VIRTUAL UNIVERSITY OF PAKISTAN

MID TERM PAST PAPER

MADE AND SOLVED BY HADI

Question No : 1 of 26 Marks: 1 (Budgeted Time 1 Min)

The solutions $y_1 = c_1, y_2 = c_2 \cos x, y_3 = c_3 \sin x$ of a Differential Equation are

Answer (Please select your correct option)

- Linearly independent

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- Linearly dependent
- both of the other options

Question No : 2 of 26 Marks: 1 (Budgeted Time 1 Min)

Wronskian of the functions $y_1(x) = 1$, $y_2(x) = \text{Cos}x$, $y_3(x) = \text{Sin}x$ is

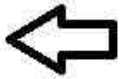
Answer (Please select your correct option)

- 0
- 1
- 2
- 3

Question No : 3 of 26 Marks: 1 (Budgeted Time 1 Min)

The value of amplitude in the solution X=7Sin (3t+ 2.45) is

Answer (Please select your correct option)

- 7  correct answer solve by hadi
- 3
- 2.45
- 1

Question No : 4 of 26 Marks: 1 (Budgeted Time 1 Min)

The order of the differential equation $(\frac{du}{dt})^{\frac{1}{3}} = \frac{1}{u}$ is

Answer (Please select your correct option)

1

2

3

4

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Question No : 5 of 26 Marks: 1 (Budgeted Time 1 Min)

The solution of the differential equation $\frac{dy}{dx} = \tan x$ is ----------

Answer (Please select your correct option)

- $y = \ln|\sin x| + c$
- $y = \ln|\sec x| + c$
- $y = \ln|\operatorname{cosec} x| + c$ ⇦ correct answer solve by hadi
- $y = \ln|\cos x| + c$

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Question No : 6 of 26 Marks: 1 (Budgeted Time 1 Min)

A differential equation $M(x, y)\,dx + N(x, y)\,dy = 0$ is said to be an exact if -----.

Answer (Please select your correct option)

- $\frac{\partial M}{\partial x} = \frac{\partial N}{\partial y}$
- $\frac{\partial M}{\partial y} \neq \frac{\partial N}{\partial x}$
- $\frac{\partial M}{\partial y} = \frac{\partial N}{\partial x}$ ⇦
- $\frac{\partial M}{\partial y} = \frac{\partial N}{\partial y}$

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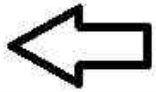
Question No : 7 of 26 Marks: 1 (Budgeted Time 1 Min)

The differential equation $(x^2 - 2x + 2y^2)\,dx + 2xy\,dy = 0$ is a/an -----differential equation.

Answer (Please select your correct option)

- Exact
- Non-exact
- Homogenous
- Separable



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Question No : 8 of 26 Marks: 1 (Budgeted Time 1 Min)

For a 1st order linear differential equation $\frac{dy}{dt} - \frac{1}{t}y = 2t^2$; the integarating factor will be -----.

Answer (Please select your correct option)

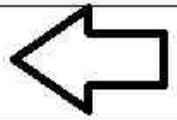
- $\mu = -\frac{1}{t}$
- $\mu = \frac{1}{t}$ ⇦ correct answer solve by hadi
- $\mu = t$
- $\mu = 2t$

Question No : 9 of 26 Marks: 1 (Budgeted Time 1 Min)

A differential equation $\frac{dy}{dx} + p(x)y = q(x)y^n$ $for\, n \neq 0,1$ is called a/an ----.

Answer (Please select your correct option)

- Non-Exact differential equation
- Linear differential equation
- Bernoulli equation
- Exact differential equation



correct answer solve

Question No : 10 of 26 Marks: 1 (Budgeted Time 1 Min)

In order to change the Bernoulli Equation

$$\frac{dy}{dx} + p(x)y = q(x)y^n$$

into linear differential equation, we choose ----.

