

Reg. No.: 22BEC1018

Name :

**VIT**

Vellore Institute of Technology

Affiliated to University under section 3 of UO Act 1956

## Continuous Assessment Test (CAT)- II- October 2023

Programme	B.Tech.	Semester	Fall 2023-2024
Course Title	Probability and Statistics	Code	BMAT202L
Faculty	Dr. G Y Mythili	Slot	F2+TF2
Duration	90 minutes	Class Nbr	CH2023240101042
		Max. Marks	50

Answer all the Questions (50 marks)

Question

Marks

Q.No.

1. A monitor issues a warning signal when an action is needed as part of a production process. The interval,  $X$  hours, between successive signals follows an exponential distribution with parameter 0.08.  
 (a) Find the probability that the interval between the next two signals is:  
 (i) Between 10 and 20 hours;  
 (ii) Less than two hours;  
 (iii) Longer than 50 hours  
 (b) State the mean and standard deviation of the intervals between successive signals.  
 (c) Following a warning signal, what is the longest time the production process could be left unsupervised whilst ensuring the probability of missing the next signal is less than 0.01? (5+3+2)
2. (a) The average number of trucks arriving on any one day at a truck depot in a town is 12. Find the chance that on any given day less than 9 trucks will arrive at the depot?  
 (b) Most graduate schools of business require applicants for admission to take the Graduate Management Admission Council's GMAT examination. Scores on the GMAT are roughly normally distributed with a mean of 527 and a standard deviation of 112.  
 (i) How high must an individual score on the GMAT in order to score in the highest 5%?  
 (ii) What is the probability of an individual scoring above 500 on the GMAT? (5+5)

In two groups of infants in the 8<sup>th</sup> month of age the following values were observed.

Group	Number of infants	Mean weight	SD of weights
1	100	6.9kg	1.10 kg
2	169	7.3kg	0.91 kg

10

Test whether mean birth weights are significantly different.

(a) A die is thrown 276 times and the results of these throws are given below.

(5+5)

No. appeared on the die	1	2	3	4	5	6
Frequency	40	32	29	59	57	59

Test whether the die is biased or not.

(b) A certain injection administered to each of 12 patients resulted in the following increases of blood pressure. 5, 2, 8, -1, 3, 0, 6, -2, 1, 5, 0, 4

Can it be concluded that the injection will be, in general, accompanied by an increase in B.P?

Evaluate the following dataset to fit a multiple linear regression model.

$y$	140	155	162	192	200	212	187	175	199	159
$x_1$	62	67	70	71	72	75	78	55	60	64
$x_2$	25	24	20	15	14	14	11	18	16	19

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**WINTER SEMESTER 2022-2023**  
**SCHOOL OF ADVANCED SCIENCES**  
**DEPARTMENT OF MATHEMATICS**

**CONTINUOUS ASSESSMENT TEST - II**

**Course Code : BMAT202L**  
**Course Name : Probability and Statistics**  
**Slot : B2-TB2**  
**Duration : 90 Minutes**  
**Date : 13.03.2023**

**Max. Marks: 50****Answer ALL the following questions.****General instructions: Students are allowed with one hand written notebook and statistical tables**

