Ex/IT/BS/B/T/222/2024

BE INFO TECH 2nd YEAR 2nd SEMESTER EXAMINATION 2024

Mathematics for IT - II

Time: 3 Hours Full Marks: 100

Answer All Questions

[Please show all intermediate steps clearly and elaborately. Do not skip any steps]

1.a) With the help from a Single Numerical Example, explain the concept of Experiment, Event, Simple Event and Independent Event.

b) In a certain random experiment, 3 dice were thrown at the same time. Our event of interest is about getting 17 and up when we sum up all three face values of the three dice. What is the probability of our event of interest? (6+4) **[CO1]**

2.a) Toss a fair coin 4 times and record the number of heads. We call this number X. What is the mean and variance of X?

b) Find the variance and standard deviation for the number of ships(x) to arrive at the harbor on any given day. The probability distribution of x is given below.

x	10	11	12	13	14
P(x)	.4	.2	.2	.1	.1

(5+5) **[CO1]**

3.a) The market share of Suzuki cars in India is about 45%. If we choose 10 cars at random from any Indian Road, what is the probability that 3 of them will be a Suzuki car?

b) Prove that for the case of Exponential Probability Distribution, the probability that x will have a value less than equal to A is $(1-e^{-A})$. (5+5) **[CO2]**

[Turn over

4. Find the Measures of location, Measures of Spread, third and fourth orders of moments of the following: (3+3+2+2) **[CO2]**

x	2	4	5	6	9	10
f	3	3	4	9	3	4

5.a) Using relevant numerical examples, explain the various characteristic parameters of Sampling Distribution of the Proportion.

b) In a certain Exam (Full Marks 100) taken by 90 students; the μ and σ came out to be 55 and 13. Approximately, how many students scored more than 80? (5+5) **[CO3]**

6.a) Using Proper Numerical Examples, differentiate between probability and Likelihood.

b) We tossed a biased coin 5 times and we got 3 heads. What is the most likely value of success (of getting a head) given we got 3 heads out of 5 tosses?

c) List down various methods of maximizing Likelihood. (4+4+2) **[CO4]**

7.a) With respect to the OR (Operation Research) Tools and Techniques, find the Odd Man Out:-

Game Theory, Queuing Theory, Theory of Calculus, Decision Theory, Theory of Quantum Mechanics, Information Theory

b) Using relevant Numerical Payoff Matrix, explain Zero-Sum-Game, Pure Strategy, Minimax Criterion, Value of the Game, Equilibrium and Saddle Point.

c) Using relevant Numerical Payoff Matrix, explain Mixed-Strategy-Game. (2+6+2) **[CO5]**

8.a) List down the 5 different types of inventory which belong to the category of Inventory from the point of view of Manufacturing aspect.

b) List down and explain different costs associated with Inventory.

c) With respect to the EOQ-I, draw the diagram of the Saw-Tooth Inventory Model. Explain the diagram in detail.

(2+4+4) **[CO5]**

9.a) Explain Kendall's Notation for Queuing Models.

b) For M/M/1 Queue, draw the state-transition diagram which is also called Markov Chain Model.

c) The new Coffee shop which has opened recently has become quite popular and we see the queue forming during the morning rush hour. The service time per customer is about 5 minutes on the avarage. And the custom arrival rate is about 1 in 15 minutes. What is the mean interval between customer arrival and departure? Also, what is the average waiting time in the Queue for a customer?

(2+2+6) **[CO6]**

10.a) Study the below Activity List for a certain Project. Develop an AON for this Project. Identify the Critical Path and Compute the Project Completion Time.

Activity Name	Immediate Predecessor	Duration (in Weeks)
T1		8
T2	T1	3
T3	T1	6
T4	T1, T3	3
T5	T2	6
T6	T5	7
T7	T3, T6	7

b) Now, add four more columns to the above table by adding the ES, EF, LS, LF information.

c) In addition to 4 columns mentioned in (b), add one more column to include the information about Slack.

