

**PSG COLLEGE OF ARTS & SCIENCE
(AUTONOMOUS)**

**BCA DEGREE EXAMINATION DECEMBER 2023
(First Semester)**

**Branch- COMPUTER APPLICATIONS
STATISTICS AND OPERATIONS RESEARCH**

Time: Three Hours

Maximum: 75 Marks

SECTION-A (10 Marks)

Answer **ALL** questions

ALL questions carry **EQUAL** marks (10 × 1 = 10)

Module No.	Question No.	Question	K Level	CO
1	1	The word 'Statistics' is used as: a) Singular b) Plural c) Singular and Plural d) None of the above	K1	CO1
	2	Extreme value have no effect on: a) Average b) Median c) Mode d) Geometric mean	K2	CO1
2	3	Regression Coefficient is independent of : a) Origin b) Scale c) Both origin and scale d) Variable	K1	CO1
	4	To test an Hypothesis about proportion of items in a data, the test is a) t- test b) F-test c) Z-test d) None of the above	K2	CO3
3	5	Analysis of Variance utilizes: a) F-test b) Z-test c) t- test d) None of the above	K1	CO3
	6	(2x2) contingency table was given by a) Karl Pearson b) Pascal c) Demoivre d) R.A.Fisher	K2	CO3
4	7	Any Solution of an Linear Programming satisfies the non-negative conditions is called a) Feasible Solution b) Optimal Solution c) Solution d) None of the above	K1	CO4
	8	In graphical method, the region common to all the constraints is called: a) Solution space b) Feasible Solution c) Optimal solution d) All the above	K2	CO4
5	9	A Transportation problem is balanced if total Supply and total Demand are a) Equal b) Unequal c) Zero d) All the above	K1	CO4
	10	In Network Analysis, Events are represented by: a) Circle b) Squares c) Rectangles d) None of the above	K2	CO5

Cont...

SECTION - B (35 Marks)

Answer ALL questions

ALL questions carry EQUAL Marks (5 × 7 = 35)

Module No.	Question No.	Question	K Level	CO																														
1	11.a.	Represent the following data by a Pie diagram. <table border="1" style="margin-left: 20px;"> <thead> <tr> <th>Item</th> <th>Food</th> <th>Clothing</th> <th>Rent</th> <th>Education</th> <th>Fuel</th> </tr> </thead> <tbody> <tr> <td>Family A (in Rs)</td> <td>2,400</td> <td>200</td> <td>800</td> <td>150</td> <td>450</td> </tr> </tbody> </table>	Item	Food	Clothing	Rent	Education	Fuel	Family A (in Rs)	2,400	200	800	150	450	K3	CO1																		
	Item	Food	Clothing	Rent	Education	Fuel																												
Family A (in Rs)	2,400	200	800	150	450																													
11.b.	Calculate the mode from the following data. <table border="1" style="margin-left: 20px;"> <thead> <tr> <th>Size</th> <td>10</td> <td>11</td> <td>12</td> <td>13</td> <td>14</td> <td>15</td> <td>16</td> <td>17</td> <td>18</td> </tr> <tr> <th>frequency</th> <td>10</td> <td>12</td> <td>15</td> <td>19</td> <td>20</td> <td>8</td> <td>4</td> <td>3</td> <td>2</td> </tr> </thead> </table>	Size	10	11	12	13	14	15	16	17	18	frequency	10	12	15	19	20	8	4	3	2													
Size	10	11	12	13	14	15	16	17	18																									
frequency	10	12	15	19	20	8	4	3	2																									
2	12.a.	Apply the Coefficient of Correlation between X- Advertisement Expenditure and Y-Sales. <table border="1" style="margin-left: 20px;"> <tbody> <tr> <td>X</td> <td>10</td> <td>12</td> <td>18</td> <td>8</td> <td>13</td> <td>20</td> <td>22</td> <td>15</td> <td>5</td> <td>17</td> </tr> <tr> <td>Y</td> <td>88</td> <td>90</td> <td>94</td> <td>86</td> <td>87</td> <td>92</td> <td>96</td> <td>94</td> <td>88</td> <td>85</td> </tr> </tbody> </table>	X	10	12	18	8	13	20	22	15	5	17	Y	88	90	94	86	87	92	96	94	88	85	K3	CO3								
	X	10	12	18	8	13	20	22	15	5	17																							
Y	88	90	94	86	87	92	96	94	88	85																								
12.b.	Explain the testing procedure of Large Sample tests.																																	
3	13.a.	Explain the testing procedure of Oneway classification.	K5	CO3																														
	13.b.	A Typist in a company commits the following number of mistakes per page in typing 432 pages. <table border="1" style="margin-left: 20px;"> <tbody> <tr> <td>No. of mistakes per page</td> <td>0</td> <td>1</td> <td>2</td> <td>3</td> <td>4</td> <td>5</td> </tr> <tr> <td>No. of pages</td> <td>223</td> <td>142</td> <td>48</td> <td>15</td> <td>4</td> <td>0</td> </tr> </tbody> </table> Fit a Poisson law to the above information.			No. of mistakes per page	0	1	2	3	4	5	No. of pages	223	142	48	15	4	0																
No. of mistakes per page	0	1	2	3	4	5																												
No. of pages	223	142	48	15	4	0																												
4	14.a.	A person requires at least 10,12 and 12 units of the chemicals A, B and C respectively for his garden. A liquid product contains 1,2 and 4 units of A,B and C respectively per jar. A dry product contains 5,2 and 1 units of A, B and C per carton. The liquid product sells for Rs.3 per jar and the dry product sells for Rs.2 per carton. Formulate this as an L.P.P for minimizing the cost and ensuring the requirements.	K4	CO4																														
	14.b.	Solve by graphical method: Maximize $Z=3X_1+4X_2$ Subject to $4X_1+2X_2 \leq 80$ $2X_1+5X_2 \leq 180$ and $X_1, X_2 \geq 0$																																
5	15.a.	Find an initial basic feasible solution by Vogel's approximation method <table border="1" style="margin-left: 20px;"> <thead> <tr> <th></th> <th>D₁</th> <th>D₂</th> <th>D₃</th> <th>D₄</th> <th>Supply</th> </tr> </thead> <tbody> <tr> <td>O₁</td> <td>40</td> <td>25</td> <td>22</td> <td>33</td> <td>200</td> </tr> <tr> <td>O₂</td> <td>44</td> <td>35</td> <td>30</td> <td>30</td> <td>60</td> </tr> <tr> <td>O₃</td> <td>38</td> <td>38</td> <td>28</td> <td>30</td> <td>140</td> </tr> <tr> <td>Demand</td> <td>200</td> <td>40</td> <td>120</td> <td>40</td> <td></td> </tr> </tbody> </table>		D ₁	D ₂	D ₃	D ₄	Supply	O ₁	40	25	22	33	200	O ₂	44	35	30	30	60	O ₃	38	38	28	30	140	Demand	200	40	120	40		K4	CO5
		D ₁	D ₂	D ₃	D ₄	Supply																												
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Demand	200	40	120	40																														
	(OR)																																	

