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**Question Paper Code : 55102**

M.B.A. DEGREE EXAMINATIONS, NOVEMBER/DECEMBER 2025.

First Semester

MB 25C01 — STATISTICS FOR MANAGEMENT

(Common to Master of Business Administration (Artificial Intelligence and Data Science)/Master of Business Administration (Business Analytics))

(Regulations 2025)

Time : Three hours

Maximum : 100 marks

Statistical tables may be permitted.

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Let  $A_1$  and  $A_2$  be independent events such that  $P(A_1) > 0$  and  $P(A_2) > 0$ . Show that these events are not mutually exclusive.
2. What is a discrete random variable? Give a suitable example.
3. State the Central Limit Theorem.
4. How do point estimates differ from interval estimates in statistics?
5. In hypothesis testing, is there any situation where both Type I and Type II errors occur together? Give reason.
6. Give an example of a situation where a non-parametric test is preferred over a parametric test.
7. What is the purpose of the Mann-Whitney U rank sum test?
8. Distinguish between positive and negative correlation.
9. Does zero correlation always mean there is no regression relationship? Justify.
10. Why is storytelling important in business analytics?

PART B — (5 × 13 = 65 marks)

11. (a) A doctor has decided to prescribe two new drugs to 200 heart patients as follows: 50 get drug A, 50 get drug B, and 100 get both. The 200 patients were chosen so that each had an 80 percent chance of having a heart attack if given neither drug. Drug A reduces the probability of a heart attack by 35 percent, drug B reduces the probability by 20 percent, and the two drugs, when taken together, work independently. If a randomly selected patient in the program has a heart attack, what is the probability that the patient was given both drugs? Also, use a tree diagram, to illustrate the above by showing each treatment group and the corresponding probability that a patient experiences a heart attack.

Or

- (b) Anushree Saxena has created a self-paced training program. The time it takes for an employee to complete this program follows a normal distribution with a mean (average) of 44 days and a standard deviation of 12 days.
- (i) What are the chances that a randomly selected employee completes the program in a time that is more than 33 days but less than 42 days? (4)
- (ii) What is the likelihood that an employee finishes the program in under 30 days? (4)
- (iii) What is the probability that an employee takes either less than 25 days or more than 60 days to finish? (5)
12. (a) Jonida Martinez, researcher for the Brown Beans Coffee Corporation, is interested in determining the rate of coffee usage per household in India. She believes that yearly consumption per household is normally distributed with an unknown mean  $\mu$  and a standard deviation of about 1.25 pounds.
- (i) If Jonida Martinez takes a sample of 36 households and records their consumption of coffee for one year, what is the probability that the sample mean is within one-half pound of the population mean?
- (ii) How large a sample must she take in order to be 98 percent certain that the sample mean is within one-half pound of the population mean?

Or

(b) Adhitya, an industrialist, was accumulating normal times for various tasks on a labor-intensive assembly process. This process included 300 separate job stations, each performing the same assembly tasks. She sampled seven stations and obtained the following assembly times for each station : 1.9, 2.5, 2.9, 1.3, 2.6, 2.8 and 3.0 minutes.

(i) Calculate the mean assembly time and the corresponding standard deviation for the sample. (4)

(ii) Estimate the population standard deviation. (4)

(iii) Construct a 98 percent confidence interval for the mean assembly time. (5)

13. (a) Richardson, the Dean of Students at Midstate College, is wondering about grade distributions at the school. He has heard grumblings that the GPAs in the Business School are about 0.25 lower than those in the College of Arts and Sciences. A quick random sampling produced the following GPAs.

Business : 2.86 2.77 3.18 2.80 3.14 2.87

Art and sciences : 3.35 3.32 3.36 3.63 3.41 3.37

Business : 3.19 3.24 2.91 3.00 2.83

Art and sciences : 3.45 3.43 3.44 3.17 3.26

Do these data indicate that there is a factual basis for the grumblings? State and test appropriate hypotheses at  $\alpha = 0.02$ .

Or

(b) The following data show the number of claims processed per day for a group of four insurance company employees observed for a number of days. Test the hypothesis that the employees' mean claims per day are all the same. Use the 0.05 level of significance.

Employee 1 : 15 17 14 12

Employee 2 : 12 10 13 17

Employee 3: 11 14 13 15 12

Employee 4 : 13 12 12 14 10 9

14. (a) To see whether silicon chip sales are independent of where the U.S. economy is in the business cycle, data have been collected on the weekly sales of Zippy Chippy, a Silicon Valley firm, and on whether the U.S. economy was rising to a cycle peak, at a cycle peak, falling to a cycle trough, or at a cycle trough. The results are:

Economy	Weekly Chip Sales		
	High	Medium	Low
At peak	20	7	3
At trough	30	40	30
Rising	20	8	2
Falling	30	5	5

Perform a Chi-Square Test of Independence to determine if Zippy Chippy's weekly silicon chip sales are independent of the U.S. economy's business cycle at 0.10 level of significance.

Or

- (b) Use the sign test to see whether there is a difference between the number of days required to collect an account receivable before and after a new collection policy. Use the 0.05 significance level.

Before : 33 36 41 32 39 47 34 29 32 34 40 42 33 36 29

After : 35 29 38 34 37 47 36 32 30 34 41 38 37 35 28

15. (a) Professor Nihar is interested in determining whether his brightest students (those making the best grades) tend to turn in their tests earlier (because they can recall the material faster) or later (because they take longer to write down all they know) than the others in the class. For a particular physics test, he observes that the students make the following grades in order of turning their tests in:

Order	Grades										
1-10	94	70	85	89	92	98	63	88	74	85	
11-20	69	90	57	86	79	72	80	93	66	74	
21-30	50	55	47	59	68	63	89	51	90	88	

- (i) If Professor Nihar counts those making a grade of 90 and above as his brightest students, then at a 5 percent level of significance, can he conclude the brightest students turned their tests in randomly? (8)
- (ii) If 60 and above is passing in Professor Newton's class, then did the students passing versus those not passing turn their tests in randomly? (Also use the 5 percent significance level.) (5)

Or

- (b) What is data-driven storytelling? Explain its role in business analytics. Illustrate with an example how dashboards and visualizations (charts, KPIs, slicers) can help communicate insights to stakeholders.

PART C — (1 × 15 = 15 marks)

16. (a) A mail-order gift company has the following sample data on dollar sales, separated according to how the order was paid. Test the hypothesis that there is no difference in the dollar amount of orders paid for by cash, by check, or by credit card. Use the Kruskal-Wallis test with a 0.05 significance level

Credit-card orders :	78	64	75	45	82	69	60
Check orders :	110	70	53	51	61	68	
Cash orders :	90	68	70	54	74	65	59

Or

- (b) Sales of major appliances vary with the new housing market: when new home sales are good, so are the sales of dishwashers, washing machines, driers, and refrigerators. A trade association compiled the following historical data (in thousands of units) on major appliance sales and housing starts:

Housing Starts (thousands)	Appliance Sales (thousands)
2.0	5.0
2.5	5.5
3.2	6.0
3.6	7.0
3.3	7.2

Housing Starts (thousands)      Appliance Sales (thousands)

4.0	7.7
4.2	8.4
4.6	9.0
4.8	9.7
5.0	10.0

- (i) Develop an equation for the relationship between appliance sales (in thousands) and housing starts (in thousands). (5)
- (ii) Interpret the slope of the regression line. (5)
- (iii) Compute and interpret the standard error of estimate. (5)
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