Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE- SEMESTER– 1st / 2nd • REMEDIAL EXAMINATION – SUMMER 2015

Subject Code: MTH002 **Date:29/05/2015**

Subject Name: Ordinary Differential Equations

Time: 10.30AM-01.00PM **Total Marks: 70**

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions whenever necessary.**
3. **Figures to the right indicate full marks.**

Objective Section (MCQ)

Q.1	If $y=\sum_{n=0}^{\infty} a_n x^n$ then y'' is	1
	(A) $\sum_{n=2}^{\infty} a_{n+2} x^{n+2}$ (C) $\sum_{n=0}^{\infty} (n+2)(n+1) a_{n+2} x^n$	
	(B) $\sum_{n=0}^{\infty} n(n-1) a_n x^{n-2}$ (D) None of these	
Q.2	The power series $\sum_{n=0}^{\infty} (x+1)^n$ is centred at 'a'=_____.	1
	(A) 1 (C) -1	
	(B) i (D) -i	
Q.3	The power series is that series which include	1
	(A) zero or positive integer powers	
	(B) negative powers.	
	(C) fractional powers.	
	(D) non negative fractional powers.	
Q.4	If $f(x)$ and $g(x)$ are analytic functions then $f(x)/g(x)$	1
	(A) nowhere analytic.	
	(B) analytic everywhere except $g(x)=0$.	
	(C) analytic only at '0'.	
	(D) analytic at '0' and '1'.	
Q.5	A second order differential equation is called linear if it can be written as	1
	(A) $y''y+p(x)y'+q(x)y=r(x)$ (B) $y''+p(x)y'y+q(x)y=r(x)$	
	(C) $y''+p(x)y'+q(x)y^2=r(x)$ (D) $y''+p(x)y'+q(x)y=r(x)$	
Q.6	A equation $y''+p(x)y'+q(x)y=r(x)$ is called	1
	(A) Homogeneous differential equation	
	(B) Non homogeneous differential equation	

	(C) Power equation	
	(D) None of these	
Q.7	A basis of solutions of a second order differential equation is a pair y_1, y_2 of	1
	(A) Linearly dependent solutions	
	(B) Linearly independent solutions	
	(C) Homogeneous solutions	
	(D)None of these	
Q.8	The general solution of $\frac{d^2y}{dx^2} - y = 0$ is defined as	1
	(A) $y = c_1e^{2x} + c_2e^{-x}$ (B) $y = c_1e^{2x} + c_2e^{-2x}$	
	(C) $y = c_1e^{x} + c_2e^{-x}$ (D) None of these	
Q.9	For the differential equation $f(x,y)\frac{dy}{dx} + g(x,y) = 0$ is said to be exact if	1
	(A) $\frac{\partial f}{\partial y} = \frac{\partial g}{\partial x}$ (B) $\frac{\partial f}{\partial x} = \frac{\partial g}{\partial y}$	
	(C) $\frac{\partial^2 f}{\partial y \partial x} = \frac{\partial^2 g}{\partial x \partial y}$ (D) None of these	
Q.10	The degree and order of the differential equation $\left(\frac{dy}{dx}\right)^2 + y\sin x = 0$	1
	(A) Degree: 1 and order: 2 (B) Degree: 2and order: 2	
	(C) Degree: 2 and order: 1 (D) None of these	
Q.11	A non exact differential equation become an exact if it multiply by	1
	(A) Any differential operator (B) trigonometric function	
	(C) Complementary function (D) Integrating factor	
Q.12	A differential equation $(x^2 + y^2)dx = 2xydy$ is	1
	(A)Non Homogeneous and exact (B) Homogeneous and exact	
	(C) Homogeneous and non exact (D) None of the above	
Q.13	A differential equation $xdy - ydx = 0$ is	1
	(A) Exact and linear (B) Exact and non linear	
	(C) Non Exact and homogeneous (D) Non Exact and nonogeneous	
Q.14	The General Solution of $\frac{dy}{dx} + Py = Q$, where P and Q are function of x or constant is	1
	(A) $y(I.F) = \int Q(I.F)dx + c$, where C is constant	
	(B) $x(I.F) = \int Q(I.F)dy + c$, where C is constant	
	(C) $x(I.F) = \int P(I.F)dy + c$, where C is constant	
	(D) $y(I.F) = \int P(I.F)dy + c$, where C is constant	
Q.15	Which of the following is known as Legendre's Differential Equation:	1

