JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST -3 EXAMINATION- 2024

B. Tech. -III Semester (CSE/IT/ECE/CE)

COURSE CODE (CREDITS): 18B11MA313(3) MAX. MARKS: 35

COURSE NAME: Probability and Statistics

COURSE INSTRUCTORS: BKP*, SST MAX. TIME: 2 Hours

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	On an end term examination, students $X, Y,$ and Z forgot to sign their papers. Professor knows that they can write a good exam with probabilities 0.8, 0.7, and 0.5, respectively. After the grading, he notices that two unsigned exams are good and one is bad. Given this information, and assuming that students worked independently of each other, what is the probability that the bad exam belongs to student Z?	**CO-1**	**4**
Q2	The time, in minutes, it takes to reboot a certain system is a continuous variable with the density $$f(x) = \begin{cases} C(10-x)^2, 0 < x < 10 \\ 0, otherwise \end{cases}$$ Compute the following: **a)** C. **b)** The probability that it takes between 1 and 2 minutes to reboot. **c)** Mean reboot time. **d)** Standard deviation for the reboot time.	**CO-2**	**4**
Q3	An average scanned image occupies 0.6 megabytes of memory with a standard deviation of 0.4 megabytes following normal distribution. If you plan to publish 80 images on your web site, what is the probability that their total size is less than 50 megabytes?	**CO-3**	**4**
Q4	A survey was conducted to determine whether three categories of employees prefer pension scheme or not resulting the table given below: **Teaching** | **Non-teaching** | **Administrative** **For pension**: 67, 84, 109 **Against pension**: 33, 66, 41 At 0.01 significant level, test whether the proportions of employees favoring pension scheme are same.	**CO-5**	**5**

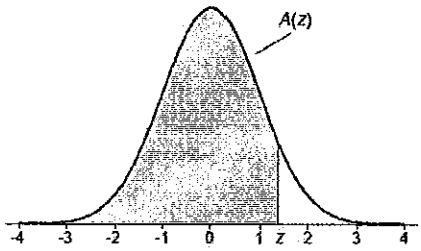
Q5	IQ test on two groups of boys and girls gave the following results: **Mean of girls = 78, Standard deviation=10, number of girls= 30;** **Mean of boys = 78, Standard deviation=13, number of boys= 70;** Is there any significant difference in the mean score of girls and boys at 5% significant level.	**CO-5**	**6**
Q6	The lifetime of electric bulbs for a random sample of 10 from a large consignment gave the following data: **Item** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** **Life in '000' hrs** | **4.2** | **4.6** | **3.9** | **4.1** | **5.2** | **3.8** | **3.9** | **4.3** | **4.4** | **5.6** Can we accept the hypothesis that the average lifetime of bulb is 4000 hrs?	**CO-5**	**6**
Q7	A plant has installed two machines for producing polythene bags. During installation, the manufacturer stated that each machine has a capacity to produce 20 bags per day. However, due to various factors such as differences in operators, raw materials, and other operational conditions, there is variability in the number of bags produced each day. The company researcher collected random samples of daily production for 10 days from Machine 1 and 12 days from Machine 2. The following data represent the number of units produced by the two machines on the sampled days: **Machine I** | **20** | **16** | **26** | **27** | **23** | **22** | **18** | **24** | **25** | **19** | | | **Machine II** | **27** | **33** | **42** | **35** | **32** | **34** | **38** | **28** | **41** | **43** | **30** | **37** How can the researcher determine whether the variances of production are from the same population or from different populations? Perform the analysis using a 5% level of significance.	**CO-5**	**6**

Important Statistical Table

χ^2 (Chi-Squared) Distribution: Critical Values of χ^2

Degrees of freedom	*Significance level* 5%	1%	0.1%
1	3.841	6.635	10.828
2	5.991	9.210	13.816

Cumulative Standardized Normal Distribution



$A(z)$ is the integral of the standardized normal distribution from $-\infty$ to z (in other words, the area under the curve to the left of z). It gives the probability of a normal random variable not being more than z standard deviations above its mean. Values of z of particular importance:

z	$A(z)$	
1.645	0.9500	Lower limit of right 5% tail
1.960	0.9750	Lower limit of right 2.5% tail
2.326	0.9900	Lower limit of right 1% tail
2.576	0.9950	Lower limit of right 0.5% tail
3.090	0.9990	Lower limit of right 0.1% tail
3.291	0.9995	Lower limit of right 0.05% tail