(4+4+2) **[CO6]**

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Z-Table

z	0	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
+0	.50000	.50399	.50798	.51197	.51595	.51994	.52392	.52790	.53188	.53586
+0.1	.53983	.54380	.54776	.55172	.55567	.55966	.56360	.56749	.57142	.57535
+0.2	.57926	.58317	.58706	.59095	.59483	.59871	.60257	.60642	.61026	.61409
+0.3	.61791	.62172	.62552	.62930	.63307	.63683	.64058	.64431	.64803	.65173
+0.4	.65542	.65910	.66276	.66640	.67003	.67364	.67724	.68082	.68439	.68793
+0.5	.69146	.69497	.69847	.70194	.70540	.70884	.71226	.71566	.71904	.72240
+0.6	.72575	.72907	.73237	.73565	.73891	.74215	.74537	.74857	.75175	.75490
+0.7	.75804	.76115	.76424	.76730	.77035	.77337	.77637	.77935	.78230	.78524
+0.8	.78814	.79103	.79389	.79673	.79955	.80234	.80511	.80785	.81057	.81327
+0.9	.81594	.81859	.82121	.82381	.82639	.82894	.83147	.83398	.83646	.83891
+1	.84134	.84375	.84614	.84849	.85083	.85314	.85543	.85769	.85993	.86214
+1.1	.86433	.86650	.86864	.87076	.87286	.87493	.87698	.87900	.88100	.88298
+1.2	.88493	.88686	.88877	.89065	.89251	.89435	.89617	.89796	.89973	.90147
+1.3	.90320	.90490	.90658	.90824	.90988	.91149	.91308	.91466	.91621	.91774
+1.4	.91924	.92073	.92220	.92364	.92507	.92647	.92785	.92922	.93056	.93189
+1.5	.93319	.93448	.93574	.93699	.93822	.93943	.94062	.94179	.94295	.94408
+1.6	.94520	.94630	.94738	.94845	.94950	.95053	.95154	.95254	.95352	.95449
+1.7	.95543	.95637	.95728	.95818	.95907	.95994	.96080	.96164	.96246	.96327
+1.8	.96407	.96485	.96562	.96638	.96712	.96784	.96856	.96926	.96995	.97062
+1.9	.97128	.97193	.97257	.97320	.97381	.97441	.97500	.97558	.97615	.97670
+2	.97725	.97778	.97831	.97882	.97932	.97982	.98030	.98077	.98124	.98169
+2.1	.98214	.98257	.98300	.98341	.98382	.98422	.98461	.98500	.98537	.98574
+2.2	.98610	.98645	.98679	.98713	.98745	.98778	.98809	.98840	.98870	.98899
+2.3	.98928	.98956	.98983	.99010	.99036	.99061	.99086	.99111	.99134	.99158
+2.4	.99180	.99202	.99224	.99245	.99266	.99286	.99305	.99324	.99343	.99361
+2.5	.99379	.99396	.99413	.99430	.99446	.99461	.99477	.99492	.99506	.99520
+2.6	.99534	.99547	.99560	.99573	.99585	.99598	.99609	.99621	.99632	.99643
+2.7	.99653	.99664	.99674	.99683	.99693	.99702	.99711	.99720	.99728	.99736
+2.8	.99744	.99752	.99760	.99767	.99774	.99781	.99788	.99795	.99801	.99807
+2.9	.99813	.99819	.99825	.99831	.99836	.99841	.99846	.99851	.99856	.99861
+3	.99865	.99869	.99874	.99878	.99882	.99886	.99889	.99893	.99896	.99900
+3.1	.99903	.99906	.99910	.99913	.99916	.99918	.99921	.99924	.99926	.99929
+3.2	.99931	.99934	.99936	.99938	.99940	.99942	.99944	.99946	.99948	.99950
+3.3	.99952	.99953	.99955	.99957	.99958	.99960	.99961	.99962	.99964	.99965
+3.4	.99966	.99968	.99969	.99970	.99971	.99972	.99973	.99974	.99975	.99976
+3.5	.99977	.99978	.99978	.99979	.99980	.99981	.99981	.99982	.99983	.99983
+3.6	.99984	.99985	.99985	.99986	.99986	.99987	.99987	.99988	.99988	.99989
+3.7	.99989	.99990	.99990	.99990	.99991	.99991	.99992	.99992	.99992	.99992
+3.8	.99993	.99993	.99993	.99994	.99994	.99994	.99994	.99995	.99995	.99995
+3.9	.99995	.99995	.99996	.99996	.99996	.99996	.99996	.99996	.99997	.99997
+4	.99997	.99997	.99997	.99997	.99997	.99997	.99998	.99998	.99998	.99998