Examination October 2020

B.Sc. T.Y (Sem-VI)

2047B 2)Ordinary Differtial Equation II -604

Time: One Hour **Max. Marks: 25**

instruction

- solve any 25 questions from Q.1 to Q.30

1 A differential equation is considered to be ordinary if it has...

(A) One dependent varaible (B) More than one dependent varaible (C) One independent varaible (D) More than one independent varaible

2 Let $L(y)=a_0 y^{(n)}+a_1(x)y^{(n-1)}+......+an(x)y=b(x)$ .Points where $a_0(x)=0$ is called

(A) Regular point (B) Regular and singular point (C) Singular point (D) Niether singular nor regular point

3 An initial value problem $xy^1+y=0, y(0)=1$ has a solution..

(A) x (B) e^x (C) *Log x* (D) $\frac{1}{x}$

4 There exists ….. linearly independent solutions of $y^{(n)}+a_1(x)y^{(n-1)}+....+a_n(x)y=0$

(A) One (B) Three (C) n (D) (n - 1)

5 The equation $y''+\frac{1}{x}y'-\frac{1}{x^2}y=0$ has a solution of the form

(A) $x^r, r\, is\, constant$ (B) $x^{-r}, r\, is\, constant$ (C) $rx, r\, is\, constant$ (D) $\frac{1}{x^r}, r\, is\, constant$

6 If $Q_1, Q_2, ...Q_n$ are definite an interval I is called linearly independent, if there exist a constant $C_1, C_2, ..., C_n$ such that $C_1, C_2, ..., C_n$ such that $C_1Q_1+C_2Q_2+....+C_nQ_n$

(A) $C_1=C_2=.....=Cn=1$ (B) $C_1=C_2=.....=Cn=0$ (C) $C_1=C_2=.....=Cn\neq 0$ (D) $C_1=1, C_2=C_3=...=Cn=0$

7 If a linear space of functions $Q_1, Q_2, ..., Q_n$ which are linearly independent and such that every function in the space can be represented as a linear combition of these , then $Q_1, Q_2, ..., Q_n$ is called

(A) Dimension of linear space (B) Curl of linear space (C) Basis for the linear space (D) Gradient of a linear space

8 If Q_1, Q_2, ….. , Q_n are n solutions of $L(y)=y^{(n)}+a_1(x)y(n-1)+....+an(x)y=0$ on an interval I, they are linearli independent if and only if ….

(A) $W(Q_1, Q_2, ..., Q_n)=0$ (B) $W(Q_1, Q_2, ..., Q_n)\neq 0$ (C) $W(Q_1, Q_2, ..., Q_n)=1$ (D) None of these

9 The dimension of a linear space does not depend on a choice of ….

(A) Basis (B) Solution (C) Differential equation (D) None of these

10 The Wronskin of solutions $Q_1(x)=\cos x \text{ and } Q_2(x)=\sin x$ is

(A) 1 (B) 2 (C) 3 (D) 4

11 If $(Q_1, Q_2, ..., Q_n)=0$ are n solutions of $L(y)=y(n)+a_1(x)y^{(n-1)}+.....+an(x)y=0$ on an interval I, and let as x_0 be any point in $W(Q_1, Q_2, ..., Q_n)(x)=...$

(A) $\exp[\int_{xo}^{x} a_1(t)dt]W(Q_1, Q_2, ..., Q_n)$ (B) $\exp[\int_{xo}^{x} a_1(t)dt]$ (C) $\exp[-\int_{xo}^{x} a_1(t)dt]W(Q_1, Q_2, ..., Q_n)(x_0)$ (D) None of these

12 If $Q_1, Q_2, ..., Q_n$ are m solutions of n^th order differential equation L(y) = 0 on I, then the function which is identically zero on I is known as ….

(A) Regular solution (B) Singular solution (C) Non trival solution (D) Trival solution

13 The solution of IVP xy' + y = 0, y(1) = 1 exits only on …...

(A) $0<x<\infty$ (B) $-\infty<x<0$ (C) $-\infty<x<\infty$ (D) None of these

14 If $Q_1, Q_2, ..., Q_n$ are linearly independent solutions of $L(y)=y^{(n)}+an(x)y(n-1)+.....+an(x)y=0$ on an interval I. If Q is any solution of L(y) = 0 on I, then it can be represented in the form...

