UNIVERSITY OF THE PUNJAB

B.S. 4 Years Program / Seventh Semester – Spring 2022

Roll No. .....

Paper: Mathematics (Advance) **Course Code: BBA-403** **Time: 3 Hrs. Marks: 60**

THE ANSWERS MUST BE ATTEMPTED ON THE ANSWER SHEET PROVIDED

Q.1. Solve the following: **(5x6=30)**

(i) If $y = (1 + \sqrt{\sin x})^2$ then find its first and second order derivatives at $x = 0, \frac{\pi}{4}$.

(ii) Given the cost function $C(x) = ax^2 + bx + c$. Then find the actual expression for $C(x)$ by using conditions $C(0) = 0$, $C'(1) = 1$ and $C'(-1) = 1$.

(iii) Evaluate the integral $\int x^2 \sin x dx$.

(iv) Then find the area between the curve $y = \sin 2x$ and x-axis from 0 to $\frac{\pi}{3}$.

(v) Maximize $f(x, y) = xy$ subject to the constraint $x + y = 12$.

Q.2. Solve the following: **(5x6=30)**

(a) If $y = e^x \sin x$ then find $\frac{dy}{dx}$ and $\frac{d^2y}{dx^2}$. Also show that $\frac{d^2y}{dx^2} - 2\frac{dy}{dx} + 2y = 0$.

(b) If $x = a\cos\theta$, $y = a\sin\theta$ then first and second order derivatives w. r. t. x.

(c) Evaluate the definite integrals $\int_1^2 (x^2 + 1)dx$ and $\int_0^{\frac{\pi}{6}} \cos^3 x dx$.

(d) A random variable X has probability density function (p.d.f.)

$$f(x) = \begin{cases} kx(2-x), & \text{if } 0 \le x \le 2, \\ 0, & \text{if otherwise.} \end{cases}$$

Find (i) k (ii) $P(0 \le x \le 1)$ (iii) $P(1 \le x \le 2)$.

(e) Use the method of least squares to find least squares linear regression line $y = ax + b$ for the data given below. Estimate the value of y when $x = 30$.

x	5	6	8	10	12	13	15	16	17
y	16	19	23	28	36	41	44	45	50