Answer (Please select your correct option)

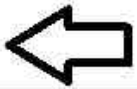
- $v = y^{n-1}$
- $v = y^{1-n}$ ⇦ correct answer solve by hadi
- $v = y^n$
- $v = y'$

Question No : 11 of 26 Marks: 1 (Budgeted Time 1 Min)

To convert the non-homogeneous differential equation $\frac{dy}{dx} = \frac{a_1x + b_1y + c_1}{a_2x + b_2y + c_2}$ into separable form, if $\frac{a_1}{a_2} = \frac{b_1}{b_2}$, then we use the substitution-----.

Answer (Please select your correct option)

- $x = X + h$
- $y = Y + h$
- $z = a_1x + b_1y$
- $z = Y + X$

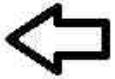


Question No : 12 of 26 Marks: 1 (Budgeted Time 1 Min)

In exponential model for the population growth $P(t) = P_0 e^{kt}$ *If* $k > 0$, *then* $\lim_{t \to \infty} P(t) = - - -$.

Answer (Please select your correct option)

- ∞
- $-\infty$
- 0
- 1



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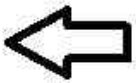
Question No : 13 of 26 Marks: 1 (Budgeted Time 1 Min)

The constant solutions of the logistic equation $\frac{dP}{dt} = P(a - bP)$ are----.

Answer (Please select your correct option)

- P=0, P= b/a
- P=0, P=a/b
- P=a/b, P=b/a
- P=0,P=0



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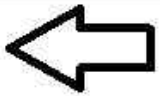
Question No : 14 of 26 Marks: 1 (Budgeted Time 1 Min)

The orthogonal trajectory to the family of curves $3x + 4y = c$ is------.

Answer (Please select your correct option)

- $y = 2x$
- $y - x = c$
- $4x - 3y = c$ 
- $4x + 3y = c$

correct answer solve
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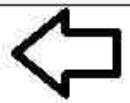
Question No : 15 of 26 Marks: 1 (Budgeted Time 1 Min)

If the tangent lines of two curves are perpendicular at their point of intersection then both the curves are------

Answer (Please select your correct option)

- Non-intersecting curves
- Parallel curves
- Orthogonal curves
- Intersecting curves



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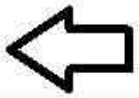
Question No : 16 of 26 Marks: 1 (Budgeted Time 1 Min)

If initial amount of a radioactive isotope is 100g. What will be the amount at the end of 30 days such that K=0.043?

Answer (Please select your correct option)

- 371.415
- 380.560
- 363.279
- 360.351



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Question No : 17 of 26 Marks: 1 (Budgeted Time 1 Min)

If $y = 1 + 6x^3 - 7x^3$, then which of the following is true for it ?

Answer (Please select your correct option)

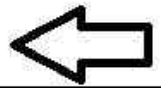
- Its annihilator operator is D.
- Its annihilator operator is D^2.
- Its annihilator operator is D^3.
- Its annihilator operator is D^4. ⇦ correct answer solve by hadi

Question No : 18 of 26 Marks: 1 (Budgeted Time 1 Min)

If $y = e^{-6x}$, then which of the following is the most accurate option?

Answer (Please select your correct option)

- The annihilator operator of $y = e^{-6x}$ is $(D-6)^2$.
- The annihilator operator of $y = e^{-6x}$ is $(D-6)^3$.
- The annihilator operator of $y = e^{-6x}$ is $(D-6)$.
- The annihilator operator of $y = e^{-6x}$ is $(D+6)$.



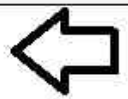
correct answer solve by hadi

Question No : 19 of 26 Marks: 1 (Budgeted Time 1 Min)

If $y_1 = x$ and $y_2 = xe^x$ are the first and second solution of $x^2\frac{d^2y}{dx^2} - x(x+2)\frac{dy}{dx} + (x+2)y = 0$ on $(0, \infty)$, then which of the following is the most accurate option?

Answer (Please select your correct option)

- $y_1 = x$ and $y_2 = xe^x$ may or may not be linearly dependent.
- $y_1 = x$ and $y_2 = xe^x$ must be linearly independent.
- $y_1 = x$ and $y_2 = xe^x$ may or may not be linearly independent.
- $y_1 = x$ and $y_2 = xe^x$ must be linearly dependent.



