University of Sargodha

B.A/B. Sc. 1st Annual Exam 2017.

Subject: B Course of Math **Paper: B**

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

Note: Attempt any two questions from each section.

Section- I

Q.1. (a) Solve D.E. $(e^x + 1)ydy = (y + 1)e^x dx$ (8)

(b) Solve the initial value problem $\frac{dy}{dx} = \frac{2x}{y+x^2y}$ $y(0) = -2$ (9)

Q.2. (a) Solve D.E. $dx + \left(\frac{x}{y} - \sin y\right)dy = 0$ (8)

(b) Solve D.E. $(x + 2y^3)\frac{dy}{dx} = y$ (9)

Q.3. (a) Find an equation of orthogonal trajectories of the curve $\gamma^2 = a \sin 2\theta$ (8)

(b) Solve $P^2 + P - 6 = 0$ (9)

Q.4. (a) Find singular solution of $x^3P^2 + x^2yP + a^3 = 0$ (8)

(b) Solve $(x^2D^2 - 2xD + 2)y = x^3$ where $D = \frac{d}{dx}$ (9)

Section- II

Q.5. (a) Compute i. $\mathcal{L}\{t^3 - 1\}e^{-2t}$ ii. $\mathcal{L}\{e^{-t}\sin 2t\}$ (8)

(b) Compute inverse Laplace transform $\frac{1}{(S-1)(S^2+4)}$ (8)

Q.6. (a) Use the Newton-Raphson method to approximate up to four places $\sin x = 1 - x$ with $x_0 = 0$ (8)

(b) Use the trapezoidal rule to approximate the integral $\int_1^4 \frac{dx}{x} = \ln 4$ with $n = 3$ (8)

Q.7. (a) Use Simpson's rule to approximate the integral $\int_{-1}^{2} x^5 dx$ with $n = 10$ (8)
Also find bound error.

(b) Evaluate $\mathcal{L}^{-1}\left\{tan^{-1}\frac{a}{s}\right\}$ (8)

Q.8. (a) Solve $\frac{d^2y}{dt^2} - 2\frac{dy}{dt} + y = te^t$ I.C. $y(0) = 0$ $y'(0) = 0$ by method of Laplace transform. (8)

(b) Use trapezoidal rule to approximate $\int_1^2 \ln x \, dx$ with $n = 4$ (8)

Section- III

Q.9. (a) A straight line makes angles of measure α, β, γ, δ with the four diagonals of a cube. Prove that $cos^2\alpha + cos^2\beta + cos^2\gamma + cos^2\delta = \frac{4}{3}$ (8)

(b) Find an equation of the plane through the points $P(4,-1,2), Q(-3,-2,-1), R(7,-1,3)$ (9)

Q.10. (a) Show that the straight line $\frac{x}{1} = \frac{y}{2} = \frac{z}{3}$ is perpendicular to the plane $4x + 8y + 12z + 19 = 0$ (8)

(b) Find an equation of the cone whose directrix is $y^2 = x$, $z = 4$ and vertex is at $A(0,2,0)$ (9)

Q.11. (a) An equation in cylindrical coordinates is $r^2 \cos 2\theta = z$ Transform the equation into rectangular coordinates. (8)

(b) Find the direction of Qibla of the Badshahi Mosque, Lahore, Latitude = $31^\circ 35.4'N$ and Longitude = $74^\circ 18.7'E$ (9)

Q.12. (a) Find the eigen values and eigen vectors $A = \begin{bmatrix} 2 & 2 \\ 3 & 1 \end{bmatrix}$ (8)

(b) Find a real orthogonal matrix P which $P^{-1}AP$ is diagonal matrix where $A = \begin{bmatrix} 1 & 2 \\ 2 & 1 \end{bmatrix}$ (9)