z	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
0.0	0.5000	0.5040	0.5080	0.5120	0.5160	0.5199	0.5239	0.5279	0.5319	0.5359
0.1	0.5398	0.5438	0.5478	0.5517	0.5557	0.5596	0.5636	0.5675	0.5714	0.5753
0.2	0.5793	0.5832	0.5871	0.5910	0.5948	0.5987	0.6026	0.6064	0.6103	0.6141
0.3	0.6179	0.6217	0.6255	0.6293	0.6331	0.6368	0.6406	0.6443	0.6480	0.6517
0.4	0.6554	0.6591	0.6628	0.6664	0.6700	0.6736	0.6772	0.6808	0.6844	0.6879
0.5	0.6915	0.6950	0.6985	0.7019	0.7054	0.7088	0.7123	0.7157	0.7190	0.7224
0.6	0.7257	0.7291	0.7324	0.7357	0.7389	0.7422	0.7454	0.7486	0.7517	0.7549

t Table

cum. prob	$t_{.50}$	$t_{.75}$	$t_{.80}$	$t_{.85}$	$t_{.90}$	$t_{.95}$	$t_{.975}$	$t_{.99}$	$t_{.995}$	$t_{.999}$	$t_{.9995}$
one-tail	0.50	0.25	0.20	0.15	0.10	0.05	0.025	0.01	0.005	0.001	0.0005
two-tails	1.00	0.50	0.40	0.30	0.20	0.10	0.05	0.02	0.01	0.002	0.001
df											
1	0.000	1.000	1.376	1.963	3.078	6.314	12.71	31.82	63.66	318.31	636.62
2	0.000	0.816	1.061	1.386	1.886	2.920	4.303	6.965	9.925	22.327	31.599
3	0.000	0.765	0.978	1.250	1.638	2.353	3.182	4.541	5.841	10.215	12.924
4	0.000	0.741	0.941	1.190	1.533	2.132	2.776	3.747	4.604	7.173	8.610
5	0.000	0.727	0.920	1.156	1.476	2.015	2.571	3.365	4.032	5.893	6.869
6	0.000	0.718	0.906	1.134	1.440	1.943	2.447	3.143	3.707	5.208	5.959
7	0.000	0.711	0.896	1.119	1.415	1.895	2.365	2.998	3.499	4.785	5.408
8	0.000	0.706	0.889	1.108	1.397	1.860	2.306	2.896	3.355	4.501	5.041
9	0.000	0.703	0.883	1.100	1.383	1.833	2.262	2.821	3.250	4.297	4.781
10	0.000	0.700	0.879	1.093	1.372	1.812	2.228	2.764	3.169	4.144	4.587
11	0.000	0.697	0.876	1.088	1.363	1.796	2.201	2.718	3.106	4.025	4.437

F Distribution: Critical Values of *F* (5% significance level)

ν_2 \ ν_1	1	2	3	4	5	6	7	8	9	10	12	14	16	18	20
1	161.45	199.50	215.71	224.58	230.16	233.99	236.77	238.88	240.54	241.88	243.91	245.36	246.46	247.32	248.01
2	18.51	19.00	19.16	19.25	19.30	19.33	19.35	19.37	19.38	19.40	19.41	19.42	19.43	19.44	19.45
3	10.13	9.55	9.28	9.12	9.01	8.94	8.89	8.85	8.81	8.79	8.74	8.71	8.69	8.67	8.66
4	7.71	6.94	6.59	6.39	6.26	6.16	6.09	6.04	6.00	5.96	5.91	5.87	5.84	5.82	5.80
5	6.61	5.79	5.41	5.19	5.05	4.95	4.88	4.82	4.77	4.74	4.68	4.64	4.60	4.58	4.56
6	5.99	5.14	4.76	4.53	4.39	4.28	4.21	4.15	4.10	4.06	4.00	3.96	3.92	3.90	3.87
7	5.59	4.74	4.35	4.12	3.97	3.87	3.79	3.73	3.68	3.64	3.57	3.53	3.49	3.47	3.44
8	5.32	4.46	4.07	3.84	3.69	3.58	3.50	3.44	3.39	3.35	3.28	3.24	3.20	3.17	3.15
9	5.12	4.26	3.86	3.63	3.48	3.37	3.29	3.23	3.18	3.14	3.07	3.03	2.99	2.96	2.94
10	4.96	4.10	3.71	3.48	3.33	3.22	3.14	3.07	3.02	2.98	2.91	2.86	2.83	2.80	2.77
11	4.84	3.98	3.59	3.36	3.20	3.09	3.01	2.95	2.90	2.85	2.79	2.74	2.70	2.67	2.65
12	4.75	3.89	3.49	3.26	3.11	3.00	2.91	2.85	2.80	2.75	2.69	2.64	2.60	2.57	2.54
13	4.67	3.81	3.41	3.18	3.03	2.92	2.83	2.77	2.71	2.67	2.60	2.55	2.51	2.48	2.46
14	4.60	3.74	3.34	3.11	2.96	2.85	2.76	2.70	2.65	2.60	2.53	2.48	2.44	2.41	2.39