TELANGANA UNIVERSITY
S.S.R. DEGREE COLLEGE, NIZAMABAD (C.C:5029)
II SEMESTER INTERNAL ASSESSMENT II EXAMINATIONS
MATHS (DIFFERENTIAL EQUATIONS) QUESTION BANK

I. Multiple Choice Questions.

1. If the auxiliary equation has complex conjugate roots, then the complementary function is [a]
(a) $e^{\alpha x}(C_1\cos\beta x + C_2\sin\beta x)$ (b) $e^{-\alpha x}(C_1\cos\beta x + C_2\sin\beta x)$
(c) $e^{\beta x}(C_1\cos\alpha x + C_2\sin\alpha x)$ (d) $e^{-\beta x}(C_1\cos\alpha x + C_2\sin\alpha x)$

2. The complementary function of an equation having the roots -1, -1, 4 is [b]
(a) $(C_1 + C_2x)e^{4x} + C_3e^{-x}$ (b) $(C_1 + C_2x)e^{-x} + C_3e^{4x}$
(c) $(C_1 + C_2x)e^{-4x} + C_3e^{x}$ (d) $(C_1 + C_2x)e^{x} + C_3e^{-4x}$

3. The general solution of nth order non homogeneous differential equation is [a]
(a) $y = y_c + y_p$ (b) $y = y_c \,.\, y_p$ (c) $y = y_c - y_p$ (d) $y = y_c\left(\frac{1}{yp}\right)$

4. The particular integral of $(D^2 - 5D + 6)y = 0$ is [d]
(a) 1 (b) 5 (c) 6 (d) 0

5. The particular integral of $\frac{cos3x}{D^2-1}$ is [c]
(a) $\frac{1}{10}cos3x$ (b) $\frac{1}{10}sin3x$ (c) $-\frac{1}{10}cos3x$ (d) $-\frac{1}{10}sin3x$

6. The complementary function of $(D^2 - 1)$ is [c]
(a) $C_1e^{x} + C_2e^{-x}$ (b) $C_1\cosh x + C_2\sinh x$ (c) Both a & b (d) Neither a nor b

7. The particular integral of $\sin\alpha x$, if $f(-a^2) = 0$ is [a]
(a) $\frac{-x}{2a}cosax$ (b) $\frac{x}{2a}cosax$ (c) $\frac{-x}{2a}sinax$ (d) $\frac{x}{2a}sinax$

8. The particular integral of $\frac{9}{D^2+5D+4}$ is [d]
(a) 0 (b) 1 (c) $\frac{4}{9}$ (d) $\frac{9}{4}$

9. The complementary function of $(D^2 + 4)y$ is [a]
(a) $C_1\cos 2x + C_2\sin 2x$ (b) $C_1\cosh 2x + C_2\sinh 2x$ (c) $(C_1 + C_2x)e^{2x}$ (d) $C_1e^{2x} + C_2e^{-2x}$

10. The particular integral of 4x2 can be written as (using method of undetermined coefficient) [a]
(a) $Ax^2 + Bx + C$ (b) $Ax^2 - Bx + C$ (c) $Ax^2 + Bx - C$ (c) $-(Ax^2 + Bx + C)$

11. If one of the solutions of differential equation is known then the second solution can be determined by using [c]
(a) Method of undetermined coefficients (b) Variation of parameters
(c) Reduction of order method (d) None of these

12. If $y_2 = y_1 \int u(x)dx$ then, $u(x) =$ [b]
(a) exp$\frac{\left[\int\frac{f_1(x)}{f_2(x)}dx\right]}{y_1^2}$ (b) exp$\frac{\left[-\int\frac{f_1(x)}{f_2(x)}dx\right]}{y_1^2}$ (c) exp$\frac{\left[\int\frac{f_2(x)}{f_1(x)}dx\right]}{y_1^2}$ (d) exp$\frac{\left[-\int\frac{f_2(x)}{f_1(x)}dx\right]}{y_1^2}$

13. In Cauchy euler equation, x is substituted as [c]
(a) t (b) log t (c) e^t (d) None of these

14. The two linearly independent solutions of $(D^2 - 3D + 2)y$ is [d]

(a) e^{-x}, e^{-2x} (b) e^{-x}, e^{2x} (c) (a) e^{x}, e^{-2x} (d) (a) e^{x}, e^{2x}

