



BHARATIYA VIDYA BHAVAN'S
SARDAR PATEL INSTITUTE OF TECHNOLOGY
MUNSHI NAGAR, ANDHERI (WEST), MUMBAI – 400 058, India
(Autonomous College Affiliated to University of Mumbai)

End Semester Examination April/May 2018

Max. Marks: 100

Class: FYMCA

Course Code: MCA 25

Subject: **Probability and Statistics**

Duration: 3 hrs

Semester: II

Date: 07/06/2018

Time: 10:20 am - 01:00 pm

Instructions: (1) All questions are compulsory.
(2) Use of scientific calculator is allowed.
(3) Assume any necessary data but justify the same.

Q.N		Marks	CO																						
1.	State and prove Baye's theorem.	[10]	CO-4																						
(a)	Measurements at the University of Mumbai on a certain day indicated that the source of incoming jobs is 15% from MIDC Thane, 35% from MIDC Taloja, and 50% from MIDC Andheri. Suppose that the probabilities that a job initiated from these MIDCs requires set-up are 0.01, 0.05, and 0.02 respectively. Find the probability that a job chosen at random at University of Mumbai requires set-up. Also find the probability that a randomly chosen job comes from MIDC Taloja, given that it requires set-up. OR From the following data on age of employees, calculate the Karl Pearson's coefficient of skewness. <table><tr><td>Age (years)</td><td>20-25</td><td>25-30</td><td>30-35</td><td>35-40</td><td>40-45</td><td>45-50</td><td>50-55</td></tr><tr><td>Number of employees</td><td>8</td><td>12</td><td>20</td><td>25</td><td>15</td><td>12</td><td>8</td></tr></table>	Age (years)	20-25	25-30	30-35	35-40	40-45	45-50	50-55	Number of employees	8	12	20	25	15	12	8	[10]	CO-4						
Age (years)	20-25	25-30	30-35	35-40	40-45	45-50	50-55																		
Number of employees	8	12	20	25	15	12	8																		
(b)	Prove with example that three events may be mutually independent but need not be pairwise independent.	[10]	CO-4																						
2.	The lengths in cm of 10 nails produced by a certain machine are as: (a) 5.10, 4.98, 5.03, 4.99, 5.00, 5.07, 5.04, 5.03, 4.91, 4.97 Can it be concluded that average length of a nail produced by the machine is 5cm. [Given: The value of t_{α} at 5% level of significance for 9 degrees of freedom is 1.833] OR The following table gives the number of accidents in a city during 10 days of time. Find whether the accidents are uniformly distributed over that period. <table><tr><td>Day</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td><td>8</td><td>9</td><td>10</td></tr><tr><td>Number of accidents</td><td>8</td><td>8</td><td>10</td><td>9</td><td>12</td><td>8</td><td>10</td><td>14</td><td>10</td><td>11</td></tr></table> (Given for 9 degrees of freedom at 5% level of significance, the table value of χ^2 is 16.9)	Day	1	2	3	4	5	6	7	8	9	10	Number of accidents	8	8	10	9	12	8	10	14	10	11	[10]	CO-3
Day	1	2	3	4	5	6	7	8	9	10															
Number of accidents	8	8	10	9	12	8	10	14	10	11															



