E-MAIL FOR ANSWER-SCRIPT SUBMISSION (within 01-hour after exam).

B.Com./Part-III/Hons./AMPW-VIII/2021   **psenscm@gmail.com**   -06/07/21 (Tues)

WEST BENGAL STATE UNIVERSITY
B.Com. Honours Part-III Examination, 2021

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. For a certain establishment, the total revenue function R and total cost function C 5
are given by $R = 83x - 4x^2 - 21$ and $C = x^3 - 12x^2 + 48x + 11$ for the output x.
Find the output for which the profit is maximum.

OR

Find the maximum and minimum of $f(x) = x^3 - 6x^2 + 9x + 1$ 5

2. (a) Find the area included between the curve $y^2 - 9x$ and the straight line $y = x$.   5

   (b) Evaluate: $\displaystyle\int_{1}^{2} \frac{dx}{2\sqrt{x}}$ 2

OR

(a) Evaluate: $\displaystyle\int_{0}^{1} \frac{e^x(1+x)dx}{\cos^2(xe^x)}$ 4

(b) Evaluate: $\displaystyle\int \frac{x\,dx}{\sqrt{1+x^2}}$ 3

3. (a) Solve by Cramer's rule: 4
$$x - y + x = 3,\ 2x - 3y + 5z = 4,\ x + 2y - 4z = -1$$

   (b) Without expanding show that   4
$$\begin{vmatrix} 1 & a & a^2 - bc \\ 1 & b & b^2 - ca \\ 1 & c & c^2 - ab \end{vmatrix} = 0$$

OR

(a) Solve by matrix inversion method: 5
$$2x - z = 1, \ 5x + y = 2, \ y + 3z = 3$$

(b) For the matrix $A = \begin{pmatrix} 3 & 1 \\ -1 & 2 \end{pmatrix}$, prove that $A^2 - 5A + 7I = 0$ where I, the identity 3
matrix of order 2.

MODULE-II
Advanced Statistics
Marks-30

Answer *all* the questions from the following

4. (a) Find the power set of the set $\{1, 2, 3\}$. 2

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

OR

(a) Given $A = \{1, 3\}$ and $B = (3, 5\}$. Examine whether the following statement 2
$A \times B = B \times A$.

(b) Out of 440 boys in a college, 112 boys read German, 120 read French and 168 4
Spanish. Of these 32 read French and Spanish, 40 read German and Spanish, 20
read German and French, while 12 read all the three languages. Using set theory
find how many boys

(i) did not read any language and

(ii) read just one language.

5. (a) Find the value of k for which the function 2+3

$$f(x) = \begin{cases} kx^3, & 0 < x < 1 \\ 0 & , \ \text{elsewhere} \end{cases}$$

may be a probability density function. Find also $P(X < 1)$.

(b) A random variable X follows a Poisson distribution such that 5
$P(X = 1) = P(X = 2)$. Find $P(X = 0)$.

OR

(a) Find the probability that in a family of 4 children there will be at least 1 boy. 3
Assume that the probability of male birth is $\frac{1}{2}$.

(b) Find the expectation $E(X)$ for the following distribution function: 3

$$f(x) \ = \frac{4x}{5} \qquad , 0 < x \leq 1$$
$$= \frac{2}{5}(3 - x), 1 < x \leq 2$$
$$= 0 \qquad , \ \text{elsewhere}$$

   (c) Find the event space when three coins are tossed once.   2

   (d) Let, $Y = 5 - 3X$. Find the variance of Y if variance of X is 2.   2

6. (a) A population consists of 5 number 1, 3, 5, 7, 9. Consider all possible samples of size two which can be drawn with replacement from this population. Find the population mean and S.D. of sample mean.   6

   (b) What do you mean by population characteristics and sample characteristics?   2

OR

   (a) The distribution of a population of random variable X is given by $P(X = 0) = P(X = 1) = \frac{1}{2}$. A random sample (x_1, x_2, x_3, x_4) of size 4 is taken from the population of X. Show that the sampling distribution of the statistic $t = x_1 + x_2 + x_3 + x_4$ is a Binomial $(4, \frac{1}{2})$ distribution.   6

   (b) State the main objectives of sampling.   2

7.   Current ratios of 10 sample companies of a particular sector result in $\overline{X} = 1.7$ and S.D. = 0.30. Test whether current ratios of the sample companies are significantly differing from the standard 2. [Given, $t_{0.025(9)} = 2.26$]   6

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 $\chi^2_{0.05} = 11.07$ for 5 degree of freedom]

N.B. : *Students have to complete submission of their Answer Scripts through E-mail / Whatsapp to their own respective colleges on the same day / date of examination within 1 hour after end of exam. University / College authorities will not be held responsible for wrong submission (at in proper address). Students are strongly advised not to submit multiple copies of the same answer script.*

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