



SB-3596

**M. Sc. (Part-II) Examination**  
**March / April – 2011**  
**AM-206 : Applied Mathematics**  
*(Mathematical Statistics)*

Time : 3 Hours]

[Total Marks : 70

**Instructions :**

(1)

नीचे दर्शायेख निशानीवाणी विगतो उत्तरवडी पर अवश्य लपवी. Fillup strictly the details of signs on your answer book.	Seat No. :
Name of the Examination :	<input type="text"/>
<input type="text" value="M. Sc. (Part-2)"/>	<input type="text"/>
Name of the Subject :	<input type="text"/>
<input type="text" value="AM-206 - Applied Mathematics"/>	<input type="text"/>
Subject Code No. : <input type="text" value="3"/> <input type="text" value="5"/> <input type="text" value="9"/> <input type="text" value="6"/>	<input type="text"/>
Section No. (1, 2,.....) : <input type="text" value="Nil"/>	
Student's Signature	

(2) Attempt all questions.

(3) Follow usual notations.

- 1 (a) State and prove Bayes theorem. 6
- (b) There are two boxes (A), containing 4 white and 3 red, and (B) containing 3 white and 7 red balls. A box is chosen at random and a ball is drawn from it. If the ball is white, find the probability that it is from box A. 4
- (c) Two cards are drawn from a bridge deck, without replacement. What is the probability that the first is an ace and the second is a king ? 4

**OR**

- 1 (a) The chance of X, Y and Z becoming managers are 4 : 2 : 3. The probability that bonus scheme will be introduced if X, Y and Z become managers is 0.3, 0.5 and 0.8 respectively. Then 6
- (i) What is the probability that the bonus scheme would be introduced ?
- (ii) If the bonus scheme is introduced what will be the probability that the appointed manager is Z.
- (b) Define conditional probability. Also if a bag X contains 2 white and 3 red balls and a bag Y contains 4 white and 5 red balls. One ball is drawn at random from one of the bags and is found to be red. Find the probability that it was drawn from bag Y. 4

- (c) An experiment randomly select two people from a group of five men and four women. A random variable  $X$  is the number of women selected. Find the probability distribution of  $X$  and represent it graphically in histogram. 4
- 2 (a) The probability density function of the random variable  $X$  follows the probability law 6
- $$p(x) = \frac{1}{2\theta} \exp\left(-\frac{|x-\theta|}{\theta}\right); -\infty < x < \infty.$$
- Find the moment generating function of  $X$ . Hence or otherwise find  $E(X)$  and  $V(X)$ .
- (b) From the binomial distribution for the experiment of rolling a die three times and counting the number of times 4 appears. 4
- (c) A coffee connoisseur claims that he can distinguish between a cup of instant coffee and a cup of percolator coffee 75% times of the time. It is agreed that his claims will be accepted if he correctly identifies at least 5 of the 6 cups. Find the chances of having the claim (i) accepted (ii) rejected, when he does have the ability he claims. 4
- OR**
- 2 (a) Define Moment Generating Function (MGF). Also find the MGF and hence the mean and variance of a random variable  $X$  assuming the value 'r' with the probability law :  $P(X=r) = q^{r-1}p$  ;  $r=1, 2, 3, \dots$  6
- (b) A person has two taxis to hire. The distribution of demand for taxis is Poisson. The average demand of taxi per day is 1.5. Out of 100 days in how many days : 4
- (i) There will be no demand.
- (ii) He will not meet the demand
- (c) Certain mass produced articles of which 0.5% are defective, are packed in cartons each containing 100. What portions of cartons are free from defective articles and what portion contains 3 or more defectives ? 4
- 3 (a) The marks obtained by a number of students for a certain subject are assumed to be approximately normally distributed with mean value 65 and with a standard deviation of 5. If 3 students are taken at random from this set, what is the probability that exactly 2 of them will have marks over 70. 6

- (b) Find the following probabilities and illustrate each case with a diagram (i)  $P(0 < Z < 1.25)$  and (ii)  $P(Z > 1.43)$  [Table at the end] 4
- (c) If 'a' is a constant then prove that (i)  $Var(a) = 0$  4  
(ii)  $Var(ax) = a^2 Var(x)$

**OR**

- 3 (a) The average salary of male employees in a firm was Rs. 5200 and that of female was Rs. 4200. The mean salary of all the employees was Rs. 5000. Find the percentage of male and female employees. 6
- (b) Find the mode for the following distribution : 4

Class	0-10	10-20	20-30	30-40	40-50	50-60	60-70	70-80
Freq.	5	8	7	12	28	20	10	10

- (c) Fit a least square straight line  $Y = a + bX$  to the following data : 4

X	0	1	2	3	4
Y	1	1.8	3.3	4.5	6.3

- 4 (a) Explain the method of fitting a second degree parabola  $y = a + bx + cx^2$  to the given data : 7
- (b) Fit a least square curve of the type  $y = ab^x$  to the following data : 7