15.b.	A Project is as follows:							
	Activity	A	B	C	D	E	F	G
	Duration (in days)	4	9	3	8	7	2	5
	Preceding activity	-	-	A	B	B	D	E
Construct the network and find the critical path and the project duration.								

SECTION -C (30 Marks)

Answer ANY THREE questions

ALL questions carry EQUAL Marks (3 × 10 = 30)

Module No.	Question No.	Question	K Level	CO																																
1	16	<p>The following table gives the marks of 7 students. Determine Mean, Median and Mode.</p> <table border="1"> <tr> <td>Marks</td> <td>11-20</td> <td>21-30</td> <td>31-40</td> <td>41-50</td> <td>51-60</td> <td>61-70</td> <td>71-80</td> </tr> <tr> <td>No. of students</td> <td>42</td> <td>38</td> <td>120</td> <td>84</td> <td>48</td> <td>36</td> <td>31</td> </tr> </table>	Marks	11-20	21-30	31-40	41-50	51-60	61-70	71-80	No. of students	42	38	120	84	48	36	31	K5	CO1																
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No. of students	42	38	120	84	48	36	31																													
2	17	<p>From the data given below, find:</p> <p>a) the two regression equations</p> <p>b) the most likely marks in Statistics(Y) when the marks in Mathematics (X) is 30.</p> <table border="1"> <tr> <td>X</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>Y</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>	X	25	28	35	32	31	36	29	38	34	32	Y	43	46	49	41	36	32	31	30	33	39	K4	CO2										
X	25	28	35	32	31	36	29	38	34	32																										
Y	43	46	49	41	36	32	31	30	33	39																										
3	18	<p>The following table gives the yields on 15 sample plots under three varieties of seed:</p> <table border="1"> <tr> <td>Seeds A</td> <td>20</td> <td>21</td> <td>23</td> <td>16</td> <td>20</td> </tr> <tr> <td>Seeds B</td> <td>18</td> <td>20</td> <td>17</td> <td>15</td> <td>25</td> </tr> <tr> <td>Seeds C</td> <td>25</td> <td>28</td> <td>22</td> <td>28</td> <td>32</td> </tr> </table> <p>Find out if the average yields of land under different varieties of seed show significant difference.</p>	Seeds A	20	21	23	16	20	Seeds B	18	20	17	15	25	Seeds C	25	28	22	28	32	K4	CO3														
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4	19	<p>Determine the decision variables by Simplex method.</p> <p>Maximize $Z = 4X_1 + 3X_2$</p> <p>Subject to $2X_1 + X_2 \leq 10$</p> <p>$3X_1 + 2X_2 \leq 16$</p> <p>and $X_1, X_2 \geq 0$</p>	K4	CO4																																
5	20	<p>A Small project is composed of seven activities whose time estimates are given in the following table:</p> <table border="1"> <tr> <td>Activity</td> <td>1-2</td> <td>1-3</td> <td>1-4</td> <td>2-5</td> <td>3-5</td> <td>4-6</td> <td>5-6</td> </tr> <tr> <td>t_0</td> <td>1</td> <td>1</td> <td>2</td> <td>1</td> <td>2</td> <td>2</td> <td>3</td> </tr> <tr> <td>t_m</td> <td>1</td> <td>4</td> <td>2</td> <td>1</td> <td>5</td> <td>5</td> <td>6</td> </tr> <tr> <td>t_p</td> <td>7</td> <td>7</td> <td>8</td> <td>1</td> <td>14</td> <td>8</td> <td>15</td> </tr> </table> <p>i) Draw the project network and identify all the paths through it.</p> <p>ii) Determine the expected project length.</p> <p>iii) Calculate the Standard deviation and variance of the project length.</p>	Activity	1-2	1-3	1-4	2-5	3-5	4-6	5-6	t_0	1	1	2	1	2	2	3	t_m	1	4	2	1	5	5	6	t_p	7	7	8	1	14	8	15	K4	CO5
Activity	1-2	1-3	1-4	2-5	3-5	4-6	5-6																													
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