



**National University of Computer & Emerging Sciences, Karachi**  
**Spring-2017EE-Department**  
**Final Exam**  
**23<sup>rd</sup> May 2017, 9:00 am – 12 pm**



Course Code:MT203	Course Name: Differential Equations
Instructor Name :	Muhammad Jamil usmani
Student Roll No:	Section No:

**OBJECTIVE PART – A [35 Marks]**

**INSTRUCTIONS:**

1. Part- A consist of four pages and you are allowed **80** minutes for this Part.
2. Over writing or double marked answer will be rejected .
3. After returning back “Part – A”, you will be given “Part – B” for the next **100** minutes.
4. Shade the correct option for each question. More than one shaded answer will not marked.

For example: if option 'a' is correct:

		b	c	d			b	c	d		
	1	a	b	c	d		19	a	b	c	d
	2	a	b	c	d		20	a	b	c	d
	3	a	b	c	d		21	a	b	c	d
	4	a	b	c	d		22	a	b	c	d
	5	a	b	c	d		23	a	b	c	d
	6	a	b	c	d		24	a	b	c	d
	7	a	b	c	d		25	a	b	c	d
	8	a	b	c	d						
	9	a	b	c	d		26		T	F	
	10	a	b	c	d		27		T	F	
	11	a	b	c	d		28		T	F	
	12	a	b	c	d		29		T	F	
	13	a	b	c	d		30		T	F	
	14	a	b	c	d		31		T	F	
	15	a	b	c	d		32		T	F	
	16	a	b	c	d		33		T	F	
	17	a	b	c	d		34		T	F	
	18	a	b	c	d		35		T	F	

I, \_\_\_\_\_(Student ID) , certify that I will neither receive nor give unpermitted aid on this examination and that I will report all such incidents observed by me in which unpermitted aid is given.

Student's signatures \_\_\_\_\_

Invigilator's signature\_\_\_\_\_

**MCQS: Choose the letter of the best answer in each questions.**

1. Classify the differential equation  $e^x \frac{dy}{dx} - 4y = x^2 y$ 
  - a) Separable and not linear.
  - b) Linear and not separable.
  - c) Both separable and linear.
  - d) None of these.
2. The given differential equation  $(y^2 + yx)dx + x^2 dy = 0$  is a form of
  - a) Exact
  - b) Homogenous
  - c) Bernoulli
  - d) None of these
3. Which one is true for the differential equation  $x \frac{d^3 y}{dx^3} - 2\left(\frac{dy}{dx}\right)^4 + y = 0$ 
  - a) Linear ,Third order, first degree
  - b) Nonlinear ,First order, fourth degree
  - c) Nonlinear ,Third order, first degree
  - d) None of these
4. Which of the following differential equations is Exact ?
  - a)  $(x + x^2 y)dx + (2y + xy^2)dy = 0$
  - b)  $\left(x^3 + \frac{y}{x}\right)dx + (y^2 + \ln x)dy = 0$
  - c)  $(2x - 3y)dx + (3x + 2y) dy = 0$
  - d) None of these
5. The series  $\sum_{n=0}^{\infty} (-1)^n \frac{x^{2n}}{(2n)!}$  is known as
  - a) Sine series
  - b) Cosine series
  - c) Exponential series
  - d) None of these
6. The roots of the auxiliary equation  $m^2 + 4m + 7 = 0$  are
  - a) Distinct
  - b) Complex
  - c) Repeated
  - d) None of these

7. The given differential equation  $\frac{dy}{dx} + f(x)y = g(x)y^2$  is called
- Linear equation
  - Bernoulli equation
  - Homogeneous equation
  - Riccati's equation
8. Consider the differential equation  $y'' + 9y = \frac{1}{4}\operatorname{cosec}3x$ , if  $y_c = C_1\cos3x + C_2\sin3x$  then the value of Wronskian i.e  $W =$
- 2
  - 3
  - 0
  - None of these
9. A trial particular solution of  $y'' + 2y' = 5 - e^{-x}$
- $y_p = A + Be^{-x}$
  - $y_p = Ae^{-x}$
  - $y_p = (A + Bx)e^{-x}$
  - None of these
10. The given linear differential equation  $\frac{dT}{dt} = k(T - T_m)$  model used for
- Newton law of Cooling/warming
  - Population growth and Decay
  - velocity of falling bodies
  - None of these
11. Consider the linear differential equation  $xy' + (x + 1)y = 3x^2e^{-x}$  then one possible Integrating factor for given equation is
- $xe^x$
  - $e^x$
  - $x + \ln|x|$
  - None of these

