University of Mumbai
Examination Second Half 2021 (Lead College: BVIMIT)

Program: **MCA**
Curriculum Scheme: MCA (2year – 2020 Course)
Examination: M.C.A Semester I
Course Code: MCA11 and Course Name: Mathematical Foundations for Computer Science1
Time: 2 hour 30 minutes Max. Marks: 80

<table>
<tr><th>Q1.</th><th>Choose the correct option for following questions. All the Questions are compulsory and carry equal marks [20 Marks]</th></tr>
<tr><td>1.</td><td>If V(X) = 2 then, V(2X+5) = ?</td></tr>
<tr><td>Option A:</td><td>9</td></tr>
<tr><td>Option B:</td><td>8</td></tr>
<tr><td>Option C:</td><td>12</td></tr>
<tr><td>Option D:</td><td>32</td></tr>
<tr><td></td><td></td></tr>
<tr><td>2.</td><td>In a manufacturing process of a certain component, two types of defect are likely to occur with respective probabilities 0.05 and 0.1. What is the probability that a randomly chosen component is defective?</td></tr>
<tr><td>Option A:</td><td>0.145</td></tr>
<tr><td>Option B:</td><td>0.15</td></tr>
<tr><td>Option C:</td><td>0.005</td></tr>
<tr><td>Option D:</td><td>0.5</td></tr>
<tr><td></td><td></td></tr>
<tr><td>3.</td><td>A fair coin is tossed 7 times. Find the probabilities of obtaining one head</td></tr>
<tr><td>Option A:</td><td>1/128</td></tr>
<tr><td>Option B:</td><td>7/128</td></tr>
<tr><td>Option C:</td><td>21/128</td></tr>
<tr><td>Option D:</td><td>35/128</td></tr>
<tr><td></td><td></td></tr>
<tr><td>4.</td><td>For the following what is bivariate probability distribution of X and Y,
Find P(X ≤ 1, y=2)
<table>
<tr><th>Y
X</th><th>1</th><th>2</th><th>3</th><th>4</th><th>5</th><th>6</th></tr>
<tr><td>0</td><td>0</td><td>0</td><td>1/32</td><td>2/32</td><td>2/32</td><td>3/32</td></tr>
<tr><td>1</td><td>1/16</td><td>1/16</td><td>1/8</td><td>1/8</td><td>1/8</td><td>1/8</td></tr>
<tr><td>2</td><td>1/32</td><td>1/32</td><td>1/64</td><td>1/64</td><td>0</td><td>2/64</td></tr>
</table>
</td></tr>
<tr><td>Option A:</td><td>1/16</td></tr>
<tr><td>Option B:</td><td>7/8</td></tr>
<tr><td>Option C:</td><td>11/64</td></tr>
<tr><td>Option D:</td><td>1/32</td></tr>
<tr><td></td><td></td></tr>
<tr><td>5.</td><td>The z-test is best used for</td></tr>
<tr><td>Option A:</td><td>greater-than-100 samples</td></tr>
<tr><td>Option B:</td><td>less-than 10 samples</td></tr>
<tr><td>Option C:</td><td>greater-than-30 samples</td></tr>
<tr><td>Option D:</td><td>less-than 20 samples</td></tr>
<tr><td></td><td></td></tr>
<tr><td>6.</td><td>If Q1=10, Q2 = 20 and Q3=40 Find Bowley’s coefficient of skewness.</td></tr>
</table>

