UNIVERSITY OF EDUCATION
"UExam" Semester-IV, 2019
BS Physics Session:2017-21
Course Code: MATH2117
Subject: Ordinary Differential Equations

No. 61

Roll No. (in fig.)_____

Roll No. (in words)_____

Candidate's Signature._____

Signature of Addl. Supdt._____

SECTION: I (MCQ's)

Time Allowed: 20 Minutes **Max. Marks: 18**

NOTE: Encircle the correct/ best answer in each of the followings. Each Question carries 1 mark. Use of remover carries zero mark. Cutting and Overwriting is not allowed.

Q1.

- Order of differential equation $\frac{d^3y}{dx^3}+\frac{dy}{dx}=e^x$ is _____.
  (a) 1 (b) 2 (c) 3 (d) 4
- The equation $(1-y)\frac{dy}{dx}+2y=0$ is _____ equation.
  (a) linear (b) non-linear (c) linear second order (d)non-linear second order
- $x^2+y^2=25$ is an _____ solution of a differential equation.
  (a) Explicit (b) Implicit (c) both (a) and (b) (d) none of the above
- $\frac{d^2y}{dx^2}-y=0,\ y(0)=1,\ y'(1)=2$ is a _____ problem.
  (a) Initial value (b) Boundary value (c) non-initial value (d) both (a) and (b)
- $f(x,y)=x^3+y^3$ is a_____ function of degree 3.
  (a) Homogeneous (b) Non-homogeneous (c) both (a) and (b) (d) none of these
- The set of solutions is linearly independent on an interval I iff wronskian of that set is _____.
  (a) $=0$ (b) $\neq 0$ (c) >0 (d) <0
- Annihilator operator of e^{-3x} is _____.
  (a)$(D-3)$ (b) $(D-3)^2$ (c) $(D+3)^2$ (d) $(D+3)$
- Solution in case of repeated roots of Cauchy-Euler equation is of the form _____.
  (a) $y=c_1e^{m_1x}+c_2e^{m_2x}$ (b) $y=c_1e^{m_1x}+c_2xe^{m_2x}$
  (c) $y=c_1x^{m_1}+c_2x^{m_2}$ (d) $y=c_1x^{m_1}+c_2lnx\,x^{m_2}$
- $x=2, x=-2$ are _____ points of $(x^2-4)^2y''+3(x-2)y'+5y=0$.
  (a) ordinary (b) singular (c) non-singular (d) None of these .
- Laplace transform of e^{-3t} is
  (a) $\frac{1}{s-3}$ (b) $\frac{1}{s+3}$ (c) $\frac{1}{s-2}$ (d) $\frac{1}{s+2}$
- Radius of convergence of $\sum_{n=1}^{\infty}\frac{(-1)^n}{n}x^n$ is _____.
  (a) 1 (b) 2 (c) -1 (d) -2
- $\Gamma(1+v+1)=$ _____.
  (a) $(1+v)\Gamma(v)$ (b) $(1-v)\Gamma(v)$
  (c) $(1+v)\Gamma(v+1)$ (d) $(1-v)\Gamma(v-1)$
- $P_n(-x)=$_____.
  (a) $(-1)P_n(x)$ (b) $(1)^nP_n(x)$ (c) $(-1)^nP_n(x)$ (d) $(-1)^nP_o(x)$
- Inverse Laplace transform of $\frac{1}{s}$ is _____.
  (a) 0 (b) 1 (c) -1 (d) -2
- $X_1=\begin{pmatrix}1\\-1\end{pmatrix}e^{-2t}$ and $X_2=\begin{pmatrix}3\\5\end{pmatrix}e^{6t}$ are linearly_____.
  (a) dependent (b) independent (c) both (a) and (b) (d) None of these.
- If y_1, y_2 and y_3 are the solutions of a differential equation then which of the following is also a solution.
  (a) $y_1+y_2-y_3$ (b) $c_1y_1+c_2y_2-y_3$ (c) $y_1-y_2+y_3$ (d) all of the above.
- The functions $y_1=e^x, y_2=e^{2x}$ and $y_3=e^{3x}$ _____ a fundamental set of solution.
  (a) do not form (b) form (c) may form (d) may not form.
- If e^{7x} is a solution of differential equation, then which of the following is also the solution of that equation.

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Section II (Short Answer)

Q.2- Write short answers of the following.

3x6 = 18

(i) Solve $\frac{dy}{dx} - 3y = 0$.

(ii) Check whether the differential equation is exact or not

$$(e^{2y} - y\cos xy)dx + (2xe^{2y} - x\cos xy + 2y)dy = 0.$$

(iii) Find inverse Laplace transform of $\frac{1}{(s^2+k^2)^2}$.

(iv) Describe the modeling of differential equation with the help of an example.

(v) Solve $y' + 2y = f(x)$, $y(1) = 0$ $f(x) = \begin{cases} 0, & 0 \le x \le 1 \\ 1, & x > 1 \end{cases}$.

(vi) Find a power series representation of $e^x sinx$.

Section III (Essay Type)

Answer the following Questions

6x4 = 24

Q.3:- Solve the System

$$L\frac{di_1}{dt} + Ri_2 = E(t)$$

$$RC\frac{di_2}{dt} + i_2 - i_1 = 0$$

by Laplace transformation under the conditions $E(t) = 60V$, $L = 1h$, $R = 50\Omega$, $C = 10^{-4}f_1$ and the currents i_1 and i_2 are initially zero.

Q.4:- Find 2 power series solution of $(x^2 + 1)y'' + xy' - y = 0$ about the ordinary point $x = 0$.

Q.5:- Solve the $y'' - 6y' + 8y = 3e^{-2x} + 2x$ by undetermined coefficients.

Q.6:- Find the solution of differential equation

$$\frac{d^5y}{dr^5} + 5\frac{d^4y}{dr^4} - 2\frac{d^3y}{dr^3} - 10\frac{d^2y}{dr^2} + \frac{dy}{dr} + 5y = 0.$$

a) $\frac{3}{35}$ b) $-\frac{3}{35}$ c) $-\frac{}{3}$ d) $\frac{}{3}$