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(b)	(i) In the frequency distribution of 100 families given below, the number of families corresponding to expenditure groups (20-40) and (60-80) are missing. The median is known to be 50. Find the missing frequencies. <table><tr><td>Expenditure (Rs.)</td><td>0-20</td><td>20-40</td><td>40-60</td><td>60-80</td><td>80-100</td></tr><tr><td>No of families</td><td>14</td><td>--</td><td>27</td><td>--</td><td>15</td></tr></table> (ii) Let X be a random variable for which $E(X)=10$ and $V(X)=25$. Find the values of a and b such that $Y=aX-b$ has expectation zero and variance 1.	Expenditure (Rs.)	0-20	20-40	40-60	60-80	80-100	No of families	14	--	27	--	15	[5]	CO-2		
Expenditure (Rs.)	0-20	20-40	40-60	60-80	80-100												
No of families	14	--	27	--	15												
3	(i) From the following data obtain the two regression equations. Marks in PS : 25 28 35 32 31 36 29 38 34 32 Marks in DS : 43 46 49 41 36 32 31 30 33 39 OR (ii) A continuous random variable has pdf $f(x) = \begin{cases} k(2-x), & 0 \leq x < 2 \\ kx(x-2), & 2 \leq x < 3 \\ 0, & \text{otherwise} \end{cases}$ Find k and median of the distribution.	[10]	CO-2														
(a)		[10]	CO-2														
(b)	Find the coefficient of variation for the following distribution. <table><tr><td>Class Interval</td><td>20-40</td><td>40-60</td><td>60-80</td><td>80-100</td><td>100-120</td><td>120-140</td></tr><tr><td>Frequency</td><td>7</td><td>12</td><td>16</td><td>13</td><td>13</td><td>4</td></tr></table>	Class Interval	20-40	40-60	60-80	80-100	100-120	120-140	Frequency	7	12	16	13	13	4	[10]	CO-2
Class Interval	20-40	40-60	60-80	80-100	100-120	120-140											
Frequency	7	12	16	13	13	4											
4	The lifetime of certain kinds of electronic devices have a mean life of 300 hours and standard deviation of 25 hours. Assuming that the distribution is normal, find the probability that any of these electronic devices will have a lifetime of more than 350 hours. Also find what percentage will have lifetime between 275 and 325 hours? [Given: $P(0 \leq Z \leq 1) = 0.3413$, $P(0 \leq Z \leq 2) = 0.4772$] OR Show that the r^{th} moment of Beta distribution of second kind about origin is $\mu_r' = \frac{1}{\beta(m,n)} \beta(m+r, n-r)$ Hence or otherwise show that the variance Beta distribution of second kind is $\frac{m(m+n-1)}{(n-1)^2(n-2)}$ where m and n are parameters of the distribution.	[10]	CO-6														
(a)		[10]	CO-6														



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(b)	<p>Two discrete random variables X and Y have joint pmf given by the following table.</p> <table border="1"> <tr> <th>Y \ X</th><th>1</th><th>2</th><th>3</th></tr> <tr> <th>1</th><td>2/16</td><td>2/16</td><td>1/16</td></tr> <tr> <th>2</th><td>3/16</td><td>2/16</td><td>1/16</td></tr> <tr> <th>3</th><td>2/16</td><td>1/16</td><td>2/16</td></tr> </table> <p>Are X and Y independent? Are they un-correlated?</p>	Y \ X	1	2	3	1	2/16	2/16	1/16	2	3/16	2/16	1/16	3	2/16	1/16	2/16	[10]	CO-2
Y \ X	1	2	3																
1	2/16	2/16	1/16																
2	3/16	2/16	1/16																
3	2/16	1/16	2/16																
5 (a)	<p>(i) A random sample of 1000 farms in a year gives an average yield of wheat of 2500 kg. per hectare with a s.d. 200 kg. A random sample of 1000 farms in the following year gives an average yield of wheat of 2700 kg. per hectare with a s.d. 250 kg. Can it be inferred that there is a significant increase in the mean yield? [Given: The value of Z_{α} at 1% level of significance is 2.58]</p> <p>(ii) The probability that a man aged 60 will live up to 70 is 0.65. What is the probability that out of 10 such men now at 60, at least 7 will live up to 70?</p>	[5]	CO-3																
(b)	<p>(i) A coin is tossed until a head appears. What is the expectation of the number of tosses required?</p> <p>(ii) A series of n jobs arrive at a computing centre with n processors. Assume that each of the n^n possible assignments vectors (processor for job 1, ..., processor for job n) is equally likely. Find the probability that exactly one processor will be idle?</p>	[5]	CO-4																