Q. No.	Question	Marks																						
1.	<p>From the following data, find  (i). the two regression equations.  (ii). the most likely marks in statistics when marks in Economics are 30.</p> <table border="1" data-bbox="223 1080 1218 1327"> <tr> <td>Marks in Economics</td><td>25</td><td>28</td><td>35</td><td>32</td><td>31</td><td>36</td><td>29</td><td>38</td><td>34</td><td>32</td></tr> <tr> <td>Marks in Statistics</td><td>43</td><td>46</td><td>49</td><td>41</td><td>36</td><td>32</td><td>31</td><td>30</td><td>33</td><td>39</td></tr> </table>	Marks in Economics	25	28	35	32	31	36	29	38	34	32	Marks in Statistics	43	46	49	41	36	32	31	30	33	39	10
Marks in Economics	25	28	35	32	31	36	29	38	34	32														
Marks in Statistics	43	46	49	41	36	32	31	30	33	39														
2.	<p>(i). Six dice are thrown 729 times. How many times do you expect at least three dice to show a five or six?  (ii). If a random variable <math>X</math> follows Poisson distribution such that <math>P(X = 1) = P(X = 2)</math>, find (a) The mean and variance of the distribution. (b) <math>P(X = 0)</math>.</p>	6+4																						
3.	<p>The hourly wages of 1,000 workmen are normally distributed around a mean of Rs. 70 and with a standard deviation of Rs. 5. Estimate the number of workers whose hourly wages will be:  (i) Between Rs. 69 and Rs. 72. (ii) More than Rs. 75; (iii) Less than Rs. 63.</p>	10																						
4.	<p>A machine puts out 16 imperfect articles in sample of 500. After the machine is overhauled, it puts out 3 imperfect articles in a batch of 100. Has the machine improved?</p>	10																						
5.	<p>The heights of college students in a city are normally distributed with S.D. 6cms. A sample of 100 students has mean height 158cms. Test the hypothesis that the mean height of college students in the college is 160cms.</p>	10																						



**VIT**

Vellore Institute of Technology

Vellore - 632014, Tamil Nadu, India  
DEPARTMENT OF MATHEMATICS  
SCHOOL OF ADVANCED SCIENCES  
WINTER SEMESTER 2022-2023

### CONTINUOUS ASSESSMENT TEST - II

Programme Name & Branch	: B. Tech.	
Course Code	: BMAT202L	
Course Name	: Probability and Statistics	
Slot	: B1	
Duration	: 90 minutes	<b>Max. Marks : 50</b>

**General instruction(s):** Answer all questions

Q. No	Question	Marks																										
1.	<p>The National Center for Health Statistics publishes data on heights and weights in Vital and Health Statistics. A random sample of 12 females age 18–24 years gave the following data, where <math>x</math> denotes height, in inches, and <math>y</math> denotes weight, in pounds</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td style="padding: 2px;">x</td><td style="padding: 2px;">56</td><td style="padding: 2px;">42</td><td style="padding: 2px;">72</td><td style="padding: 2px;">36</td><td style="padding: 2px;">63</td><td style="padding: 2px;">47</td><td style="padding: 2px;">55</td><td style="padding: 2px;">49</td><td style="padding: 2px;">38</td><td style="padding: 2px;">42</td><td style="padding: 2px;">68</td><td style="padding: 2px;">60</td></tr> <tr> <td style="padding: 2px;">y</td><td style="padding: 2px;">147</td><td style="padding: 2px;">125</td><td style="padding: 2px;">160</td><td style="padding: 2px;">118</td><td style="padding: 2px;">149</td><td style="padding: 2px;">128</td><td style="padding: 2px;">150</td><td style="padding: 2px;">145</td><td style="padding: 2px;">115</td><td style="padding: 2px;">140</td><td style="padding: 2px;">152</td><td style="padding: 2px;">155</td></tr> </table> <p>Also estimate the weight of a female whose height is 45 and the height of a female whose weight is 135.</p>	x	56	42	72	36	63	47	55	49	38	42	68	60	y	147	125	160	118	149	128	150	145	115	140	152	155	10
x	56	42	72	36	63	47	55	49	38	42	68	60																
y	147	125	160	118	149	128	150	145	115	140	152	155																
2.	<p>An irregular 6 faced dice is thrown thirty times and the number of sixes seen is eight. If the dice is thrown a further twelve times find:</p> <p>(a) the probability that a six will occur exactly twice;</p> <p>(b) the expected number of sixes;</p> <p>(c) the variance of the number of sixes.</p>	10																										
3.	<p>The Vellore Institute of Technology installed 10,000 electric led bulbs in the Vellore campus. If these bulbs have an average life of 1,000 burning hours with a standard deviation of 200 hours, how many bulbs might be expected to fail (i) in the first 800 burning hours? (ii) between 800 and 1200 burning hours? After how many burning hours would you expect (iii) 10% of the bulbs to fail? (iv) 10% of the bulbs to be still burning? Assume that the life of the bulbs is normally distributed.</p>	10																										
4.	<p>In a sample of 600 students of a certain college, 400 are found to use dot pens. In another college from a sample of 900 students 450 were found to use dot pens. Test with 1% LOS, whether the two colleges significantly differ with respect to the habit of using dot pens. Null and alternative hypothesis should be stated clearly.</p>	10																										



