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University of Sargodha

B.A/B. Sc 1st Annual Examination 2012.

Applied Math **Paper: A**

Maximum Marks: 100 **Time Allowed: 3 Hours**

Note: **Attempt any two questions from each section.**

Section- I

Q.1. a. Solve the initial value problem $\frac{dy}{dx} = \frac{x(x^2+1)}{4y^3}$ $y(0) = \frac{-1}{\sqrt{2}}$ (8)

b. Solve the equation. $(D^2 + 6D + 9)y = 0$ $y(0) = 2$ $y'(0) = -3$ (9)

Q.2. a. Solve differential equation. $\frac{dy}{dx} = \frac{x+3y-5}{x-y-1}$ (8)

b. Solve by the method of U.C $y'' - 4y' + 4y = e^{2x}$ (9)

Q.3. a. Solve $(1+x^2)\frac{dy}{dx} + 4xy = \frac{1}{(1+x^2)^2}$ (8)

b. Solve $x^2\frac{d_2y}{dx^2} + 7x\frac{dy}{dx} + 5y = x^5$ (9)

Q.4. a. Find orthogonal trajectories of family of cardiods. $r = a(1 + cos\theta)$ (8)

b. Find a series solution of differential equation around indicated point (9)

$y'' - x^2y = 0$ around $x = 0$

Section-II

Q.5. a. Compute the Laplace transformation of $cos^2 a\,t$ (8)

b. Compute the inverse Laplace transformation of $\frac{9S-67}{S^2-16S+49}$ (8)

Q.6. a. Using Newton Raphson method find a root of $f(x) = x^3 - 2x - 5 = 0$ (8)

b. Solve the transcendental equation $f(x) = e^{-x} - sin\left(\frac{\pi x}{2}\right) = 0$ to a positive real root by Bisection method. (8)

Q.7. a. Use the trapezoidal rule with $n = 4$ to approximate. $I = \int_0^4 \sqrt{x^2+1}\,dx$ (8)

b. Use Simpson's rule to approximate the Integral $\int_1^2 \ln x\,dx$ with $n = 4$. (8)

Q.8. a. Find the first and second order derivatives of the function from the following data at $x = 2$. (8)

x	1	2	3	4	5
$f(x)$	3	10	29	66	127

b. Find a bound on the error in approximating the given integral using: (8)

i. Trapezoidal rule ii. Simpson's rule. $\int_{-1}^2 x^5 dx$ with $n = 10$

Section- III

Q.9. a. Minimize $z = 2x_1 + x_2$ subject to the conditions (9)

$$x_1 + x_2 \geq 1$$
$$x_1 - x_2 \geq -1$$
$$x_1 + 2x_2 \geq 4$$
$$x_1, x_2 \geq 0$$

b. Use the simplex method to find the maximum value of object function (8)
$z = 10x_1 + 11x_2$ with the condition

$$3x_1 + 4x_2 \leq 9$$
$$5x_1 + 2x_2 \leq 8$$
$$x_1 + 2x_2 \leq 1$$
$$x_1 \geq 0 \text{ and } x_2 \geq 0$$

Q.10. a. A set of eight cards contains one joker. A and B are two players and A choose 5 cards at random, B taking the remaining 3 cards. What is the probability that A has the joker? (8)

b. A pair of fair dice is thrown. If the two numbers appearing are different, find the probability that sum is (i) 6 (ii) sum is 4 or less. (9)

Q.11. a. If $f(x) = \frac{1}{n}(x = 1,2,3 \ldots\ldots\ldots\ldots n)$then find $E(x)$ and $Var(x)$ (8)

b. Suppose that the life length (in hours) of a certain radio tube is continuous random variable x with probability density function $f(x) = \frac{100}{x^2}$ $x > 100$ (9)

And zero elsewhere. What is the probability that a tube will last less than 200 hours, if it is known that tube is still functioning after 150 hours of service?

Q.12. a. An event has the probability $P = 3/8$, Find the complete Binomial distribution for $n = 5$ trials? (9)

b. Let X be random variable having a binomial distribution with parameters $n = 25$ and $P = 0.2$ evaluate $P[X < \mu - 2\sigma]$ (8)