	(A) $(1-x^2)y''-xy'+\alpha^2 y=0$ (B) $x^2y''+xy'+(x^2-v^2)y=0$	
	(C) $(1-x^2)y''-2xy'+\alpha(\alpha+1)y=0$ (D) $(1+x^3)y''+4xy'+y=0$	
Q.16	For the differential equation $\left(x^2+4\right)y''+2xy'-12y=0$ the singular points are	1
	(A) $x=\pm 2$ (B) $x=\pm 2i$	
	(C) $x=\pm 4$ (D) $x=\pm 4i$	
Q.17	The power series solution of the equation : $y''=0$ is	1
	(A) $2a_0+a_1x$ (B) $2a_0$	
	(C) a_0+a_1x (D) $3a_0+5a_1x$	
Q.18	If $y_1=\cos\omega x,\ y_2=\sin\omega x$ are solutions of $y''+\omega^2 y=0$ then the value of wronskian is	1
	(A) ω (B) ω^2	
	(C) 2ω (D) None of these	
Q.19	What is the choice of trial solution for $y''+4y=8x^2$ in method of undetermined coefficients	1
	(A) ax^2+bx+c (B) ax^2+c	
	(C) bx^2+c (D) None of these	
Q.20	The General Solution of $\frac{dx}{dy}+Px=Q$, where P and Q are function of y or constant in which I.F. is	1
	(A) $e^{\int p(x)dx}$ (B) $e^{-\int p(x)dx}$	
	(C) $e^{\int p(y)dy}$ (D) $e^{-\int p(y)dy}$	
Q.21	The solution of differential equation $9yy'+4x=0$ gives	1
	(A) Ellipse (B) Parabola	
	(C) Hyperbola (D) Circle	
Q.22	The equation formed from the coefficient of the lowest powers of is called _____.	1
	(A) Frobenius equation (B) Indicial equation	
	(C) Recurrence relation (D) None of these	
Q.23	The incorrect equation among the following is	1
	(A) $p_0(x)=1$ (B) $p_1(x)=x$	
	(C) $p_n(-x)=(-1)^{n+1}p_n(x)$ (D) None of the above	
Q.24	What is an ordinary point of Diff. Eqn. $(1-x^2)y''-2xy'+2y=0$.	1
	(A) $x=1$ (B) $x=0$	
	(C) $x=-1$ (D) None of these	

Q.25	$J_{\frac{1}{2}}(x)$ is given by:	1
	(A) $\sqrt{\frac{2\pi}{x}}\sin x$ (B) $\sqrt{\frac{2\pi}{x}}\cos x$	
	(C) $\sqrt{\frac{2}{\pi x}}\sin x$ (D) $\sqrt{\frac{2}{\pi x}}\cos x$	
Q.26	If $y=\sum_{n=0}^{\infty}a_n x^n$ is a solution of $y''+y=0$ then the recurrence relation for coefficients is given by:	2
	(A) $(n-2)(n-1)a_{n-2}+a_n=0$ (B) $(n+2)(n+1)a_{n+2}+a_n=0$	
	(C) $n(n+1)a_{n+1}+a_n=0$ (D) None of these	
Q.27	For Diff. Eqn. $x^2(1-x)^2y''+2xy'+4y=0$, the point $x=1$ is:	2
	(A) Ordinary point. (B) Regular singular point.	
	(C) Irregular Singular point. (D) None of the above.	
Q.28	$dy=\sqrt{1-y^2}\,dx$ has solution	2
	(A) $y=\sin x+c$ (B) $y=\sin(x+c)$	
	(C) $y=\cos x+c$ (D) $y=\cos(x+c)$	
Q.29	An Integrating factor of the differential equation $x\frac{dy}{dx}-y=(x+1)e^{-x}$ is	2
	(A) $(1+x)^{-1}$ (B) $(1+x^2)^{-1}$	
	(C) $(1-x)^{-1}$ (D) $(1-x^2)^{-1}$	
Q.30	The general solution of $\frac{d^2y}{dx^2}-5\frac{dy}{dx}+6y=0$ is defined as	2
	(A) $y=c_1e^{2x}+c_2e^{3x}$ (B) $y=c_1e^{x}+c_2e^{-2x}$	
	(C) $y=c_1e^{x}+c_2$ (D) $y=c_1e^{x}+c_2e^{2x}$	

Subjective Section

Attempt any five:

Q.1 Solve: (1) $y' + 6x^2 y = \frac{e^{-2x^3}}{x^2}$, *where* $y(1) = 0$.

(2) $\frac{dy}{dx} + \frac{1}{x} = \frac{e^y}{x^2}$

Q.2 The rate at which bacteria multiply is proportional to the instantaneous number present. If the original number doubles in 2 hours, in how many hours will it triple?

Q.3 (1) Solve the non homogeneous equation $y'' - 3y' + 2y = e^x$

(2) Solve: $\frac{d^2y}{dx^2} - 4\frac{dy}{dx} + 4y = \frac{e^{2x}}{x^5}$

Q.4 Solve $\left(x^2D^2 - 3xD + 4\right)y = x^2$ given that $y(1) = 1$ and $y'(1) = 0$

Q.5 Using method of variation of parameters, solve $y'' - 6y' + 9y = \frac{e^{3x}}{x^2}$

Q.6 Using method of undetermined coefficients, solve the differential equation $y'' + 4y = 8x^2$

Q.7 Using power series method solve $y' - y = 0$
