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Daffodil International University

Department of Electrical and Electronic Engineering

Faculty of Engineering

Final Examination, Spring – 2026

Course Code: 0542 221 | Course Title: Probability and Statistics

Section: A,B,C,D,E | Level-Term: L2-T2 | Teacher's Initial: JA

Full Marks: 40 | Exam Date: April 28, 2026 | 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 C(4) 10

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

i. Analyze the correlation by drawing the scatter plot.

ii. Calculate the estimated regression model.

iii. Explain the value β_0 and β_1.

iv. Conclude the transformer efficiency when the load is 110%.

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

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

50
55
45

i) Solve the probability that a randomly selected student prefers EV Systems.

ii) Calculate the probability that a student belongs to the Control Systems group.

iii) Identify the probability that a student is from the Communication Systems group and prefers Hybrid Systems.

iv) Compute the probability that a student is from the Power Electronics group given that they prefer EV Systems.

v) Identify the probability that a student is either from the Control Systems group or prefers Hybrid Systems.

vi) Identify whether the preference for EV Systems and Hybrid Systems are independent events.

80 70 150

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

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 supply. The voltage follows a normal distribution with average value 220V and variance 9 V^2. CO-3 C(3) 5

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 of two different solar panel types under identical sunlight conditions. The output current (in mA) is recorded for both panels during a fixed testing period. The collected sample data is as follows: CO-3 C(3) 10

- 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,
$t_{0.025,15} = 2.13$

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