



Daffodil International University
Department of Electrical and Electronic Engineering
Faculty of Engineering
Final Examination, Spring – 2026

Course Code: 0542 221

Section: A,B,C,D,E

Full Marks: 40

Course Title: Probability and Statistics

Level-Term: L2-T2

Exam Date: April 28, 2026

Teacher's Initial: JA

Time: 2.00 Hours

*****Notes: Answer all the questions sequentially. The second right most column indicates the course outcomes(COs) with respective Bloom's level and the right most column indicates the allocated marks.**

Q1. An Electrical Engineering student studies how transformer efficiency changes with load: CO-2 10

Load (%)	20	40	60	80	100
Efficiency (%)	70	78	85	90	93

C(4)

- Analyze the correlation by drawing the scatter plot.
- Calculate the estimated regression model.
- Explain the value β_0 and β_1 .
- Conclude the transformer efficiency when the load is 110%.

Q2. A survey was conducted among 150 Electrical and Electronic Engineering students CO-3 10
regarding their preference for Electric Vehicles (EV Systems) and Hybrid Systems. The C(3)
students belong to three specialization groups:

Group	EV Systems	Hybrid Systems
Power Electronics	35	15
Control Systems	25	30
Communication Systems	20	25

50

55

45

- Solve the probability that a randomly selected student prefers EV Systems.
- Calculate the probability that a student belongs to the Control Systems group.
- Identify the probability that a student is from the Communication Systems group and prefers Hybrid Systems.
- Compute the probability that a student is from the Power Electronics group given that they prefer EV Systems.
- Identify the probability that a student is either from the Control Systems group or prefers Hybrid Systems.
- Identify whether the preference for EV Systems and Hybrid Systems are independent events.

80

70

150

Q3.a. An EEE student is monitoring the failure rate of electrical components in a power CO-3 5 distribution system. 20 components are reviewed every hour, and the probability of a C(3) component failing during inspection is 8%. Apply an appropriate distribution to find the probability that,

- i) No component failures occur in an hour?
- ii) At most 2 component failures occur in an hour?
- iii) More than 2 component failures occur in an hour?
- iv) The expected number of component failures in a 10-hour inspection period?

b. An Electrical Engineering student is analyzing the voltage output of a regulated power CO-3 5 supply. The voltage follows a normal distribution with average value 220V and variance 9 C(3) V^2 .

For safe operation, the voltage must remain between 215V and 225V. Using an appropriate distribution, Calculate:

- i) The probability that voltage exceeds 225 V.
- ii) The percentage of readings within the range 215 V to 225 V.
- iii) If 1000 measurements are recorded, estimate how many are unsafe.

Using the standard normal table,
 $P(Z < 1.67) = 0.9525$
 $P(Z < -1.67) = 0.0475$

Q4. An Electrical and Electronic Engineering (EEE) researcher is comparing the current output CO-3 10 of two different solar panel types under identical sunlight conditions. The output current (in C(3) mA) is recorded for both panels during a fixed testing period. The collected sample data is as follows:

- Solar Panel Type A (Monocrystalline): {5.8, 6.0, 5.9, 6.1, 6.2, 5.9, 6.0, 6.1}
- Solar Panel Type B (Polycrystalline): {5.4, 5.5, 5.6, 5.5, 5.7, 5.4, 5.6, 5.5, 5.6}

State null and alternative hypotheses. Apply two-sample t-test (assuming equal variances) at 5% level of significance to determine whether there is a statistically significant difference in the average current output between Solar Panel Type A and Solar Panel Type B.

Using t-table,
 $t_{0.025, 15} = 2.13$