

(AUTONOMOUS)

MSc DEGREE EXAMINATION MAY 2026

(Third Semester)

Branch – STATISTICS

MAJOR ELECTIVE COURSE – I: BIOSTATISTICS AND EPIDEMIOLOGY

Time: Three Hours

Maximum: 75 Marks

SECTION-A (10 Marks)

Answer **ALL** questions

ALL questions carry **EQUAL** marks

(10 × 1 = 10)

Module No.	Question No.	Question	K Level	CO
1	1	Select the measure of central tendency is least affected by extreme values? a) Mean b) Median c) Mode d) Range	K1	CO1
	2	Show, the probability of getting exactly 2 heads in 3 tosses of a coin follows which distribution? a) Binomial b) Poisson c) Normal d) Exponential	K2	CO2
2	3	Match a 95% confidence interval for mean systolic BP is 118–132 mmHg. Which statement is correct? a) There is 95% chance that population mean lies in this interval b) 95% of sample means lie in this interval c) The population mean is exactly 125 mmHg d) None of the above	K1	CO2
	4	Select the suitable test to be used, compare means of two independent groups? a) Paired t-test b) Unpaired t-test c) McNemar's test d) Chi-square test	K2	CO3
3	5	Which type of correlation coefficient between BMI and cholesterol is 0.7. What does it indicate? a) Strong positive correlation b) Weak positive correlation c) Negative correlation d) No correlation	K1	CO3
	6	Relate, Logistic regression is used when the dependent variable is: a) Continuous b) Categorical (binary) c) Ordinal d) Count	K2	CO3
4	7	How study design is follows participants forward in time? a) Prospective b) Retrospective c) Cross-sectional d) Case-control	K1	CO1
	8	Demonstrate Absolute Risk Reduction (ARR) is calculated as: a) Risk in treatment group – Risk in control group b) Risk in control group – Risk in treatment group c) Risk ratio of two groups d) Odds ratio	K2	CO3

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5	9	Choose sensitivity of a test measures: a) Probability that disease is correctly detected b) Probability that healthy is correctly detected c) Probability of false positives d) Probability of false negatives	K1	CO4
	10	Classify the area under the ROC curve (AUC) indicates: a) Test's ability to discriminate between diseased and non-diseased b) Test's false positive rate c) Test's prevalence d) Sample size	K2	CO4

SECTION - B (35 Marks)

Answer **ALL** questions

ALL questions carry **EQUAL** Marks (5 × 7 = 35)

Module No.	Question No.	Question	K Level	CO												
1	11.a.	Experiment with a hospital records systolic blood pressure of 10 patients: 120, 125, 130, 135, 140, 125, 130, 135, 140, 145. Calculate the mean, median, and mode.	K3	CO1												
	(OR)															
	11.b.	Solve the mean, variance, and standard deviation, and comment on variability. A hospital records the number of patients admitted per day for a week: 5, 7, 8, 6, 10, 9, 7.														
2	12.a.	Distinguish between paired t-test and unpaired t-test with clinical examples.	K4	CO1												
	(OR)															
	12.b.	Compare a study measures systolic BP in two groups: Group A (mean=130, SD=10, n=20), Group B (mean=125, SD=12, n=25). Test whether the difference in means is significant (unpaired t-test).														
3	13.a.	Analyze the correlation coefficient (r) between height and weight. The heights (cm) and weights (kg) of 5 patients are: <table border="1"><tr><td>Height</td><td>160</td><td>165</td><td>170</td><td>175</td><td>180</td></tr><tr><td>Weight</td><td>55</td><td>60</td><td>65</td><td>70</td><td>75</td></tr></table>	Height	160	165	170	175	180	Weight	55	60	65	70	75	K4	CO2
	Height	160	165	170	175	180										
	Weight	55	60	65	70	75										
(OR)																
13.b.	Analyze and fit a simple linear regression line ($Y = a + bX$). The number of cigarettes smoked per day (X) and systolic BP (Y) in 6 patients: <table border="1"><tr><td>X</td><td>2</td><td>4</td><td>6</td><td>8</td><td>10</td><td>12</td></tr><tr><td>Y</td><td>118</td><td>120</td><td>125</td><td>130</td><td>135</td><td>138</td></tr></table>	X	2	4	6	8	10	12	Y	118	120	125	130	135	138	
X	2	4	6	8	10	12										
Y	118	120	125	130	135	138										
4	14.a.	Explain the purpose of randomization in clinical trials.	K5	CO3												
	(OR)															
	14.b.	Determine in a cross-sectional study of 100 patients, 40 are smokers. Among smokers, 12 have hypertension; among non-smokers (60), 6 have hypertension. Calculate prevalence ratio (PR) and odds ratio (OR).														
5	15.a.	Compare the Positive Predictive Value (PPV) and Negative Predictive Value (NPV)? Give clinical examples.	K5	CO4												
	(OR)															
	15.b.	Determine a diagnostic test for anemia was performed on 120 patients. Results: TP=30, FP=20, TN=50, FN=20. Calculate sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV), and interpret clinically.														

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SECTION -C (30 Marks)Answer **ANY THREE** questions**ALL** questions carry **EQUAL** Marks (3 × 10 = 30)

Module No.	Question No.	Question	K Level	CO												
1	16	Explain the scope and applications of biostatistics in clinical and public health research. Include: role of descriptive statistics, importance of sampling techniques and application of probability distributions	K3	CO1												
2	17	Analyze a paired study, pre-treatment glucose = 150, 145, 160, 155, 150; post-treatment glucose = 140, 138, 150, 145, 142. Test for significant reduction using paired t-test.	K4	CO2												
3	18	Assume a survival study follows 50 patients after cardiac surgery. Draw a Kaplan–Meier survival curve and explain how to calculate the median survival time.	K4	CO2												
4	19	Assess a cohort study reports to the following data: <table><tr><td>Group</td><td>Disease (+)</td><td>Disease (–)</td><td>Total</td></tr><tr><td>Exposed</td><td>40</td><td>60</td><td>100</td></tr><tr><td>Unexposed</td><td>20</td><td>80</td><td>100</td></tr></table> Calculate Relative Risk (RR), Odds Ratio (OR), Absolute Risk Reduction (ARR), and Risk Ratio (RRR). Interpret the results.	Group	Disease (+)	Disease (–)	Total	Exposed	40	60	100	Unexposed	20	80	100	K5	CO3
Group	Disease (+)	Disease (–)	Total													
Exposed	40	60	100													
Unexposed	20	80	100													
5	20	Explain ROC curve construction for a glucose test and how to choose the optimal cut-off. Construct a hypothetical table of sensitivity and specificity for at least 3 cut-off points..	K5	CO4												

Z-Z-Z

END

