

Jaypee University of Information Technology, Waknaghat

Test-2 Examinations, October 2022

B.Tech - III Semester (CSE/IT)

Course Code/Credits: 18B11MA313/3  
 Course Title: Probability and Statistics  
 Course Instructors: RAD, SST

Max. Marks: 25

Max. Time: 90 minutes

**Instructions:** Answer all the questions. Define **random variables** along with range where applicable. Scientific calculators are allowed. Necessary statistical tables are supplied.

- A new computer virus can enter the system through e-mail or through the internet. There is a 30% chance of receiving this virus through e-mail, denoting the event as  $E$ . There is a 40% chance of receiving it through the internet - denote the event as  $I$ . Also, the virus enters the system simultaneously through e-mail and the internet with probability 0.15. What is the probability  $P(\bar{E} \cap \bar{I})$  that the virus does not enter the system at all? (3 Marks) [CO-1]
- Let  $X$  have a Poisson distribution with  $\mu = 100$ . Use Chebyshev's inequality to determine a lower bound for  $P(75 < X < 125)$ . (3 Marks) [CO-2]
- A program consists of 2 blocks. Compilation time for each block is exponentially distributed with the same parameter  $\lambda = 1 \text{ sec}^{-1}$ , and it is independent of the compilation of other blocks. Find the probability that the whole program compiles in less than 2.5 seconds. (4 Marks) [CO-2]
- Upgrading a certain software package requires installation of  $n=68$  new files. Files are installed consecutively. The *installation time* for a file is assumed to be normally distributed and, on average it takes 15 sec to install a file, with a variance of  $11 \text{ sec}^2$ . (5 Marks) [CO-3]
  - Find the probability that the whole package is updated in less than 16 minutes?
  - Currently a new version of the package is released. It requires only  $N$  new files to be installed, and it is promised that 95% of the time upgrading takes less than 10 minutes. Given this information, compute  $N$ .
- Two CS/IT students were asked to rate eight different textbooks for a *Probability & Statistics* course on an ascending scale from 0 to 20 points: (5 Marks) [CO-4]

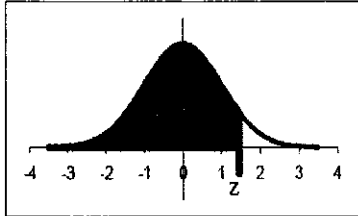
Textbook	A	B	C	D	E	F	G	H
Student 1	4	10	18	20	12	2	5	9
Student 2	4	6	20	14	16	8	11	7

- Compute the *Spearman's rank correlation coefficient* for the data.
  - Interpret your result.
- Haverty's Furniture is a family business that has been selling to retail customers in the Chicago area for many years. The company advertises extensively on radio, TV, and the Internet, emphasizing low prices and easy credit terms. The owner would like to review the relationship between sales and the amount spent on advertising, based on the 4-month data. (5 Marks) [CO-3]

Month	Advertising Cost (x) (USD million)	Sales Revenue (y) (USD million)
Jul	2	7
Aug	1	3
Sep	3	8
Oct	4	10

- Obtain a regression equation of the type  $y = b_0 + b_1x$ .
- Give interpretation of  $b_0$  and  $b_1$ . Estimate sales when \$3 million is spent on advertising.

(Standard) Normal probability table to compute  $P(Z \leq z)$ :



z	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
0.0	0.5000	0.5040	0.5080	0.5120	0.5160	0.5199	0.5239	0.5279	0.5319	0.5359
0.2	0.5793	0.5832	0.5871	0.5910	0.5948	0.5987	0.6026	0.6064	0.6103	0.6141
0.4	0.6554	0.6591	0.6628	0.6664	0.6700	0.6736	0.6772	0.6808	0.6844	0.6879
0.6	0.7257	0.7291	0.7324	0.7357	0.7389	0.7422	0.7454	0.7486	0.7517	0.7549
0.8	0.7881	0.7910	0.7939	0.7967	0.7995	0.8023	0.8051	0.8078	0.8106	0.8133
1.0	0.8413	0.8438	0.8461	0.8485	0.8508	0.8531	0.8554	0.8577	0.8599	0.8621
1.2	0.8849	0.8869	0.8888	0.8907	0.8925	0.8944	0.8962	0.8980	0.8997	0.9015
1.4	0.9192	0.9207	0.9222	0.9236	0.9251	0.9265	0.9279	0.9292	0.9306	0.9319
1.6	0.9452	0.9463	0.9474	0.9484	0.9495	0.9505	0.9515	0.9525	0.9535	0.9545
1.8	0.9641	0.9649	0.9656	0.9664	0.9671	0.9678	0.9686	0.9693	0.9699	0.9706
2.0	0.9772	0.9778	0.9783	0.9788	0.9793	0.9798	0.9803	0.9808	0.9812	0.9817
2.2	0.9861	0.9864	0.9868	0.9871	0.9875	0.9878	0.9881	0.9884	0.9887	0.9890
2.4	0.9918	0.9920	0.9922	0.9925	0.9927	0.9929	0.9931	0.9932	0.9934	0.9938

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