**VIT**  
Vellore Institute of Technology  
Affiliated to the Anna University, Chennai, Tamil Nadu

Vellore – 632014, Tamil Nadu, India  
**DEPARTMENT OF MATHEMATICS**  
**SCHOOL OF ADVANCED SCIENCES**  
**WINTER SEMESTER 2022-2023**

5. The average number of defective articles per day in a certain factory is claimed to be less than the average for all the factories. The average for all the factories is 30.5. A random sample of 100 days showed the following distribution:

Class limits	16-20	21-25	26-30	31-35	36-40	Total
No. of days	12	22	20	30	16	100

Calculate the mean and standard deviation of the sample and use it to claim that the average is less than the figure for all factories, at 5% level of significance.

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Course Code & Name : BMAT2021L – Probability and Statistics  
Exam Duration : 90 Minutes

Slot : F2 + TF2

Maximum Marks : 50

Instructions: Handwritten note book and statistical tables allowed.

**Answer All the Questions**

**Each question carries equal marks ( $5 \times 10 = 50$  Marks)**

1. (a). In a partially destroyed data of an analysis of correlation, the following results only are legible: Standard Deviation of  $Y = 1$ . The regression equations are  $13x + 4y = 43$  and  $x + 12y = 7$ . What were (i) the mean values of  $X$  and  $Y$ ? (ii) standard deviation of  $X$ ? (iii) correlation coefficient between  $X$  and  $Y$ ? (6 M/C03/ L2)

(b). From the data relating to the yield of dry bark  $X_1$ , height  $X_2$  and girth  $X_3$  for 18 cinchona plants the following correlation coefficients were obtained:  $r_{12} = 0.77$ ,  $r_{13} = 0.72$  and  $r_{23} = 0.52$ . Find the partial correlation coefficient  $r_{12.3}$  and multiple correlation coefficient  $R_{1.2.3}$  (4 M/C03/ L2)

2. Fit a Binomial frequency distribution for the following data:

$x$ :	0	1	2	3	4	5	6	7	8
$f$ :	60	160	136	96	41	26	8	4	5

(10 M/C02/ L5)

3. In an examination it is laid down that student passes if he secures 30 per cent or more marks. He is placed in the first, second or third division according as he secures 60% or more marks, between 45% and 60% marks and marks between 30% and 45% respectively. He gets distinction in case he secures 80% or more marks. It is noticed from the result that 15% of the students failed in the examination, whereas 10% of them obtained distinction. Calculate the percentage of students placed in the second division. (10 M/C02/ L4)

4. (a). In a year there are 956 births in a town A of which 52.5% were males, while in towns A and B combined, this proportion in a total of 1,406 births was 0.496. Is there any significant difference in the proportion of male births in the two towns? (6 M/C04/ L4)

(b). In a sample of 1,000 people in Tamil Nadu, 540 are rice eaters and the rest are wheat eaters. Can we assume that both rice and wheat are equally popular in this State at 1% level of significance? (4 M/C04/ L4)

5. An insurance agent has claimed that the average age of policyholders who insure through him is less than the average for all agents, which is 30.5 years. A random sample of 100 policyholders, who had insured through him gave the following age distribution:

Age last birthday: 16-20 21-25 26-30 31-35 36-40

No. of persons: 12 22 20 30 16

Calculate the arithmetic mean and standard deviation of this distribution and use these values to test his claim at the 5% level of significance. (10 M/C04/ L5)



