Jagan Institute of Management Studies
End-Term Examination, December, 2016 – January, 2017
Trimester II – PGDM (IB) 2016-18

Quantitative Techniques II
ET_IB_QT-II_0201

Time: 3 Hrs.   *M. Marks: 70*

INSTRUCTIONS: Attempt any FIVE questions including Q1 & Q7 which are compulsory.

Q 1   Comment on any **FOUR** of the following:
  a)   Type-I and Type-II errors.
  b)   "The backbone of inferential statistics is the Central Limit Theorem".
            Explain the statement and write the Central Limit Theorem.
  c)   Probability Distributions and explain Binomial Distribution
  d)   What is the probability of i) drawing a black Knight in a draw from a
            pack of 52 cards ii) An urn contains Fiver blue balls and Six white balls.
            Find the probability of a blind man obtaining one blue ball in a single
            draw. iii) if two dices are thrown what is the probability of throwing two
            fives iv) what is the probability of not throwing a total of 11.
  e)   The two bottling plants are supposed to fill 5 liters of water in each
            bottle. A researcher has taken a random sample and collected the
            following data:

	Bottling Plant A	Bottling Plant B
Mean	5.01	5.01
Sample Std. dev.	2.24	1.24
N	10	15

            At the 0.05 level of significance, is the variability of Bottling Plant A
            significantly higher than variability of Bottling Plant B? Assume that
            the populations are normally distributed. (F value = **2.65** with 9 degree
            of freedom in Numerator and 14 degree of freedom in denominator).
  f)   The parents of students staying in PG accommodation are inquisitive
            about the amount spent on food by students. They requested the
            coordinator at JIMS. The coordinator randomly samples 42 students and
            found that the amount spent is Rs. 180 with a standard deviation of
            Rs.15. What is the point estimate of the amount spent by PG Students
            on food? Construct a 99% confidence interval to estimate for the
            amount spent by students. ($P(z=2.57)= 0.495$).   **16**

Q 2 a)   The details of survey results by Hotel Windsor amongst men and
             women are as follows:

RATING	WOMEN	MEN	TOTAL
EXCELLENT	0.27	0.22	0.49
GOOD	0.14	0.1	0.24
AVERAGE	0.06	0.12	0.18
POOR	0.03	0.06	0.09
TOTAL	0.5	0.5	1

    i)   (a) What is the probability of getting an "Excellent" Rating?
          (b) What is the probability that the rating is Excellent and a Woman gave the rating?
    ii)   What is the probability that the rating is "Poor" or "Men" gave the rating?
    iii) It is known that the rating was given by "Men" what is the probability that the rating was "Good".
    iv) It is known that the rating was given "Average" what is the probability that the rating was given by "Women".   **4**

b) At least 20% PGDM-IB students of JIMS go to college Canteen for Lunch. Suppose 6 students are selected. What is the probability that out of six students
    i)   At least 1 is going to the college Canteen
    ii)   less than 2 will be going to Canteen.
    iii) what is the mean of the process, variance and standard deviation of the process.   **4**

c) The average arrival of students to morning classes in JIMS Kalkaji is 3.78 students per 5 minute interval. ($e^{-3.78}$ = 0.0228) Assuming Poisson process find the probability of
    i)   One student coming to JIMS.
    ii)   At least two students coming to JIMS.
    iii) what is the mean of the process, variance and standard deviation of the process   **4**

Q 3 a) The amount of time devoted to studying statistics by students who achieve a grade of A in the course is normally distributed with a mean of 7.5 hours per week and a standard deviation of 2.1 hours per week.
    i)   What is the probability that the students studies for more than 10 hours per week
    ii)   What is the probability that the student is studying less than 3 hours per week.
    iii) What is the probability that the student is studying between 7 and 9 hours per week.
    iv) What is the time below which 99% of the students spend studying?
    v)   Above what time do 90% of the students spend studying?   **6**
Further given that

Z =	0.24	1.19	0.71	1.28	1.96	2.33	2.14	3
P(z) =	0.0940	0.3830	0.2624	0.3997	0.4750	0.4901	0.4839	0.4987

b) A medical statistician wants to estimate the average weight loss of people who are on a new diet plan. In a preliminary study, he guesses that the standard deviation of the population of weight losses is about 10 pounds. i) How large a sample should he take to estimate the mean weight loss to within 2 pounds with 90% confidence? (P(z=1.64)= 0.45) **3**

c) Maruti claims that its market share is 28%. How many cars should you sample so as to be within 0.1 of the true population proportion with a 95% confidence interval? (P(z=1.96)= 0.475) (2 Marks). If the error of estimate becomes 0.2 what is the new sample size. **3**