$x_i$	2	3	4	5	6
$y_i$	144.0	172.8	207.4	248.8	298.5

**OR**

- 4 (a) Prove that the value of coefficient of correlation 'r' is independent of change of original scale. 7
- (b) Obtain the Regression lines  $y$  on  $x$  for the following data : 7

$x$	65	66	67	68	69	70	72	67
$y$	67	68	65	72	72	69	71	68
$u_i = x_i - 68$	-3	-2	-1	0	1	2	4	-1
$v_i = y_i - 69$	-2	-1	-4	3	3	0	2	-1

- 5 (a) The demand for a particular spare part in a factory was found to vary from day to day. In a sample study the following information was obtained : 7

Days	Mon.	Tues.	Wed.	Thurs.	Fri.	Sat.
No. of parts demanded	1124	1125	1110	1120	1126	1115

$$\left[ \chi_{0.05}^2 \text{ for 5 degree of freedom} = 11.07 \right]$$

- (b) Prove that 7
- (i)  $b_{yx}$ ,  $b_{xy}$  and  $r$  all three have the same sign.
- (ii) Both  $b_{xy}$  and  $b_{yx}$  cannot be greater than unity at the same time.

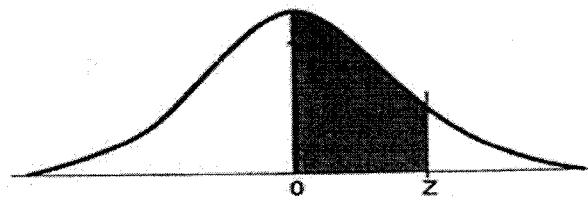
OR

- 5 (a) A survey of 800 families with four children each revealed the following distribution : 7

No. of boys	0	1	2	3	4
No. of girls	4	3	2	1	0
No. of families	32	178	290	236	64

Is this result consistent with the hypothesis that male and female births are equally probable ? [ $\chi_{0.05}^2$  for 4 degree of freedom = 9.488]

- (b) A sample analysis of examination results of 200 MBA's was made. It was found that 46 students had failed, 68 secured a third division, 62 secured a second division and the rest were placed in first division. Are these figures commensurate with the general examination result which is in ratio of 4:3:2:1 for various categories respectively ? [ $\chi_{0.05}^2$  for 3 degree of freedom = 7.815] 7



Areas Under the Standard Normal Curve

Z	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
0.5	.1915	.1950	.1985	.2019	.2054	.2088	.2123	.2157	.2190	.2224
0.6	.2257	.2291	.2324	.2357	.2389	.2422	.2454	.2486	.2517	.2549
0.7	.2580	.2611	.2642	.2673	.2704	.2734	.2764	.2794	.2823	.2852
0.8	.2881	.2910	.2939	.2967	.2995	.3023	.3051	.3078	.3106	.3133
0.9	.3159	.3186	.3212	.3238	.3264	.3289	.3315	.3340	.3365	.3389
1.0	.3413	.3438	.3461	.3485	.3508	.3531	.3554	.3577	.3599	.3621
1.1	.3643	.3665	.3686	.3708	.3729	.3749	.3770	.3790	.3810	.3830
1.2	.3849	.3869	.3888	.3907	.3925	.3944	.3962	.3980	.3997	.4015
1.3	.4032	.4049	.4066	.4082	.4099	.4115	.4131	.4147	.4162	.4177
1.4	.4192	.4207	.4222	.4236	.4251	.4265	.4279	.4292	.4306	.4319
1.5	.4332	.4345	.4357	.4370	.4382	.4394	.4406	.4418	.4429	.4441
1.6	.4452	.4463	.4474	.4484	.4495	.4505	.4515	.4525	.4535	.4545
1.7	.4554	.4564	.4573	.4582	.4591	.4599	.4608	.4616	.4625	.4633
1.8	.4641	.4649	.4656	.4664	.4671	.4678	.4686	.4693	.4699	.4706
1.9	.4713	.4719	.4726	.4732	.4738	.4744	.4750	.4756	.4761	.4767
2.0	.4772	.4778	.4783	.4788	.4793	.4798	.4803	.4808	.4812	.4817
2.1	.4821	.4826	.4830	.4834	.4838	.4842	.4846	.4850	.4854	.4857
2.2	.4861	.4864	.4868	.4871	.4875	.4878	.4881	.4884	.4887	.4890
2.3	.4893	.4896	.4898	.4901	.4904	.4906	.4909	.4911	.4913	.4916
2.4	.4918	.4920	.4922	.4925	.4927	.4929	.4931	.4932	.4934	.4936