Continuous Assessment Test (CAT) - II – April 2024					
Programme	:	B Tech	Semester	:	Wint Semester 2023-2024
Course	:	Probability and Statistics	Code	:	BMAT2021
Faculty	:	Dr. Saroj Kumar Dash, Prof. Vignesh R	Class No	:	CH2023240503420 CH2023240500898
Slot	:	C2+TC2	Duration	:	90 Minutes
Max. Mark	:	50			

**General Instructions:**

- Write only your registration number in the question paper and do not write other information.
  - Only non-programmable calculator without storage is permitted.

### **Answer All Questions**

Q.No.	Description	Marks																						
X.	An experiment was conducted to determine if the weight ( $y$ ) of an animal can be predicted after a given period of time on the basis of the initial weight of the animal ( $x_1$ ) and the amount of feed ( $x_2$ ) that was eaten. The following data, measured in kilograms, were recorded:	10																						
	<table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td><math>y</math></td><td>95</td><td>77</td><td>80</td><td>100</td><td>97</td><td>70</td></tr> <tr> <td><math>x_1</math></td><td>42</td><td>33</td><td>33</td><td>45</td><td>39</td><td>36</td></tr> <tr> <td><math>x_2</math></td><td>272</td><td>226</td><td>259</td><td>292</td><td>311</td><td>183</td></tr> </table>	$y$	95	77	80	100	97	70	$x_1$	42	33	33	45	39	36	$x_2$	272	226	259	292	311	183		
$y$	95	77	80	100	97	70																		
$x_1$	42	33	33	45	39	36																		
$x_2$	272	226	259	292	311	183																		
2.	Fit a multiple linear regression model of $y$ on $x_1$ and $x_2$ .																							
	(a) The ranking of 10 students in two subjects A and B are given in the following table.	5+5																						
	<table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td><math>A</math></td><td>3</td><td>5</td><td>8</td><td>4</td><td>7</td><td>10</td><td>2</td><td>1</td><td>6</td><td>9</td></tr> <tr> <td><math>B</math></td><td>6</td><td>4</td><td>9</td><td>8</td><td>1</td><td>2</td><td>3</td><td>10</td><td>5</td><td>7</td></tr> </table>	$A$	3	5	8	4	7	10	2	1	6	9	$B$	6	4	9	8	1	2	3	10	5	7	
$A$	3	5	8	4	7	10	2	1	6	9														
$B$	6	4	9	8	1	2	3	10	5	7														
	Obtain the rank correlation coefficient.																							
	(b) There are 3 multiple choice questions in a MCQ test. Each MCQ consist of four possible choices and only one of them is correct. If an examine answers those MCQ randomly (without knowing the correct answers)	$P(X=1)$																						
	i.) What is the probability that exactly any two of the answers will be correct?	$P(X=2)$																						
	ii.) What is the probability that at least two of the answers will be correct?	$P(X \geq 2)$																						
	iii.) What is the probability that at most two of the answers will be correct?	$P(X \leq 2)$																						
	iv.) What will be the average or expected number and standard deviation of correct answers?	$E(X)$ $\sigma(X)$																						
3.	(a) In a Ruby apartment of Chennai has three rooms only. The number of demands for a room is Poisson distributed variate with mean 1.5. Calculate the proportion of days on which	5+5																						
	i.) neither room is demanded.	?																						
	ii.) some demand for rooms is refused because of non-availability of rooms	X																						
	(b) Suppose the return of an investment in a stock over a given time period is normally distributed with average of 10% and a standard deviation of 5%.																							



