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Daffodil International University

Department of Electrical and Electronic Engineering

Faculty of Engineering

Final Examination, Fall – 2025

Course Code: 0542 221
Section: A,B,C
Full Marks: 40

Course Title: Probability and Statistics
Level-Term: L2-T2
Exam Date: Dec 22, 2025

Teacher's Initial: JA
Time: 2.00 Hours

*** ***Answer all of the following questions sequentially.***

[The figures in the right-hand margin indicate marks allocated for that question.]
[COs represent learning outcomes of the course.]
[All the symbols carry their usual meaning.]

Q1. While characterizing an LED, students measure forward voltage at different heats to study thermal effects. CO-3 C(3) 7

Temperature (°C)	20	30	40	50	60	70
Forward voltage (V)	2.10	2.06	2.02	1.98	1.94	1.90

i) **Calculate** the correlation coefficient and interpret the result.
ii) **Interpret** the meaning of r^2=96.7% in this study.

Q2. An Electrical Engineering student measures the core temperature of an induction motor at different supply voltages. CO-2 C(4) 8

Voltage(V)	20	35	50	65	80
Temperature (°C)	30	43	56	69	82

i. **Illustrate** the scatter plot.
ii. **Calculate** the estimated regression model.
iii. **Explain** the value β_0 and β_1.
iv. **Conclude** the motor temperature at 90 V.

Q3.a) In a power electronics lab, the failure of voltage regulators occurs randomly. On average, 2 voltage regulators fail per week during testing. CO-3 C(3) 5

Apply an appropriate probability distribution, find the probability that:

i) No voltage regulator fails in a given week.
ii) More than 2 voltage regulators fail in a given week.
iii) At most 1 voltage regulator fails in a week.
iv) The expected number of voltage regulators that fail in a week.

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b) An EEE student is testing microcontrollers used in an embedded system project. Each microcontroller has a 15% chance of being defective during the initial quality test. The student tests 10 microcontrollers. CO-3 C(3) 5

Apply an appropriate probability distribution, find the probability that:

i) At least 8 microcontrollers are non-defective.

ii) At most 1 microcontroller are non-defective.

iii) Determine the expected number of microcontrollers that are non-defective.

Q4. An EEE engineer is testing a power supply unit under extreme conditions. The circuit can experience: CO-3 C(3) 7

Event C: Overvoltage and **Event D:** Overcurrent

The probability of overvoltage is 0.30. The probability of overcurrent is 0.40.

The probability of overvoltage given that overcurrent occurs is 0.5.

i) **Solve** the joint probability $P(C \cap D)$.

ii) **Identify** the probability that at least one of the events occurs.

iii) **Identify** the probability that an overcurrent occurs given that overvoltage has occurred.

iv) **Discover** whether C and D are independent.

Q5. An EEE student measures the resistance of 12 identical resistors produced in a lab. The resistances (in ohms) are: CO-3 C(3) 8

98,102,100,101,99,97,103,100,101,99,98,102

The manufacturer claims that the average resistance should be 101 ohms.

Apply an appropriate test at 5% significance level, determine whether the resistors produced in the lab meet the manufacturer's claim.

Using t-table,
$t_{0.025,\,11} = 2.20$