(A) $Q=C_1Q_1+C_2Q_2+......+CnQn$ (B) $Q=C_1Q_1-C_2Q_2-......-CnQn$ (C) $Q=C_1Q_1-C_2Q_2+C_3Q_3+...+CnQn$ (D) None of these

15 The legendre polynomial of degree one is ...

(A) -x (B) x (C) x^2 (D) x^{-2}

16 The equation $(1-x^2)y''-xy'+x^2y=0$ is called ….

(A)Legendre equation (B)Hermite equation (C)Chebyshev equation (D)Bessel eqation

17 The equation $(1-x^2)y''-2xy'+x(x+1)y=0$ is known as....

(A)Hermite equation (B)Bessel equation (C)Chebyshev equation (D)Legendre equation

18 Which of the following is n – th legendre polynomial ….

(A) $Pn(x)=\frac{1}{2_n n!}\frac{d^n}{dx^n}(x^2-1)^n$ (B) $Hn(x)=(-1)^n e^{x^2}\frac{d^n}{dx^n}e^{-x^2}$ (C) $J_0(x)=\frac{\sum_{m=0}^{\infty}(-1)^m}{(m!)^2}(\frac{x}{2})^{2m}$ (D)None of these

19 The coefficient of x^n in Pn(x) is ….

(A) $(2n)!$ (B) $\frac{(2n)!}{2^n(n!)^2}$ (C) $\frac{1}{2^n(n!)}$ (D)None of these

20 The value of the integral $\int_{-1}^{1} Pn^2(x)\,dx=$.......

(A)2 (B) $\frac{1}{2n+1}$ (C) $\frac{2}{2n+1}$ (D)1

21 The value of the integral $\int_{-1}^{1} P2(x)P1(x)\,dx\, is.....$

(A)1 (B)-1 (C)2 (D)None of these

22 The rgular singular point of the equation $(1-x^2)y''-2xy'+\alpha(\alpha+1)=are....$

(A)0 (B) ±1 (C) ±2 (D)None of these

23 If ψ_p is a particular solution of $L(y)=y^{(n)}+a_{,}(x)y^{(n-1)}+\ldots\ldots+a_n(x)y=b(x)$ and $\phi_1,\phi_2,\ldots\ldots,\phi_n$ are linearly independent solution of $L(y)=0$,then every solution ψ of $L(y)=b(x)$ can be written as .....

(A) $\psi=\psi_p+c_1\phi_1+c_2\phi_{+\ldots}....+C_n\phi_n$ (B) $\psi=c_1\phi_1+c_2\phi_{+\ldots}....+C_n\phi_n$ (C) $\psi=\psi_p=c_1\phi_1+c_2\phi_{+\ldots}....+C_n\phi_n$ (D)None of these

24 The function $\phi_1(x)=x^{r1}$ and $\phi_2(x)=x^{r2}$ are the solution of . . . . .

(A)Euler equation (B)Chebyshev equation (C)Legendre equation (D)Bessel equation

25 The equation $x^2y''+\frac{3}{2}xy'+xy=0$ has a regular singular point at . . . . .

(A) ±1 (B)0 (C) ±2 (D)None of these

26 The bessed functin of zero order of first kind is given by . . . . . .

(A) $\frac{\sum_{m=0}^{\%infiniti}(-1)^m}{(m!)^2}(\frac{x}{2})^{2m}$ (B) $\sum_{m=0}^{\infty}\frac{(-1)^m}{(m!)^2}(\frac{x}{2})^m$ (C) $\sum_{m=0}^{\infty}\frac{(-1)^m}{(m!)^2}(\frac{x}{2})^{m+1}$ (D)None of these

27 The bessed function of zero order of the second kind is denoted by . . . .

(A) $J_0(x)$ (B) $P_0(x)$ (C) $H_0(x)$ (D) $K_0(x)$

28 A basis for the solution of the equation $x^2y''+xy'+y=0$ are. . . . .

(A) $\phi_1(x)=|x|^i,\phi_2(x)=|x|^{-i}$ (B) $\phi_1(x)=|x|^{2i},\phi_2(x)=|x|^{-2i}$ (C) $\phi_1(x)=|x|,\phi_2(x)=\frac{1}{|x|}$ (D)None of these

29 The genelar solution of $x^2y''+2xy'-6y=0$ is given by (for x>0) . . . . .

(A) $C_1x+C_2x^2$ (B) $C_1X^{-3}+C_2X^2$ (C) $C_1X^2+C_2X-4$ (D)None of these

30 The initial value problem $y'''+x^2y''+3xy'+2xy=0$ has at most . . . . . . solutions on I satisfying $\phi(x_0)=0,\phi'(x_0)=2,\phi''(x_0)=2$

(A)One (B)Two (C)Three (D)Four