

PSG COLLEGE OF ARTS & SCIENCE  
(AUTONOMOUS)

BCA DEGREE EXAMINATION DECEMBER 2022  
(First Semester)

Branch – COMPUTER APPLICATIONS

STATISTICS AND OPERATIONS RESEARCH

Time: Three Hours

Maximum: 50 Marks

SECTION-A (5 Marks)

Answer ALL questions

ALL questions carry EQUAL marks (5 x 1 = 5)

- Which one of the measure of central tendency is not affected by extreme values?  
i) Mode                      ii) Mean                      iii) Geometric mean      iv) Harmonic mean
- The range of simple correlation coefficient is:  
(i) 0 to  $\infty$                       ii)  $-\infty$  to  $\infty$                       iii) 0 to 1                      iv) -1 to 1
- The hypothesis that the k ( $k > 2$ ) sets of rankings of 7 or more individuals are independent can be tested by:  
(i)  $\chi^2$  test                      ii) t-test                      iii) z-test                      iv) F-test
- An objective function is maximized when it is a \_\_\_\_\_.  
(i) time                      ii) Profit                      iii) Cost                      iv) None of these
- A given Transportation problem is said to be unbalanced, if the total supply is not equal to the total \_\_\_\_\_.  
(i) Availability                      (ii) Demand                      (iii) Cost                      (iv) None of these.

SECTION - B (15 Marks)

Answer ALL Questions

ALL Questions Carry EQUAL Marks (5 x 3 = 15)

- a) Explain types of Bar diagram.  
(OR)  
a) Describe the Quartile deviation and Coefficient of variation.
- a) Explain the types of Correlation.  
(OR)  
b) Outline the steps for testing of difference of proportions.
- a) Prepare the ANOVA table for one way classifications.  
(OR)  
b) Explain briefly the testing of difference of means using 't' test.
- a) Sketch the Mathematical formulation of L.P.P.  
(OR)  
b) Narrate the steps for writing the dual of a given LPP.
- a) Describe the mathematical formulation of Transportation problem.  
(OR)  
b) Explain about NWC method.

SECTION -C (30 Marks)

Answer ALL questions

ALL questions carry EQUAL Marks (5 x 6 = 30)

- a) The temperature of two cities A and B in a winter season are given below.  
Temperature of city A (in degree Celsius):      18      20      22      24      26  
Temperature of City B (in degree Celsius):      11      14      15      17      18  
Examine which city is more consistent in temperature changes?

(OR)

Cont...

- 11.b) Draw histogram for the following frequency distribution of the weekly wages of number of workers.

Weekly wages	Number of workers
0 – 20	41
20 – 40	51
40 – 60	64
60 – 80	38
80 – 100	7

Hence find the value of mode.

- 12.a) From following information identify the correlation coefficient between advertisement expenses and sales volume using Karl Pearson's coefficient of correlation method.

Firm	:	1	2	3	4	5	6	7	8	9	10
Advertisement Exp:		11	13	14	16	16	15	15	14	13	13
(Rs. In Lakhs)											
Sales Volume :		50	50	55	60	65	65	65	60	60	50
(Rs. In Lakhs)											

(OR)

- 12.b) From the following data obtain the two regression lines:

Capital Employed (Rs. in lakh):	7	8	5	9	12	9	10	15
Sales Volume (Rs. in lakh):	4	5	2	6	9	5	7	12

- 13.a) In a packaging plant, a machine packs cartons with jars. It is supposed that a new machine would pack faster on the average than the machine currently used. To test the hypothesis, the time it takes each machine to pack ten carons are recorded.

The result in seconds is as follows.

New Machine:	42,	41,	41.3,	41.8,	42.4,	42.8,	43.2,	42.3,	41.8,	42.7
Old Machine:	42.7,	43.6,	43.8,	43.3,	42.5,	43.5,	43.1,	41.7,	44,	44.1

Perform an F-test.

(OR)

- 13.b) Suppose the National Transportation Safety Board (NTSB) wants to examine the safety of compact cars, midsize cars, and full-size cars. It collects a sample of three for each of the treatments (cars types).

Compact cars	Midsize cars	Full-size cars
643	469	484
655	427	456
702	525	402

Using the hypothetical data provided below, test whether the mean pressure applied to the driver's head during a crash test is equal for each types of car. Use  $\alpha = 5\%$ .

- 14.a) A milk plant manufactures two types of products A and B and sells them at a profit of Rs. 5 on type A and Rs. 3 on type B. Each product is processed on two machines G and H. Type A requires one minute of processing time on G and two minutes on H; type B requires one minute on G and one minute on H. The machine G is available for not more than 6 hours 40 minutes, while machine H is available for 8 hours 20 minutes during any working day. Formulate the problem as LP problem and solve the L.P.P by graphical method.

(OR)

- 14.b) Use simplex method to solve the following L.P.P:

$$\text{Maximize } Z = 4x_1 + 10x_2$$

Subject to the constraints:

$$2x_1 + x_2 \leq 50, 2x_1 + 5x_2 \leq 100, 2x_1 + 3x_2 \leq 90, x_1 \geq 0 \text{ and } x_2 \geq 0.$$

- 15.a) Find IBFS for the following transportation problem using Vogel's approximation method

Routes	Chilling centers				Route Capacity
	P	Q	R	S	
A	16	18	21	12	150
B	17	19	14	13	160
C	32	11	15	10	90
Chilling Centre Capacity	140	120	90	50	400

Total supply and demand

(OR)

- 15.b) Draw a network diagram for the following schedule of activities and find its critical path. Also calculate slack time for each event, total float, free float and independent float.

Activity	1-2	1-3	1-4	2-6	3-7	3-5	4-5	5-9	6-8	7-8	8-9
Duration (in days)	2	2	1	4	5	8	3	5	1	4	3

Z-Z-Z

END