Option A:	0.4
Option B:	0.5
Option C:	0.33
Option D:	-0.5
7.	Find the probability of constructing a two digit even number using the digits 1,2,3,4,5,6,7,8,9 if repetition of digits is allowed
Option A:	0.5
Option B:	0.4444
Option C:	0.66
Option D:	0.1
8.	Suppose A and B are events with P(A)=0.6, P(B)=0.3 and $P(A\cap B)=0.2$ find the probability that A or B occurs
Option A:	0.3
Option B:	0.7
Option C:	0.1
Option D:	0.6
9.	Which formula is used for Karl Pearson's Coefficient of skewness calculation where mode is ill-defined?
Option A:	(Mean-Mode)/Std.Dev.
Option B:	3(Mean - Mode)/ Std.Dev.
Option C:	3(Mean- Median)/ Std.Dev.
Option D:	3Mean - Mode/ Std.Dev.
10.	Two regression lines are given by the equations x + 2y -5 = 0 and 2x +3y -8 = 0. Find the values of $\bar{x}, \bar{y}$
Option A:	$\bar{x} = 1 , \bar{y} = 2$
Option B:	$\bar{x} = 2 , \bar{y} = 1$
Option C:	$\bar{x} = 4 , \bar{y} = 1$
Option D:	$\bar{x} = 1 , \bar{y} = 4$

<table>
<tr><th>Q2</th><th>Solve any Two Questions out of Three (10 marks each) [20 Marks]</th></tr>
<tr><td>A</td><td>From the following data on age of employee, 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>No. 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></td></tr>
<tr><td>B</td><td>The super market buy light globes (light bulbs) from three different manufacturers – Bright light (35%), Glow globe (20%) and Shine well (45%). In the past, the supermarket has found that 1% of Bright light’s globes are faulty, and that 1.5% of each Glow globe’s and Shine well’s globes are faulty.
A customer buys a globe without looking at the manufacturer’s name- in other words, it’s a random choice. When she gets home, she finds the globe is faulty. What is the probability she chose a shine well’s globe?</td></tr>
<tr><td>C</td><td>The probability mass function of a random variable X is zero except at points x=0, 1, 2. At these points it has the values $P(0) = 3C^2$, $P(1) = 4C – 10C^2$ and $P(2)= 5C – 1$, for some $C > 0$
1. Determine the value of C</td></tr>
</table>

2. Compute the following probabilities $P[x < 2]$ and $P[1 < x \leq 2]$
3. Find the largest x such that $F(x) < ½$
4. Find the smallest x such that $F(x) \geq 1/3$

Q3. Solve any Two Questions out of Three (10 marks each) [20 Marks]

A In a certain industrial facility, accidents occur infrequently. It is known that the probability of an accident on any given day is 0.005, and accidents are independent of each other.

(i). What is the probability that in any given period of 400 days, there will be an accident on one day?

(ii).What is the probability that there are at most three days with an accident?

B The incidence of robbery and murder per 100000 populations in simple of seven medium size cities is given below.

City	A	B	C	D	E	F	G	Total
Robbery(x)	4	6	10	5	1	2	3	31
Murder(y)	16	29	43	20	3	4	6	121

Find Karl Pearson coefficient of correlation between robbery and murder.

C The following data gives the number of car accidents in the city during a random time period. Calculate Bowley's coefficient of skewness for the following distribution

Class	5-10	10-15	15-20	20-25	25-30	30-35	35-40
Frequency	7	9	16	22	14	12	3

Q4. Solve any Two Questions out of Three (10 marks each) [20 Marks]

A Find Spearman's rank correlation for the following data

Student	A	B	C	D	E	F	G	H
Marks in Test1	52	34	47	65	43	34	54	65
Marks in Test2	65	59	65	68	82	60	57	58

B The observed and expected frequencies in rolling a die 120 times are given below. Test the hypothesis that the die is fair (Given level of significance =0.01 , 5 degrees of freedom is 15.086)

No. observed	1	2	3	4	5	6
Frequency	17	14	20	17	17	15

At 0.01 level of significance determine whether the die is true (or uniform)

C Suppose that the error in the reaction temperature in ^{0}C, for a controlled experiment is a continuous random variable X having the probability function.

$f(x) = x^2/3 \quad -1 < x < 2$

$f(x) = 0 \quad$ otherwise

(i) Verify $\int_{-\infty}^{\infty} f(x)dx = 1$

(ii) Find $P(0 < x \leq 1)$

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