

JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT
SUMMER SEMSTER (JUNE – JULY 2018)
MID TERM EXAMINATION

COURSE CODE: 10B11MA421
 COURSE NAME: BIOSTATISTICS
 COURSE CREDITS: 4

MAX. MARKS: 50

MAX. TIME: 2 Hr

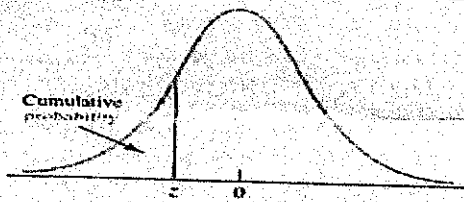
Note: All questions are compulsory. Carrying of mobile phone during examinations will be treated as case of unfair means. Use of scientific calculator is allowed.

1. Write the normal equations for method of least square in case of a parabolic fit. Hence use them to estimate the value of function at 17.0 using the following table: (7)

Y	9.4	11.8	14.7	18.0	23.0
X	1.0	1.6	2.5	4.0	6.0

2. What is autocorrelation function? Write its formula for calculation. Also write equations for autocovariance function, variance and correlation coefficient of a stochastic process. (5)
3. Two random processes $X(t)$ and $Y(t)$ are defined by $X(t) = M \cos \alpha t + N \sin \alpha t$ and $Y(t) = M \cos \alpha t - N \sin \alpha t$. Show that $X(t)$ and $Y(t)$ are jointly WSS if M and N are uncorrelated random variables with zero means and the same variances, α is a constant. (8)
4. In a well area with 3 grocery stores A, B and C, a study was made and found that each year store A retains 90% of its customers and loses 10% to store B, store B retains 5% of its customer and loses 85% to A and 10% to store C, store C retains 40% of its customer and loses 50% to A and 10% to B. The current share of the market is 25% to A, 33% to B and 42% to C. Find the share market held by each store after 2 years. Also, find the share of the market held by each store in the long run. (7)
5. Suppose $\{X(t)\}$ is a normal process with $\mu(t) = 3$ and $C_{XX}(t_1, t_2) = 4e^{-0.2|t_1 - t_2|}$. Find the probability that $X(5) \leq 2$ and $|X(8) - X(5)| \leq 1$. (5)
6. From previous observations it is known that the number of traffic accidents $N(t)$ is an area over the time interval $[0, t)$ can be modeled by a homogenous Poisson process $\{N(t), t \geq 0\}$. On an average, there is one accident within 4 hours, i.e., the intensity of the process is $\lambda = 0.25$ per hour.
- (a) What is the probability of the event $E =$ "at most one accident in $[0, 10)$, at least two accidents in $[10, 16)$ and no accident in $[16, 24)$ "?
- (b) What is the probability that the second accident occurs not before 5 hours? (8)
7. The TPM of a Markov chain $\{X_n; n \geq 0\}$ having three states 1, 2 and 3 is $\begin{bmatrix} 0.2 & 0.3 & 0.5 \\ 0.1 & 0.6 & 0.3 \\ 0.4 & 0.3 & 0.3 \end{bmatrix}$ and the initial probvability distribution is $p(0) = [0.5 \quad 0.3 \quad 0.2]$. (5)
- Find (a) $P[X_2 = 3]$ (b) $P[X_3 = 2, X_2 = 1, X_1 = 2, X_0 = 1]$.
8. Prove that Poisson process is not a stationary process. (5)

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



z	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
-2.0	.0228	.0222	.0217	.0212	.0207	.0202	.0197	.0192	.0188	.0183
-1.9	.0287	.0281	.0274	.0268	.0262	.0256	.0250	.0244	.0239	.0233
-1.8	.0359	.0351	.0344	.0336	.0329	.0322	.0314	.0307	.0301	.0294
-1.7	.0446	.0436	.0427	.0418	.0409	.0401	.0392	.0384	.0375	.0367
-1.6	.0548	.0537	.0526	.0516	.0505	.0495	.0485	.0475	.0465	.0455
-1.5	.0668	.0655	.0643	.0630	.0618	.0606	.0594	.0582	.0571	.0559
-1.4	.0808	.0793	.0778	.0764	.0749	.0735	.0721	.0708	.0694	.0681
-1.3	.0968	.0951	.0934	.0918	.0901	.0885	.0869	.0853	.0838	.0823
-1.2	.1151	.1131	.1112	.1093	.1075	.1056	.1038	.1020	.1003	.0985
-1.1	.1357	.1336	.1314	.1292	.1271	.1251	.1230	.1210	.1190	.1170
-1.0	.1587	.1562	.1539	.1515	.1492	.1469	.1446	.1423	.1401	.1379
-0.9	.1841	.1814	.1788	.1762	.1736	.1711	.1685	.1660	.1635	.1611
-0.8	.2119	.2090	.2061	.2033	.2005	.1977	.1949	.1922	.1894	.1867
-0.7	.2420	.2389	.2358	.2327	.2296	.2266	.2236	.2206	.2177	.2148
-0.6	.2743	.2709	.2676	.2643	.2611	.2578	.2546	.2514	.2483	.2451
-0.5	.3085	.3050	.3015	.2981	.2946	.2912	.2877	.2843	.2810	.2776
-0.4	.3446	.3409	.3372	.3336	.3300	.3264	.3228	.3192	.3156	.3121
-0.3	.3821	.3783	.3745	.3707	.3669	.3632	.3594	.3557	.3520	.3483
-0.2	.4207	.4168	.4129	.4090	.4052	.4013	.3974	.3936	.3897	.3859
-0.1	.4602	.4562	.4522	.4483	.4443	.4403	.4364	.4324	.4285	.4247
-0.0	.5000	.4960	.4920	.4880	.4840	.4801	.4761	.4721	.4681	.4641