15. If Q(x) = x + logx by cauchy euler equation Q(x) becomes [a]

(a) $e^t + t$ (b) $e^t - t^2$ (c) $e^t . t^2$ (d) te^t

16. In Legendre's linear equation, ax + b is substituted as [b]

(a) Log t (b) e^t (c) e^{-t} (d) None

17. Which of the following is miscellaneous differential equation? [c]

(a) $\frac{d^2y}{dx^2} = F(x)$ (b) $\frac{dx}{dy} = F'(x)$ (c) $\frac{d^2y}{dx^2} = f(x)$ (d) None

18. Which of the following is a partial differential equation? [d]

(a) $\frac{\partial z}{\partial x} = p$ (b) $\frac{\partial z}{\partial y} = q$ (c) $\frac{\partial^2 z}{\partial x^2} = p$ (d) None

19. The solution obtained from complete integral through assigning particular values to constants is [b]

(a) Complete solution (b) Particular solution (c) Both a & b (d) None

20. The subsidiary equation of (y + z)p + (x + z)q = x + y is [a]

(a) $\frac{dx}{y+z} = \frac{dy}{x+z} = \frac{dz}{x+y}$ (b) $\frac{dx}{(y+z)^2} = \frac{dy}{(x+z)^2} = \frac{dz}{(x+y)^2}$

(c) $\frac{dx}{y-z} = \frac{dy}{x-z} = \frac{dz}{x-y}$ (d) None

II. Fill in the blanks.

1. The general solution of n^{th} order homogeneous differential equation is complementary function
2. The auxiliary equation of $(D^2 - 3D + 2)y$ is $m^2 - 3m + 2 = 0$
3. The roots of $(D^2 -5D + 6)y$ are 2,3
4. If the roots of auxiliary equation are real then the complementary function is $C_1e_1^{m.x} + C_2e_2^{m.x} +$............
5. The particular integral for $f(D)y = e^{ax}$, $f(a)\neq 0$ is $\frac{e^{ax}}{f(a)}$
6. The value of $\frac{e^{2x}}{D^2+4D+3}$ is $\frac{e^{ax}}{15}$
7. The auxiliary equation having the roots 2,3 is $m^2 - 5m + 6 = 0$
8. The complementary function of (D + 2) (D-2) is $C_1e^{-2x} + C_2e^{2x}$
9. The particular integral of differential equations depends on Q(x)
10. In method of undetermined coefficients f(D)y = $f(D)y_p$
11. If y_1 is a known solution then y_2 can be determined by formula $y^2 = y_1\int u(x)dx$
12. By substituting $x = e^t$, Cauchy-Euler equation is converted into linear equation with constant coefficients.
13. The particular integral of $(D^2 +4D + 4)y = 6e^x$ is $\frac{2}{3}e^x$
14. In method of variation of parameters, the two linearly independent solutions can be determined from complementary function
15. If $Q(x) = x^2$ in Cauchy-Euler equation reduced to linear order differential equation then x^2 becomes e^{2t}
16. The two linearly independent solutions of $(D^2 +4D + 4)y$ are e^{-2x}, xe^{-2x}
17. Partial differential equation can be obtained by eliminating arbitrary constants or arbitrary functions involving two or more variables.
18. The solution of first order PDE that has two arbitrary constants is called as complete indtegral
19. The linear P.D.E of first order is also called as Lagrange's linear P.D.E
20. The equation of the form, $\frac{dx_1}{P_1} = \frac{dx_2}{P_2}$ .... $= \frac{dx_n}{P_n} = \frac{d_z}{R}$ is called as subsidiary equation

Short Answers.

1. Find the complementary function of $(D^2 - 9D + 8)y = 0$
2. Find the particular integral of $(D^2 - 3D + 2)y = e^{3x}$

3. Find the particular integral of $(D^2 + 9)y = \cos 2x$
4. Define general solution of $P(D)y = Q(x)$
5. Define particular integer of $P(D)y = Q(x)$
6. Define Cauchy's Euler Equation?
7. Define Partial Linear Differential equation of 1^{st} order?
8. Find the complementary function of $(D^4 - 1)y = 0$
9. Find the wronksian of y_1, y_2 in $(D^2 + 6D + 8)y = 3xe^{-x}$ by using method of variation of parameters.
10. Find the subsidiary equation of $(mz – ny)p + (nx – lz)q = ly - mx$