

**Second Year Bcom - Semester IV**  
**MAY/JUNE SUPPLEMENTARY EXAMINATION 2017**  
**STATISTICAL TECHNIQUES**

**Duration: 2 hours**

**Max. Marks: 80**

- Instructions:** 1) All questions are compulsory (choice is internal)  
 2) Start each new question on a fresh page  
 3) Figures to the right indicate full marks  
 4) Programmable Calculators not allowed  
 5) Log tables and graph papers will be supplied on request.

**Q.1 Attempt the following:**

- a) State the meaning of correlation. (3)
- b) The probability that an evening student will graduate is 0.4, Determine the probability that out of 5 students 1) none will graduate and 2) At least one will graduate (6)
- c) Two guns A and B fire at a moving target. The probability that A would hit the target in a single shot is  $\frac{2}{5}$  and that of B is  $\frac{1}{3}$ . Find the probability that the target is hit if both the guns fire a shot each simultaneously and independently. (7)

**OR**

**Q.I Attempt the following:**

- x) What is regression? (3)
- y) The average no. of customers, who appear at the counter of a bank in one minute is 2. Find the probability that in a given minute 1) No customer appears 2) At most 2 customers appear ( $e^{-2} = 0.135$ ) (6)
- z) The odds in favour of A solving a problem are 2:3 and odds against B solving the problem are 3:5. If both A and B attempt the problem independently, find the chance that the problem is solved. (7)

**Q.2 Attempt the following:**

- a) State and prove the addition theorem. (3)
- b) For the following data calculate Karl Pearson coefficient of correlation. (6)

$x$	10	12	15	17	19	7
$y$	12	15	16	18	24	42

- c) Eight samples of size 4 each are drawn, the mean and the range of each sample is given below. Find the CL, UCL and LCL. Also draw control chart of mean and comment. ( $A_2 = 0.72$  for sample of size 4). (7)

Sample	$S_1$	$S_2$	$S_3$	$S_4$	$S_5$	$S_6$	$S_7$	$S_8$
Mean	1.35	2.51	1.8	2.39	1.48	2.11	1.5	1.71
Range	0.3	0.5	0.4	0.6	0.3	0.7	0.5	0.4

**OR**

**Q.II Attempt the following:**

- x) Define 1) Probability of an event 2) Complementary events. (3)
- y) The following data are given for marks in subjects A and B in a certain examination. (6)

	A	B
Mean Marks	36	85
S.D.	11	8

Coefficient of correlation between A and B = 0.66

- 1) Determine the two equations of regression.
- 2) Calculate the expected marks in A corresponding to 75 marks obtained in B.



- z) The following are the range of 10 samples each of size 5. Calculate the control limits for the range chart and state whether the process is in control or not. (7)

(Given  $D_3 = 0, D_4 = 2.115$  for the sample of size 5)

Sample:	1	2	3	4	5	6	7	8	9	10
Range:	0.3	0.4	0.2	0.4	0.1	0.1	0.8	0.5	0.3	0.5

**Q.3 Attempt the following:**

- a) Write a short note on simple random sampling. (3)  
b) Obtain the most likely value of  $x$  by fitting the regression line. (6)

X:	2	3	?	10	11	14
Y:	18	17	15	13	16	11

- c) A sample of 600 persons selected randomly from a large city gives the results that males are 53%. Is there a reason to doubt the hypothesis that males and females are in equal no. in the city. Also find the 99% of confidence limits for the population proportion. (7)

OR

**Q.III Attempt the following:**

- x) Distinguish between census and sample survey. (3)  
y) Find the Karl Pearson coefficient of correlation of the following data: (6)

$$\sum x = 30, \sum y = 180, \sum xy = 1000, \sum x^2 = 200, \sum y^2 = 5642, n = 6$$

- z) i) A process is in control when the average amount of instant coffee that is packed in a jar is 100gms and S.D. is 5 gms. A sample of 100 jars is selected at random and sample mean is found to be 102 gms. Test the hypothesis at 5% level of significance. (4)  
ii) In an effort to estimate the mean spend per customer for dinner in a hotel, data were collected for a sample of 49 customer with mean = 124 Rs. and S.D. = 25 Rs. Find the 95% confidence limit for population mean. (3)

**Q.4 Attempt the following:**

- a) Define the probability function of binomial distribution. What is mean and variance of binomial distribution. (3)  
b) Find the 2 regression equation for the following data. (6)

$$\sum x = 30, \sum y = 180, \sum xy = 1000, \sum x^2 = 200, \sum y^2 = 5642, n = 6$$

- c) The no. of defects in the six samples of a certain product is given below. Find the control limits and draw the control chart for C. Also state whether the system is in control. (7)

Samples:	$S_1$	$S_2$	$S_3$	$S_4$	$S_5$	$S_6$
Faults:	4	3	11	1	2	3

OR

**Q.IV Attempt the following:**

- x) State the properties of Normal distribution. (3)  
y) Obtain the rank correlation coefficient for the following data: (6)

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

- z) The following data refers to the no. of defectives in 10 samples of 100 items each. Construct appropriate control chart and interpret the control limits. (7)

Samples No.:	1	2	3	4	5	6	7	8	9	10
No. of defectives:	4	8	11	3	11	7	7	16	12	6

Q.5 Attempt the following:

- a) Explain the terms 1) type I and 2) Type II errors. (3)
- b) The probability that a car passing through a certain junction will have an accident is 0.00005. Among 10,000 cars that pass the junction on a given day, find the probability that 1) 2 cars meet with an accident 2) At least one car meet with an accident ( $e^{-0.5} = 0.607$ ) (6)
- c) i) Find the mean and variance for the following: (4)

$X:$	0	1	2
$P(X):$	$\frac{1}{4}$	$\frac{1}{2}$	$\frac{1}{4}$

ii)  $\bar{x} = 23, \bar{y} = 35, \sigma_x = 2, \sigma_y = 3, \gamma_{xy} = 0.6$ , Estimate  $y$  when  $x = 20$  and  $x$  when  $y = 38$  (3)

OR

Q.V Attempt the following:

- x) Explain the concept of confidence interval. (3)
- y) 10,000 Light bulbs with a mean life 120 days are installed in a firm. Their length of life is normally distributed with a S.D. of 20 days. How many bulbs will expire in 1) less than 90 days 2) between 90 to 150 days  
(Area under the standard normal curve for  $t = 0$  to  $t = 1.5$  is 0.4332). (6)
- z) i) Two cards are drawn from a pack of 52 cards.  $X$  denotes the no. of king card drawn. Find the probability distribution and expectation. (4)
- ii) The marks of 8 candidates in Mathematics and English are given below, find the Spearman's rank correlation. (3)

Mathematics	76	90	98	69	54	82	67	52
English	25	37	56	12	7	36	23	11