12. A particular solution of linear differential equation  $y'' + 3y' + y = x^{-2}e^x$  can be obtained by
- Undetermined coefficient
  - variation of parameter
  - Annihilator Approach
  - None of these
13. Which of the following are the fundamental set of solution for  $y'' - 2y' + 2y = 0$
- $te^t, e^t$
  - $e^t \cos t, e^t \sin t$
  - $\cos t, \sin t$
  - None of these
14. A trial particular solution of the equation  $y'' + y' - 6y = x - 4e^{2x}$
- $y_p = Ax + B$
  - $y_p = (Ax + B)e^{2x}$
  - $y_p = Ax^2 + Bx + C$
  - None of these
15. A trial particular solution of the equation  $y'' - y' + y = 2\sin 3x$
- $y_p = A\cos 2x + B\sin 2x$
  - $y_p = A\cos 3x - B\sin 3x$
  - $y_p = A\cos 3x + B\sin 3x$
  - None of these
16. The general solution of first order differential equation  $\frac{dy}{dx} - 3y = 6$  where  $C$  is arbitrary constant.
- $y = 2 + Ce^{-3x}$
  - $y = -2 + Ce^{2x}$
  - $y = -2 + Ce^{3x}$
  - None of these

17. What is general solution to  $y'' - \sqrt{5}y' = 0$  ? Assume  $c_1$  and  $c_2$  are arbitrary constants.
- $y = C_1 e^{\sqrt{5}t} + C_2 t$
  - $y = C_1 e^{\sqrt{5}t} + C_2 t e^{\sqrt{5}t}$
  - $y = C_1 \cos \sqrt{5}t + C_2 \sin \sqrt{5}t$
  - None of these
18.  $L^{-1} \left( \frac{2}{s+3} \right) =$
- $e^{-3t}$
  - $\frac{1}{2} e^{-3t}$
  - $2e^{-3t}$
  - None of these
19. Which of the following is a solution of  $4y'' + 9y = 0$  ,  
Assume  $c_1$  and  $c_2$  are arbitrary constants.
- $y = C_1 \cos t + C_2 \sin t$
  - $y = c_1 e^t + c_2 e^{-4t}$
  - $y = C_1 \cos \left( \frac{2t}{3} \right) + C_2 \sin \left( \frac{2t}{3} \right)$
  - None of these
20. The Integrating factor of the differential equation  $3xy' + y = 12x$
- $x^{\frac{1}{3}}$
  - $\frac{1}{3} \ln x$
  - $x$
  - None of these
21.  $L^{-1} \left\{ \frac{1}{(s+2)^2} \right\} =$
- $t e^{-t}$
  - $t^2$
  - $t^2 e^{-t}$
  - None of these

22.  $L(\sinh kt) =$

a)  $\frac{k}{s^2 + k^2}$

b)  $\frac{k}{s^2 - k^2}$

c)  $\frac{s}{s^2 + k^2}$

d) None of these

23.  $L(\cos kt) =$

a)  $\frac{k}{s^2 + k^2}$

b)  $\frac{k}{s^2 - k^2}$

c)  $\frac{s}{s^2 + k^2}$

d) None of these

24.  $L\{\delta(t - t_0)\} =$

a)  $\frac{e^{-as}}{s}$

b)  $e^{-st_0}$

c)  $\frac{1}{s^2}$

d) None of these

25.  $L(te^{3t}) =$

a)  $\frac{1}{s - 3}$

b)  $\frac{1}{(s + 3)^2}$

c)  $\frac{1}{(s - 3)^2}$

d) None of these

**Answer each of the following either True or False:**

1. The word differential equation mean containing the derivatives of one or more independent variables with respect to one or more dependent variables.
2. The solution of Cauchy-Euler equation  $x^2y'' - 2xy' - 4y = 0$  is  $y = C_1x + C_2x^4$
3. The differential operator  $(D - 3)(D^2 + 1)$  annihilates the function  $y = 8e^{3x} + 4\sin x$
4. The differential equation  $\frac{d^2y}{dx^2} + 3\frac{dy}{dx} - 5y = 0$  is second order , linear and homogenous with constant coefficient.
5. The solution of  $y'' + y = \tan x$  can be obtained by undetermined coefficient method.
6. The differential equation  $x^2y'' - xy' + y = 2x$  is second order and non homogenous with variable coefficient
7. With the help of s-shifting property  $L(t^3e^{5t}) = \frac{6}{(s-5)^3}$
8. The equation  $3x^2 + y^2 = c$  is a one-parameter family of the solution of the differential equation  $y\frac{dy}{dx} = 3x$
9.  $L(t^5) = \frac{120}{s^6}$
10. The root of the auxiliary equation of differential equation  $y''' - 5y'' + 3y' + 9y = 0$  are repeated and distinct.

