PETRODICE ACADEMY

Head office: Hyderabad Branch

Topic: Differential Equation

Time Allowed: 45 Min **Maximum Marks: 25**

Read the following instructions carefully.

01. (i) Question Numbers 01 to 05 (05 questions) will carry one mark each.
(ii) Question Numbers 06 to 15 (10 questions) will carry two marks each.
02.**Wrong answers carry 33% negative marks. In Q. 01 to Q.05, 1/3 mark will be deducted for each wrong answer and in Q. 06 to Q.15,2/3 mark will be deducted for each wrong answer. However, there is no negative marking for numerical answer Type questions.**

GROUP – I

Each question carries ONE mark

5 x 1 = 5

1. The general solution of

$y\sqrt{1+x^2}$ dy + $x\sqrt{1+y^2}$ dx = 0 is

a) $\sqrt{1+x^2}+\sqrt{1+y^2}$ = c

b) $\sqrt{1+x^2}=c$

c) $\sqrt{1-x^2}+\sqrt{1-y^2}$ = c

d) $\sqrt{1+y^2}=c$

2 For exact differential Equation of the form Mdx+ *Ndy* = 0

a) $\frac{\delta M}{\delta y}=\frac{\delta N}{\delta x}$

b) $\frac{\delta M}{\delta x}=\frac{\delta N}{\delta y}$

c) $\frac{\delta M}{\delta y}\neq\frac{\delta N}{\delta x}$

d) $\frac{\delta M}{\delta x}\pm\frac{\delta N}{\delta y}$

3. The roots of A.E. is $[100\pm\sqrt{500}]$ them Complementary Function (C.F) is

a) e^{100x} (Acos$\sqrt{500}$x + Bsin$\sqrt{500}x$)

b) e^{100x} (Acosh$\sqrt{500}$x + Bsinh$\sqrt{500}x$)

c) e^{100x} (Acosh$\sqrt{500}$x - Bsinh$\sqrt{500}x$)

d) e^{100x} (Acos$\sqrt{500}$x - Bsin$\sqrt{500}x$)

4. For the differential equation $\frac{dy}{dt}$ +5y=0with y(0)=1, the general solution is

a) e^{5t} b) e^{-5t}

c) $5e^{-5t}$ d) $e^{\sqrt{-5t}}$

5. The order of the differential equation

$$\frac{d^2y}{dt^2}+\left(\frac{dy}{dt}\right)^3+y^4=e^{-t}\text{ is}$$

a) 1 b) 2

c) 3 d) 4

GROUP – II

Each question carries TWO mark

10 x 2=20

1.The general solution of the differential equation x^2 - $\frac{d^2y}{dx^2}$ – x $\frac{dy}{dx}$ + y = 0 is

a) Ax+Bx^2 (A,B are constants)

b) Ax+Blogx (A,B are constants)

c) Ax+ Bx^2logx (A,B are constants)

d) Ax+Bxlogx (A,B are constants)

2. A spherical naphthalene ball exposed to the atmosphere loses volume at a rate proportional to

its instantaneous surface area due to evaporation. If the initial diameter of the ball is 2 cm

and the diameter reduces to 1 cm after 3 months, the ball completely evaporates in

a) 6 months

b) 9 months

c) 12 months

d) Infinite time

3.

$$\frac{d^2y}{dx^2} + (x^2 + 4x)\frac{dy}{dx} + y = x^8 - 8$$

The above equation is a

a) Partial differential equation

b) Nonlinear differential equation

c) Non-homogeneous differential equation

d) Ordinary differential equation

4. A function *n*(*x*) satisfies the differential equation

$$\frac{d^2n(x)}{dx^2} - \frac{n(x)}{L^2} = 0$$

Where *L* is a constant. The

Boundary conditions are: *n*(*0*)=K and *n*(∞)= 0. The solution to this equation is

a) n(x) = K exp(x/L)

b) n(x) = K exp(x / $\sqrt{L}$)

c) n(x) = K^2exp(-x/L)

d) n(x) = K exp(-x/L)

5. With initial values y(0) = y'(0) = 1,the solution of the differential equation

$\frac{d^2y}{dx^2}$ + 4$\frac{dy}{dx}$ + 4y = 0 at x=1 is_____.

6. The solution to the differential equation

f ''(x)+4f'(x)+4f(x)=0 is

a) $f_1(x) = e^{-2x}$

b) $f_1(x) = e^{2x}$, $f_2(x) = e^{-2x}$

c) $f_1(x) = e^{-2x}$, $f_2(x) = xe^{-2x}$

d) $f_1(x) = e^{-2x}$, $f_2(x) = e^{-x}$

7. Solution of the differential equation

$$3y\frac{dy}{dx} + 2x = 0$$

Represents a family of

a) Ellipses

b) Circles

c) Parabolas

d) Hyperbolas

8.The Laplace transform of (1-e^t)/t is___

a) log ($\frac{s-1}{s}$)

b) log ($\frac{s+1}{s}$)

c) log ($\frac{s}{s-1}$)

d) log ($\frac{s}{s+1}$)

9. The one dimensional heat equation is

a) $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = 0$

b) $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = f(x,y)$

c) $\frac{\partial u}{\partial t} = c^2 \frac{\partial^2 u}{\partial x^2}$

d) $\frac{\partial^2 y}{\partial t^2} = c^2 \frac{\partial^2 y}{\partial x^2}$

10. Biotransformation of an organic compound having concentration (x) can be modelled using an

ordinary differential equation

$$\frac{dx}{dt} + kx^2 = 0,$$

where k is the reaction rate constant. If x = a at

t = 0, the solution of the equation is

a) $x = ae^{-kt}$

b) $\frac{1}{x} = \frac{1}{a} + kt$

c) $x = a(1 - e^{-kt})$

d) $x = a + kt$