decision tree with branches under market study and no market study. 4

b.3 Compute expected values (EV) at all chance nodes and decision nodes of the decision tree 4

b.4 State the decision strategy of the company. 3