	i.) What is the probability of losing money over the given period of time? ii.) What is the effect of doubling the standard deviation to 10?	$P(Z < 0)$ $\sigma \rightarrow 2\sigma$	5
m4	4. (a) The length of time for one individual to be served at a cafeteria is a random variable having an exponential distribution with a mean of 4 minutes. What is the probability that a person is served in less than 3 minutes on at least 4 of the next 6 days? (b) Let the test statistic $Z$ have a standard normal distribution when $H_0$ is true. Give the significance level $\alpha$ for each of the following situations: (i) $H_1: \mu > \mu_0$ , rejection region $z \geq 1.88$ . (ii) $H_1: \mu < \mu_0$ , rejection region $z \geq -2.75$ .	5+5	
m5	5. For a class project, two team members each approached 50 students randomly on campus. Each student was asked to participate in a survey, but the survey itself was a trick: the real goal was to see who would agree to be surveyed by Melissa (who has a British accent) or Kristine (an American accent). In the end, 41 of 50 students agreed to be surveyed by Melissa, while 27 of 50 took Kristine's survey. (a) Test the hypothesis of equal population proportions at the 0.01 significance level. (b) Hence calculate a 99% confidence interval for $p_1 - p_2$ .	10	

$$p_1 = \frac{41}{50} = \frac{21}{25}$$

$$p_2 = \frac{27}{50} = \frac{27}{50}$$

$$P_1 - P_2$$

$$\left( \hat{p}_1 - \hat{p}_2 \right) \pm Z_{0.005} \sqrt{\frac{\hat{p}_1(1-\hat{p}_1)}{n_1} + \frac{\hat{p}_2(1-\hat{p}_2)}{n_2}}$$



**Continuous Assessment Test (CAT) - II – April 2024**

Programme	:	B.Tech	Semester	:	Win Semester 2023-2024
Course	:	Probability and Statistics	Code	:	BMAT202L
Faculty	:	Dr. Prabhakar V Dr. Harshavarthini Shanmugam	Class No.	:	CH2023240500894 CH2023240500895
Slot	:	C1+TC1	Duration	:	90 Minutes
Max. Mark	:	50			

**General Instructions:**

- Write only your registration number in the question paper and do not write other information.
- Only non-programmable calculator without storage is permitted.

**Answer All Questions**

Q.No.	Description	Marks																
1.	<p>Find the correlation coefficient between the age of cars in years (<math>X</math>) and annual maintenance cost in rupees (<math>Y</math>) and comment on the nature of the relationship.</p> <table border="1"> <tr> <td><math>X:</math></td><td>2</td><td>4</td><td>6</td><td>7</td><td>8</td><td>10</td><td>12</td></tr> <tr> <td><math>Y:</math></td><td>1600</td><td>1500</td><td>1800</td><td>1900</td><td>1700</td><td>2100</td><td>2000</td></tr> </table>	$X:$	2	4	6	7	8	10	12	$Y:$	1600	1500	1800	1900	1700	2100	2000	10
$X:$	2	4	6	7	8	10	12											
$Y:$	1600	1500	1800	1900	1700	2100	2000											
2.	<p>(a) In a trivariate distribution of three random variables <math>X_1, X_2</math> and <math>X_3</math> with zero means, the standard deviations and correlation coefficients are given: <math>\sigma_1 = 4.42, \sigma_2 = 1.10, \sigma_3 = 85, \rho_{12} = 0.8, \rho_{13} = -0.40, \rho_{23} = -0.56</math>. Determine the following:            (i) partial correlation <math>\rho_{12.3}</math> (ii) regression line of <math>X_1</math> on <math>X_2</math>.</p> <p>(b) On average, 3 traffic accidents per month occur at a certain intersection. What is the probability that in any given month at this intersection</p> <ol style="list-style-type: none"> <li>exactly 5 accidents will occur?</li> <li>fewer than 3 accidents will occur?</li> <li>at least 2 accidents will occur.</li> </ol>	5+5																
3.	<p>(a) A boiler containing eight welds is manufactured in a small shop. When the boiler is completed, each weld is checked by an inspector. If more than one weld is defective on a single boiler, the person who made that boiler is reported to the foreman.</p> <ol style="list-style-type: none"> <li>If 9% of all welds made by Joe Smith are defective, what percentage of all boilers made by him will have more than one defective weld?</li> <li>Over a long period of time how many times will Joe Smith be reported to the foreman for each 15 boilers he makes?</li> </ol> <p>(b) The elongation of a steel bar under a particular load has been established to be normally</p>	5+5																



distributed with a mean of 0.05 inch and  $\sigma = 0.01$  inch. Find the probability that the elongation is

- (i) below 0.04 inch  
(ii) between 0.025 and 0.065 inch

4.

