

JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST -2 EXAMINATION- 2025

B. Tech.-III Semester (ECE/ECS/EEVLSI/MC)

COURSE CODE (CREDITS):25B11MA311 (4)

MAX. MARKS: 25

COURSE NAME: PROBABILITY AND RANDOM PROCESSES

COURSE INSTRUCTORS: SST

MAX. TIME: 1 Hour 30 Min

Note: (a) All questions are compulsory.

(b) The candidate is allowed to make suitable numeric assumptions wherever required for solving problems

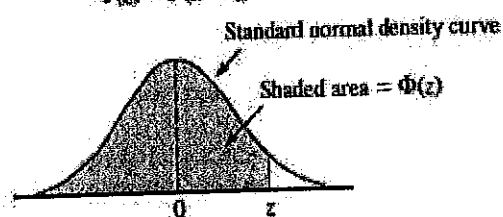
(c) Use of a scientific calculator is allowed.

Q. No.	Question	CO	Marks
Q1	Certain coded measurements of the pitch diameter of threads of a fitting have the probability density: $f_X(x) = \begin{cases} \frac{c}{\pi(1+x^2)}, & 0 < x < 1 \\ 0, & \text{else} \end{cases}$ a) Find the value of constant c b) Find the expected value of this random variable.	1	2+3
Q2	A block of 100 bits is to be transmitted over a binary channel with a probability of bit error of $p = 0.001$. a) What is the probability that three or more bits are received in error? b) Write the moment generating function for this distribution.	2	3+1
Q3	A Geiger counter counts the particles emitted by radioactive material. If the number of particles emitted per second by a particular radioactive material has a Poisson distribution with a mean of 10 particles, determine the following: a) The probability of at most 3 particles in one second. b) The probability of more than 1 particle in one second.	2	2+2
Q4	The life of a particular brand of batteries is exponentially distributed with a mean of 4 weeks. You just replaced the battery in your gadget with the particular brand. a) What is the probability that the battery life exceeds 2 weeks? b) Given that the battery has lasted 6 weeks, what is the probability that it will last at least another 5 weeks?	2	2+2

Q5	The annual rainfall in inches in a certain region has a normal distribution with a mean of 40 and variance of 16. What is the probability that the rainfall in a given year is between 30 and 48 inches?	2	2+2																										
Q6	The following data are the number of seeds germinating out of 10 on damp filter for 80 sets of seeds. Fit a binomial distribution to this data: <table><tr><td>x:</td><td>0</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td><td>8</td><td>9</td><td>10</td><td>Total</td></tr><tr><td>f:</td><td>6</td><td>20</td><td>28</td><td>12</td><td>8</td><td>6</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>80</td></tr></table>	x:	0	1	2	3	4	5	6	7	8	9	10	Total	f:	6	20	28	12	8	6	0	0	0	0	0	80	3	4
x:	0	1	2	3	4	5	6	7	8	9	10	Total																	
f:	6	20	28	12	8	6	0	0	0	0	0	80																	

Standard Normal Curve Areas

$$\Phi(z) = P(Z \leq z)$$



2.0	.9772	.9778	.9783	.9788	.9793	.9798	.9803	.9808	.9812	.9817
2.1	.9821	.9826	.9830	.9834	.9838	.9842	.9846	.9850	.9854	.9857
2.2	.9861	.9864	.9868	.9871	.9875	.9878	.9881	.9884	.9887	.9890
2.3	.9893	.9896	.9898	.9901	.9904	.9906	.9909	.9911	.9913	.9916
2.4	.9918	.9920	.9922	.9925	.9927	.9929	.9931	.9932	.9934	.9936
2.5	.9938	.9940	.9941	.9943	.9945	.9946	.9948	.9949	.9951	.9952