



Shirpur Education Society's
R. C. PATEL INSTITUTE OF TECHNOLOGY, SHIRPUR
An Autonomous Institute

[Affiliated to Dr. Babasaheb Ambedkar Technological University, Lonere]



आर. सी. पटेल इंस्टिट्यूट ऑफ टेक्नॉलॉजी, शिरपूर
(स्वायत्त महाविद्यालय)

End Semester Examination (July 2022)
Academic Year: 2021-2022

Max. Marks: 75

Class: S. Y. B. Tech.

Course: Engineering Mathematics-IV

Program: Computer Engineering

Date:-29/06/2022

Duration: 3 Hr.

Semester: Forth

Course Code: BSCO4010T

Time:10.30 am to 1.30 pm

Instructions:

- (1) Solve ANY FIVE questions.
- (2) Read the questions carefully.
- (3) Assume suitable data wherever required, but justify it.
- (4) All questions carry equal marks.
- (5) Answer to each new question is to be started on a fresh page.
- (6) Figure to the right indicate full marks.
- (7) Draw the neat labelled diagrams wherever necessary.

Question No.		Max. Marks														
Q1 (a)	Find A^{75} for the $A = \begin{bmatrix} 1 & 0 & 0 \\ 1 & 0 & 1 \\ 0 & 1 & 0 \end{bmatrix}$	7														
	OR															
Q1 (a)	Show that the following matrix A is diagonalizable also find the modal matrix P & P^{-1} which Diagonalize A where $A = \begin{bmatrix} 4 & 0 & 1 \\ -2 & 1 & 0 \\ -2 & 0 & 1 \end{bmatrix}$	7														
Q1 (b)	Using Cayley-Hamilton theorem and find A^{-1} where $A = \begin{bmatrix} 1 & 3 & 7 \\ 4 & 2 & 3 \\ 1 & 1 & 1 \end{bmatrix}$ also find the value of $B = A^7 - 4A^6 - 20A^5 - 34A^4 - 4A^3 - 20A^2 - 33A + I$	8														
Q2 (a)	A continuous random variable X has a pdf $f(x) = 3x^2, 0 \leq x \leq 1$, find the values of ' a ' & ' b ' such that (i) $P(X \leq a) = P(X > a)$, (ii) $P(x > b) = 0.05$. Also calculate $E(X)$ & $Var(X)$	7														
	OR															
Q2 (a)	A discrete random variable X has the following probability distribution: <table><tr><td>X</td><td>-2</td><td>-1</td><td>0</td><td>1</td><td>2</td><td>3</td></tr><tr><td>$P(X = x)$</td><td>0.1</td><td>k</td><td>0.2</td><td>$2k$</td><td>0.3</td><td>$3k$</td></tr></table> Find (i) k , (ii) $P(X \geq 2)$, and (iii) $P(-2 < X < 2)$	X	-2	-1	0	1	2	3	$P(X = x)$	0.1	k	0.2	$2k$	0.3	$3k$	7
X	-2	-1	0	1	2	3										
$P(X = x)$	0.1	k	0.2	$2k$	0.3	$3k$										



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Q2 (b)	A businessman goes to hotels X, Y, Z for 20%, 50%, 30% of the time respectively. It is known that 5%, 4%, 8% of the rooms in X, Y, Z hotels have faulty plumbing. What is the probability that the businessman's room having faulty plumbing is assigned to Hotel Z?	8																			
Q3 (a)	Out of 800 families with 5 children each, how many would you expect to have (i) 3 boys? (ii) 5 girls? (iii) either 2 or 3 boys? (iv) at least one boy?	7																			
OR																					
Q3 (a)	<div>A skilled typist, on routine work, kept a record of mistake made per day during 300 working days.</div> <table border="1"><tr><td>Mistakes per day</td><td>0</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td></tr><tr><td>No. of days</td><td>143</td><td>90</td><td>42</td><td>12</td><td>9</td><td>3</td><td>1</td></tr></table> <div>Find the expected frequency using Poisson distribution for the data given below:</div>	Mistakes per day	0	1	2	3	4	5	6	No. of days	143	90	42	12	9	3	1	7			
Mistakes per day	0	1	2	3	4	5	6														
No. of days	143	90	42	12	9	3	1														
Q3 (b)	The lifetime of a certain kind of batteries has a mean life of 400 hours and the standard deviation as 45 hours. Assuming the distribution of lifetime to be normal, find (i) the percentage of batteries with a lifetime of at least 470 hours, (ii) the proportion of batteries with a lifetime between 385 and 415 hours, and (iii) the minimum life of the best 5% of batteries.	8																			
Q4 (a)	A random sample of 400 persons from country A gave mean height 170 cm. Other sample of 800 persons from country B gave mean height 178 cm. Can you say that persons in country B are taller than those of A. Given that population standard deviations 6 cm & 8 cm. respectively.	7																			
OR																					
Q4 (a)	<div>Two independent samples of 8 and 7 items respectively had the following values of the variable</div> <div>Sample 1: 09 11 13 11 15 09 12 14</div> <div>Sample 2: 10 12 10 14 09 08 10</div> <div>Is the difference between the means of the samples significant?</div>	7																			
Q4 (b)	<div>1200 Children were classified according to intelligence and clothes they wore. The following table gives the necessary information:</div> <table border="1"><tr><th rowspan="2">Intelligence</th><th colspan="3">Clothing</th></tr><tr><th>Poorly clad</th><th>Well clad</th><th>Very well clad</th></tr><tr><td>Dull</td><td>72</td><td>90</td><td>78</td></tr><tr><td>Intelligent</td><td>184</td><td>305</td><td>111</td></tr><tr><td>Very Intelligent</td><td>144</td><td>105</td><td>111</td></tr></table> <div>Test whether intelligence is associated with clothing at 1% L.O.S</div>	Intelligence	Clothing			Poorly clad	Well clad	Very well clad	Dull	72	90	78	Intelligent	184	305	111	Very Intelligent	144	105	111	8
Intelligence	Clothing																				
	Poorly clad	Well clad	Very well clad																		
Dull	72	90	78																		
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Q5 (a)	Using Simplex method solve the LPP Max $Z = 5x_1 + 3x_2$, Subject to $3x_1 + 5x_2 \leq 15$, $5x_1 + 2x_2 \leq 10$, where $x_1, x_2 \geq 0$	7																						
OR																								
Q5 (a)	Using Big M method solve LPP Min $Z = 12x_1 + 20x_2$, Subject to $6x_1 + 8x_2 \geq 100$, $7x_1 + 12x_2 \geq 120$, where $x_1, x_2 \geq 0$	7																						
Q5 (b)	Find the coefficient of correlation for the data given below: <table><tr><td>X</td><td>78</td><td>36</td><td>98</td><td>25</td><td>75</td><td>82</td><td>90</td><td>62</td><td>65</td><td>39</td></tr><tr><td>Y</td><td>84</td><td>51</td><td>91</td><td>60</td><td>68</td><td>62</td><td>86</td><td>58</td><td>53</td><td>47</td></tr></table>	X	78	36	98	25	75	82	90	62	65	39	Y	84	51	91	60	68	62	86	58	53	47	8
X	78	36	98	25	75	82	90	62	65	39														
Y	84	51	91	60	68	62	86	58	53	47														

All the Best!