Green University of Bangladesh

Department of Computer Science and Engineering

Final Examination (Make Up/ Overlap), Fall 2021

Course Code: MAT 201 **Course Title: Statistics and Complex Variables**

Full Marks: 40 **Time: 2 Hours**

*Answer all the following **FOUR** questions:*

[The values on the right-hand side indicate marks allocated for that question only and the [CO#] represents mapping of the question with one of the expected outcomes of the course.]

1.	(a)	State Cauchy's integral formula. Using the formula evaluate $\oint_c \frac{3zdz}{z+\frac{\pi}{2}} dz$;where c is the circle $\|z\| = 5$.	[CO1]	3
	(b)	If x is a symmetrical binomial variate such that $2P(x = 1) = P(x = 3)$; find the probability function of x and find the value of $P(x = 2)$ and $P(x \geq 1)$.	[CO1]	3
	(c)	State and prove Bayes' theorem.	[CO1]	4
2.	(a)	Find the modulus and argument of the following complex numbers: (i) $z = \frac{\sqrt{3}+i}{\sqrt{3}-i}$ (ii) $z = \frac{-2}{1+i\sqrt{3}}$	[CO1]	3
	(b)	In a survey of newspaper reader, it is found that 50% people read the Daily Prothom Alo, 45% people read the Daily Ittefaq, 40% people read the Daily Star, 25% Prothom Alo and Ittefaq, 10% Ittefaq and Daily Star, 16% Daily Star and Prothom Alo and 8% all the above. A person is selected at random. Find the probability that among the above-mentioned newspapers, the person i) reads at least one ii) reads none iii) reads only the Daily Star.	[CO1]	2
	(c)	Given that $\bar{x} = 20, \bar{y} = 15, \sigma_x = 4, \sigma_y = 3, r = 0.7$. Determine the two regression equations. Also find the value of y $when\ x = 24$?	[CO1]	2
	(d)	Sketch the region in z-plane represented by the set of points: (i) $Im\left(\frac{1}{z}\right) < \frac{1}{2}$ (ii) $1 < \|z + i\| \leq 2$	[CO1]	3

3.	(a)	State Cauchy Riemann equation. Verify that the Cauchy Riemann equations are satisfied for the following function: $$f(z) = \frac{1}{x + iy}$$	[CO1]	2
	(b)	Determine which equation are harmonic: i) $u = \frac{1}{2}\ln(x^2 + y^2)$ ii) $u = e^{-x}(xsiny - ycosy)$	[CO1]	2
	(c)	If $y - 4x - 2 - 0$, then find the coefficient of correlation between x and y?	[CO1]	2
	(d)	Suppose that the random variables $X\ and\ Y$ have a joint density function given by $$f(x,y) = \begin{cases} c(x + y - 2xy);\ 0 \le x \le 1; 0 \le y \le 1 \\ 0; otherwise \end{cases}$$ i) Find the value of c and ii) Find the marginal density function of x and y.	[CO1]	4
4.	(a)	A factory finds that on an average 20% of the bolts produced by a given machine will be defective for certain specified requirements. If 10 bolts are selected at random form the day's production of this machine, find the probability that i) Exactly 2 ii) 2 or more will be defective	[CO2]	5
	(b)	An aircraft emergency locator transmitter (ELT) is a device designed to transmit a signal in the case of a crash. The Altigauge Manufacturing Company makes 80% of the ELTs, the Bryant Company makes 15% of them, and the Chartair Company makes the other 5%. The ELTs made by Altigauge have a 4% rate of defects, the Bryant ELTs have a 6% rate of defects, and the Chartair ELTs have a 9% rate of defects (which helps to explain why Chartair has the lowest market share). i) If an ELT is randomly selected from the general population of all ELTs, find the probability that it was made by the Altigauge Manufacturing Company. ii) If a randomly selected ELT is then tested and is found to be defective, find the probability that it was made by the Altigauge Manufacturing Company.	[CO2]	5