Manarat International University (MIU)
Department of Computer Science and Engineering
Mid-term Assessment (Summer 2020)
Artificial Intelligence (CSE - 411)

Full Marks: 20   Time: 3 Hour

Honor Code
Respect the spirit of the assignment and do not cheat. Please
I. don't share you assignment with your friends in any platform;
II. don't take help/suggestions/advice from others;
III. don't copy other students answer partly or fully in your assignment.

ANY SORT OF SIMILARITY WITH OTHER STUDENTS WILL YIELD ZERO !!!!!!!
SO BE CAREFUL !!!!!!

Answer all the questions which are of equal value.

1   Define   2 + 2

    I.   Bayes' Theorem

    II. If $X \sim$ Uni (12, 17) what is value of

       i. $P(X < 13)$

       ii. $P(X = 13)$

2   a. Show that expected mean of a Binomial distribution is the product of the number of trials   2 + 2
    by the probability of success.

    b.   The expected mean of the sum of several random variables is equal to the sum of their
    expected means

3   X, a discrete random variable has following the PMF   2 + 2

$$P(X = x) = \begin{cases} 0.1 & x = -2, -1 \\ \beta & x = 0,1 \\ 0.2 & x = 2 \end{cases}$$

    a. Find the value of β.

    b. Construct a table giving the probability distribution of X.

4   A biased die with six faces is rolled. The probability distribution of random variable X is   2+1+1
    shown in the table below.

x	1	2	3	4	5	6
P(X = x)	a	a	a	b	b	0.3

    (a) Given $E[X] = 4.2$, find the value of a and b.

    (b) Show that $E[X^2] = 20.4$

    (c) Find: $Var(5 - 3X)$

a. Adult heights can be considered to be normally distributed,

    I.   Adult women have a mean height of 65 inches and a standard deviation of 3.5 inches. What is the probability that a randomly selected adult woman is over 73 inches?

    II. What is the probability that a randomly selected woman is between 64 and 66 inches?

b. The time a mobile phone battery lasts before needing to be recharged is assumed to be normally distributed with a mean of 48 hours and a standard deviation of 8 hours.

    I.   Find the probability that a battery will last for more than 60 hours.

    II. Find the probability that the battery lasts less than 35 hours.

Standard Normal Table

Note: An entry in the table is the area under the curve to the left of z, $P(Z \le z) = \Phi(z)$

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
0.7	0.7580	0.7611	0.7642	0.7673	0.7703	0.7734	0.7764	0.7793	0.7823	0.7852
0.8	0.7881	0.7910	0.7939	0.7967	0.7995	0.8023	0.8051	0.8078	0.8106	0.8133
0.9	0.8159	0.8186	0.8212	0.8238	0.8264	0.8289	0.8315	0.8340	0.8365	0.8389
1.0	0.8413	0.8438	0.8461	0.8485	0.8508	0.8531	0.8554	0.8577	0.8599	0.8621
1.1	0.8643	0.8665	0.8686	0.8708	0.8729	0.8749	0.8770	0.8790	0.8810	0.8830
1.2	0.8849	0.8869	0.8888	0.8906	0.8925	0.8943	0.8962	0.8980	0.8997	0.9015
1.3	0.9032	0.9049	0.9066	0.9082	0.9099	0.9115	0.9131	0.9147	0.9162	0.9177
1.4	0.9192	0.9207	0.9222	0.9236	0.9251	0.9265	0.9279	0.9292	0.9306	0.9319
1.5	0.9332	0.9345	0.9357	0.9370	0.9382	0.9394	0.9406	0.9418	0.9429	0.9441
1.6	0.9452	0.9463	0.9474	0.9484	0.9495	0.9505	0.9515	0.9525	0.9535	0.9545
1.7	0.9554	0.9564	0.9573	0.9582	0.9591	0.9599	0.9608	0.9616	0.9625	0.9633
1.8	0.9641	0.9649	0.9656	0.9664	0.9671	0.9678	0.9686	0.9693	0.9699	0.9706
1.9	0.9713	0.9719	0.9726	0.9732	0.9738	0.9744	0.9750	0.9756	0.9761	0.9767
2.0	0.9772	0.9778	0.9783	0.9788	0.9793	0.9798	0.9803	0.9808	0.9812	0.9817
2.1	0.9821	0.9826	0.9830	0.9834	0.9838	0.9842	0.9846	0.9850	0.9854	0.9857
2.2	0.9861	0.9864	0.9868	0.9871	0.9875	0.9878	0.9881	0.9884	0.9887	0.9890
2.3	0.9893	0.9896	0.9898	0.9901	0.9904	0.9906	0.9909	0.9911	0.9913	0.9916
2.4	0.9918	0.9920	0.9922	0.9925	0.9927	0.9929	0.9931	0.9932	0.9934	0.9936
2.5	0.9938	0.9940	0.9941	0.9943	0.9945	0.9946	0.9948	0.9949	0.9951	0.9952