



## Al5030: PROBABILITY AND STOCHASTIC PROCESSES

Quiz 7

DATE: 18 NOVEMBER 2024

Question	1	2	Total
Marks Scored			

## **Instructions:**

- Fill in your name and roll number on each of the pages.
- You may use any result covered in class directly without proving it.
- Unless explicitly stated in the question, DO NOT use any result from the homework without proof.

Fix a probability space  $(\Omega, \mathscr{F}, \mathbb{P})$ .

Assume that all random variables appearing in the questions below are defined with respect to  $\mathscr{F}$ .

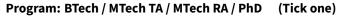
## 1. (2 Marks)

Fix  $n \in \mathbb{N}$ . Let X have the characteristic function

$$C_X(s) = \cos\left(\frac{s}{2^n}\right), \qquad s \in \mathbb{R}.$$

Determine the distribution of X.

Name: Roll Number: Department:





## 2. (3 Marks)

Let X,Y be random variables with means, variances, and moment generating functions  $\mathbb{E}[X],\mathbb{E}[Y]$ ,  $\mathrm{Var}(X),\mathrm{Var}(Y)$ , and  $M_X,M_Y$  respectively. Determine the mean, variance and moment generating function of random variables A,B,C, whose moment generating functions are defined below.

(a) 
$$M_A(t)=(M_X(t))^5$$
 for all  $t\in\mathbb{R}$ .

(b) 
$$M_B(t) = e^{6t} M_X(5t)$$
 for all  $t \in \mathbb{R}$ .

(c) 
$$M_C(t) = (M_X(t))^6 (M_Y(t))^5$$
 for all  $t \in \mathbb{R}$ .