Q 4 a) Ronaldo is a high school basketball player. He is a 70% free throw shooter. That means his probability of making a putting the ball in the basket is 0.70. During the season, what is the probability that Ronaldo gets his third basket on his fifth shot? What is the mean and standard deviation of the negative binomial distribution? **3**

b) Suppose 18 major computer companies operate in India and that 12 are located in Bangalore. If three companies are selected randomly from the entire set, what is the probability that one or more of the selected companies are located in the silicon valley? **3**

c) During winters the arrival of planes at Bhuntar (Kullu) airport is Poisson distributed with an average arrival rate of 1.12 planes per hour. i) what is the probability that alteast two hours will elapse between plane arrivals($e^{-2.24}$ = 0.1064) ii) what is the probability of two planes arriving less than 10 min apart ($e^{-0.1867}$ = 0.8297) **3**

d) The distribution of a variable is as follows:

Number of Crisis	0	1	2	3	4	5
probability	0.37	0.31	0.18	0.09	0.04	0.01

Calculate the Expected value, variance and standard deviation of the random variable. **3**

Q 5 a) In a sample of of 400 people 350 were NEXTRA users. While in a sample of 300 people 221 were TIKONA Internet users. At 10% level of significance is there enough evidence to prove that the proportion of people using NEXTRA and TIKONA significantly differs. (P (z=1.64) = 0.45) **4**

b) In a preliminary study to determine whether the installation of a camera designed to catch cars that go through red lights affects the number of violators, the number of red-light runners was recorded for each day of the week before and after the camera was installed. These data are listed here can we infer at 5% level that the camera reduces the number of red-

light runners. (t value at 6 degree of freedom and 0.025 significance level = 2.447)

Day	Before	After
Sunday	7	8
Monday	21	18
Tuesday	27	24
Wednesday	18	19
Thursday	20	16
Friday	24	19
Saturday	16	16

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c) The Dean at JIMS believes that each faculty takes about 40 hours to complete the syllabus. He randomly samples 35 different faculties teaching in BBA (all semesters) and MBA (all semesters) and finds that the faculties take an average of 42.34 hours with a standard deviation of 2.33 hours. At 1% level of significance is there evidence to believe that the faculties take longer than 40 hours to complete the course. (P(z=2.33)= 0.49).

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Q 6 a) How would you explain the features of a good questionnaire design to your friend specializing in research?

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b) When the population is too large or too geographically dispersed, we are forced to take a sample. Explain the statement. Discuss the various probabilistic and non-probabilistic methods of sampling in detail stating the atleast one advantage and one limitations of each.

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Q 7 Attempt any **TWO** of the following:

a) A company has three manufacturing plants and the number of defectives produced by them is as follows. The company officials want to determine whether there is a difference in the defectives being produced by each plants. Perform a one-way ANOVA to determine whether there is a significant difference in the mean defectives produced at the three plants use alpha=0.01.

Plant 1	Plant 2	Plant 3
9	12	5
7	13	4
10	11	4
7	14	5
8	10	6

(F = 6.93 at 2 df in numerator and 12 df in denominator and at 0.01 significance level)

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b) Is there an association between the Type of College and the Income Group of the students Studying? Suppose students were randomly

selected from three types of colleges and universities and the data shown represent the result of a survey of those students. Use a Chi-Square test of independence to answer the question. Let alpha = 0.05 (Chi square value at 6 degree of freedom and 0.05 significance level is = 12.59)

Observed Frequencies				
	Type of College or University			
Income Group	**Community college**	**Large University**	**Small College**	**Total**
High Income	21	174	27	222
Medium Income	45	137	8	190
Low Income	27	50	4	81
Very Low Income	18	10	2	30
Total	111	371	41	523

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c) i) To test whether the average expenditure on house hold items in between people residing in North Delhi and South Delhi. A researcher takes a sample of 8 families from North Delhi and finds that their average spending is on house hold items is Rs. 1541 per week with a standard deviation of Rs. 47.23. While the data from 9 families in South Delhi revealed the mean spending to be Rs. 1441 with a standard deviation of Rs. 57.23. At 5% level of significance is there enough evidence to believe that the average spending is higher of families of North Delhi. (t value at 15 degree of freedom and 0.05 significance level = 1.753).

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ii) Explain why study of probability is important. Explain how probabilities are assigned to events. For the following events indicate which method you would use to assign probabilities i) finding the probability to get 4 in a single throw of a dice ii) the probability of finding a left handed students studying in JIMS iii) The probability that 100% of the houses will be sold in one year if a Housing Complex is constructed.

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