



**WEST BENGAL STATE UNIVERSITY**  
B.Com. Honours Part-III Examination, 2020

**ADVANCED MATHEMATICS, STATISTICS AND PROJECT WORK**

**PAPER-AMPW-VIII**

Time Allotted: 2 Hours

Full Marks: 50

*The figures in the margin indicate full marks.  
Candidates should answer in their own words and adhere to the word limit as practicable.  
All symbols are of usual significance.*

**MODULE-I**

**Advanced Mathematics**

**Marks-20**

**Answer all questions from the following**

1. The sum of the two numbers is 12. Find the maximum value of their product. 5

**OR**

The total cost function of a firm is  $C = \frac{1}{3}x^3 - 5x^2 + 28x + 10$ , where  $C$  is total cost and  $x$  is output. A tax at the rate of Rs. 2 per unit of output is imposed and the producer adds it to his cost. If the market demand function is given by  $p = 2530 - 5x$ , where Rs.  $p$  is the price per unit of output, find the profit maximising output and price. 5

2. (a) Find the area bounded by the curve  $y = 16(x-1)(4-x)$  and the  $x$ -axis. 4

(b) Evaluate:  $\int \frac{x-2}{\sqrt{2x^2-8x+5}} dx$  3

**OR**

(a) Evaluate:  $\int_1^2 \frac{dx}{2\sqrt{x}}$  3

(b) Evaluate:  $\int \frac{x dx}{(ax+b)^{2/3}}$  4

3. (a) Find  $AB$  and  $BA$  where  $A = \begin{pmatrix} 4 & 2 & -1 \\ 3 & -7 & 1 \end{pmatrix}$  and  $B = \begin{pmatrix} 2 & 3 \\ -3 & 0 \\ -1 & 5 \end{pmatrix}$ . 4

(b) Solve by Cramer's rule: 4

$$x + y + z = 4$$

$$x - 2y + z = -2$$

$$3x + 2y + 7z = 14$$

**OR**

(a) Prove that  $\begin{vmatrix} 1 & 1 & 1 \\ a & b & c \\ a^2 & b^2 & c^2 \end{vmatrix} = (a-b)(b-c)(c-a)$ . 3

(b) Solve by matrix inversion method: 5

$$3x + y + z = 1$$

$$2x - 2z = 0$$

$$5x + y + 2z = 2$$

### MODULE-II

#### Advanced Statistics

Marks-30

Answer *all* the questions from the following

4. (a) Define power set of a set  $A$ . 2

(b) Prove (without the help of Venn diagram) that for any two sets  $A$  and  $B$ ,  $(A \cup B)' = A' \cap B'$  where  $X'$  is the complement of set  $X$ . 4

**OR**

(a) Given  $A = \{1, 3\}$  and  $B = \{3, 5\}$ , show that  $A \times B \neq B \times A$ . 2

(b) In a class of 100 students, 45 students read physics, 52 students read chemistry and 17 students read both the subjects. Find the number of the students who study neither physics nor chemistry. 4

5. (a) A random variable  $X$  has the following probability density function: 5

$$f(x) = \begin{cases} k(9-x) & \text{for } 0 \leq x \leq 9 \\ 0 & \text{otherwise} \end{cases}$$

Find the value of  $k$  and the mean of  $X$ .

(b) Find the mathematical expectation of receiving a tail when a balanced coin is tossed twice. 4

(c) Define random experiment. 1

**OR**

(a) For any two events  $A$  and  $B$ , prove that  $P(A \cup B) = P(A) + P(B) - P(A \cap B)$ . 5

(b) What is the probability of getting 3 white balls in a draw of 3 balls from a box containing 5 white and 4 black balls? 4

(c) What is p.d.f. of a normal distribution? 1

6. (a) A population consists of the numbers 3, 9, 6, 7, 10. Draw all possible samples (without replacement) of size 2 from the population. Find also population mean. 5  
(b) Distinguish sampling distribution and distribution of sample. 3

**OR**

- (a) A simple random sample of size 5 is drawn without replacement from a finite population consisting of 41 units. If the population standard deviation is 6.25, what is the standard error of sample mean? 5  
(b) State the main objectives of sampling. 3
7. Two types of bulbs are tested for their length of life (days) and the following data are obtained: 6

	No. of Samples	Mean life (days)	Variance
Type A	9	600	121
Type B	8	640	144

Is there a significant difference in two means? [Given the value of  $t$  for 15 degrees of freedom at 5% level of significance is 2.131].

**OR**

A die is thrown 90 times with the following results: 6

Face:	1	2	3	4	5	6
Frequency:	10	12	16	14	18	20

Are these data consistent with the hypothesis that the die is unbiased?

[Given  $\chi_{0.05}^2 = 11.07$  for 5 degrees of freedom].

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