(a) Suppose that the service life, in years, of a hearing aid battery is a random variable having a Weibull distribution with  $\alpha = 1/2$  and  $\beta = 2$ .

i.) How long can such a battery be expected to last?

ii.) What is the probability that such a battery will be operating after 2 years?

(b) Scientists have recently become concerned about the safety of Teflon cookware and various food containers because perfluorooctanoic acid (PFOA) is used in the manufacturing process. An article reported that of 600 children tested, 96% had PFOA in their blood. According to the FDA, 90% of all Americans have PFOA in their blood. Does the data on PFOA incidence among children suggest that the percentage of all children who have PFOA in their blood exceeds the FDA percentage for all Americans? Carry out an appropriate test of hypothesis at 5% level of significance.

5.

From research on comparing business environment cultures across between USA and Canada we have the following summary data:

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Country	Sample Size	Sample Mean	Population SD
USA	174	5.8	6.0
Canada	353	5.1	4.6

- (i) Does it appear that true average time per week that USA managers spend thinking about new ideas differs from that for Canadian managers at 5% level of significance?

difference man

$$Q_2(a) \quad (ii) \quad P_{12.3} = 0.7586 \quad \text{--- } (1)$$

$$\begin{aligned} &= (iii) \quad b_{12} = \rho \cdot \frac{\sigma_1}{\sigma_2} = 3.204 \\ &\quad \boxed{X_1 = b_{12} X_2} \end{aligned} \quad \left. \begin{array}{l} \\ \end{array} \right\} - (2)$$

$$\underline{\underline{\varphi_2(b)}}$$

$$(1) \leftarrow \begin{cases} \lambda = 3 \\ P(X=k) = \frac{e^{-\lambda} \lambda^k}{k!} \end{cases}$$

$$(i) P(X=5) = 0.1008 - (1)$$

$$(ii) P(X<3) = 0.4232 - (2)$$

$$(iii) P(X \geq 2) = 0.8009 - (3)$$

$$4. \alpha = \frac{1}{2}, \beta = 2$$

$$P(x) = \frac{1}{2} \cdot x \cdot x^1 \cdot e^{-\frac{1}{2}x^2}$$

$$P(x) = x e^{-\frac{x^2}{2}} \quad x \geq 0$$

$$F(x) = 1 - e^{-\frac{x^2}{2}} \quad x \geq 0$$

$$\begin{aligned}\bar{x} &= \left(\frac{1}{2}\right)^{\left(\frac{1}{2}\right)} \Gamma\left(1 + \frac{1}{2}\right) \\ &= 1.414 \times \Gamma(3/2) \\ &\approx 1.414 \times \frac{1}{2} \Gamma(1/2)\end{aligned}$$

$$\bar{x} = 2.221$$

∴ the battery is expected to last for an average of at least 2.221 years.

$$(ii) P(x > 2) = 1 - F(2)$$

$$= 1 - (1 - e^{-2})$$

$$= e^{-2}$$

$$P(x > 2) = 0.1353$$

$$\text{Q3(a)} \quad n = 8, \quad p = 0.09$$

$$P(X=k) = \binom{n}{k} p^k (1-p)^{n-k}$$

— ①

$$(i) \quad P(X > 1) = 0.1577 \quad - ②$$

$$(ii) \quad p = P(X > 1) = 0.1577; \quad n = 15 \quad \left. \right\} - ①$$

$$\mu = np = 2.37 \quad - ①$$

$$\text{Q3(b)} \quad \text{Given: } \mu = 0.05, \sigma = 0.01; \quad X \sim N(\mu, \sigma^2) \quad - ①$$

$$(i) \quad P(X < 0.4) = P(Z < -1) = 0.1587 \quad - ②$$

$$(ii) \quad P(0.025 < X < 0.065) = P(-2.5 < Z < 1.5) = 0.9270 \quad - ②$$

Given  $\alpha = \frac{\gamma}{2}$  and  $\beta = 2$

$$(a) \quad E[X] = \alpha^{-1}\beta$$

$$\Gamma\left(1 + \frac{1}{\beta}\right) = \sqrt{2} \Gamma\left(\frac{3}{2}\right) = \sqrt{\frac{\pi}{2}} = 1.253$$

$$(b) \quad P(X > 2) = e^{-\alpha(\frac{2}{\beta})^\beta} = e^{-2} = 0.1353 \quad - 2\frac{1}{2}$$

Q4(a)

Given  $\alpha = \frac{1}{2}$  and  $\beta = 2$

$$(a) E[X] = \alpha^{-\frac{1}{\beta}} \Gamma\left(1 + \frac{1}{\beta}\right) = \sqrt{2} \Gamma\left(\frac{3}{2}\right) = \frac{\sqrt{\pi}}{\sqrt{2}} = 1.253$$

$$(b) P(X > 2) = e^{-\alpha^{\frac{1}{\beta}}} = e^{-2} = 0.1353$$

Q4(b)

$$\begin{aligned} H_0: p &= 0.9 \\ H_1: p &> 0.9 \end{aligned} \quad \left. \right\} - (2)$$

Given  $n = 600$ ,

Sample proportion,  $\frac{x}{n} = 0.96 \Rightarrow x = (0.96)(n) = 576$

Reject  $H_0$ .

$$Z = \frac{\frac{x}{n} - p}{\sqrt{\frac{pq}{n}}} = \frac{0.96 - 0.9}{\sqrt{\frac{(0.9)(0.1)}{600}}} = 4.9 \quad | \quad Z_{\alpha} = 1.645$$

$$5. \quad n_1 = 174 \quad M_1 = 5.8 \quad \sigma_1 = 6.0 \quad \alpha = 5\% = 0.05$$

$$n_2 = 353 \quad M_2 = 5.1 \quad \sigma_2 = 4.6$$

$$H_0: \mu_1 = \mu_2$$

$$H_1: \mu_1 \neq \mu_2$$

Critical region:  $|z| > z_{\alpha/2}$

$$\Rightarrow |z| < z_{0.025} \Rightarrow |z| < 1.960$$

$$z = \frac{\mu_1 - \mu_2}{\sqrt{\frac{\sigma_1^2}{n_1} + \frac{\sigma_2^2}{n_2}}} = \frac{5.8 - 5.1}{\sqrt{\frac{36}{174} + \frac{21.16}{353}}} = \frac{0.7}{0.5165} = 1.355$$

As  $|z| < 1.960$ , we accept the null hypothesis. It doesn't appear to be true that the average time per week that USA managers spend thinking about new ideas differs from that for Canadian managers for given data.

Q5(a)

Given:  $n_1 = 176$ ,  $\bar{x}_1 = 5.8$ ,  $\sigma_1 = 6$

$n_2 = 353$ ,  $\bar{x}_2 = 5.1$ ,  $\sigma_2 = 4.6$

$$① - \left\{ \begin{array}{l} H_0: \mu_1 = \mu_2 \\ H_a: \mu_1 \neq \mu_2 \end{array} \right.$$

$$z = \frac{\bar{x}_1 - \bar{x}_2}{\sqrt{\frac{\sigma_1^2}{n_1} + \frac{\sigma_2^2}{n_2}}} = 1.36$$



X1223H

Projector Information

$$z_{0.025} = 1.96$$

Accept  $H_0$

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