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Question No : 20 of 26 Marks: 1 (Budgeted Time 1 Min)

If $y_2 = x^3$ is the second solution of $x^2\frac{d^2y}{dx^2} - x\frac{dy}{dx} - 3y = 0$, then which of the following is the most accurate option?

Answer (Please select your correct option)

- The first solution say y_1 must be non-trivial on the indicated interval.
- The first solution say y_1 can be trivial on the indicated interval. ⇦ correct answer solve by hadi
- The first solution say y_1 must be discontinuous on the indicated interval.
- The first solution say y_1 may or may not be continuous on the indicated interval.

Question No : 21 of 26 Marks: 2 (Budgeted Time 4 Min)

Find the order of the homogenous equation obtained from the following non-homogenous differential equation

$y'' + 4y' + 3y = 4x^2 + 5?$

Answer (Please click here to Add Answer)

Question No : 22 of 26 Marks: 2 (Budgeted Time 4 Min)

If half-time life (T) of a radioative isotope is 5 days, then find k.

Answer (Please click here to Add Answer)

Question No : 23 of 26 Marks: 3 (Budgeted Time 6 Min)

Determine the annihilator operator of the general solution of the following homogeneous linear first order differential equation:

$$\frac{dy}{dx} - 5y = 0$$

Answer (Please click here to Add Answer)

Question No : 24 of 26 Marks: 3 (Budgeted Time 6 Min)

If $y_1(x) = e^x$ is the first solution of $\frac{d^2y}{dx^2} + 2\frac{dy}{dx} - 3y = 0$, then construct its second solution using $y_2(x) = y_1(x)\int \frac{e^{-\int P(x)dx}}{y_1^2(x)}dx$.

Note: where $P(x)$ is a coefficient of the first derivative involving in the above given differential equation.

Answer (Please click here to Add Answer)

Question No : 25 of 26 Marks: 5 (Budgeted Time 10 Min)

Find period of vibration of the solution of a simple harmonic motion?

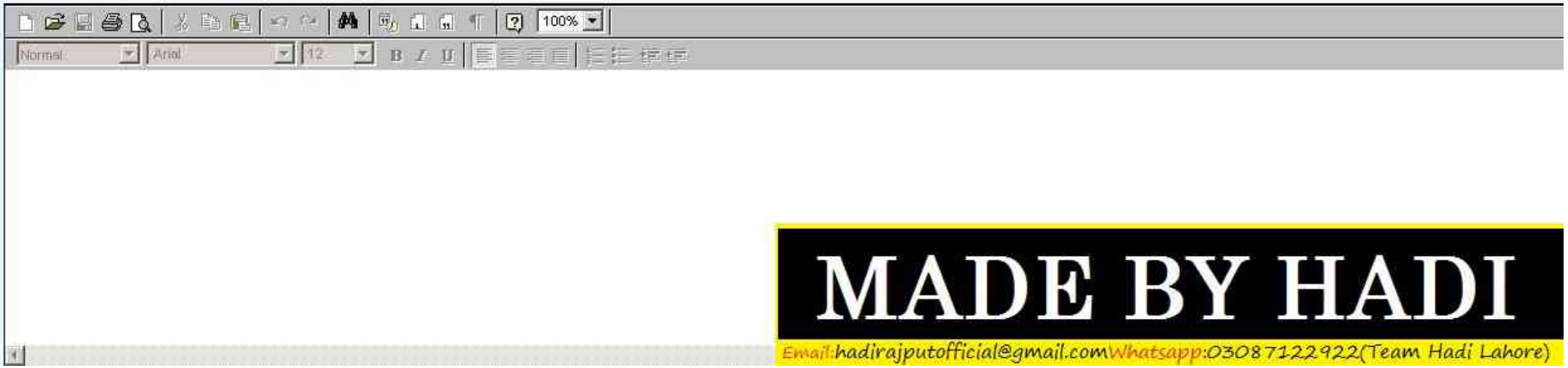
Answer (Please click here to Add Answer)

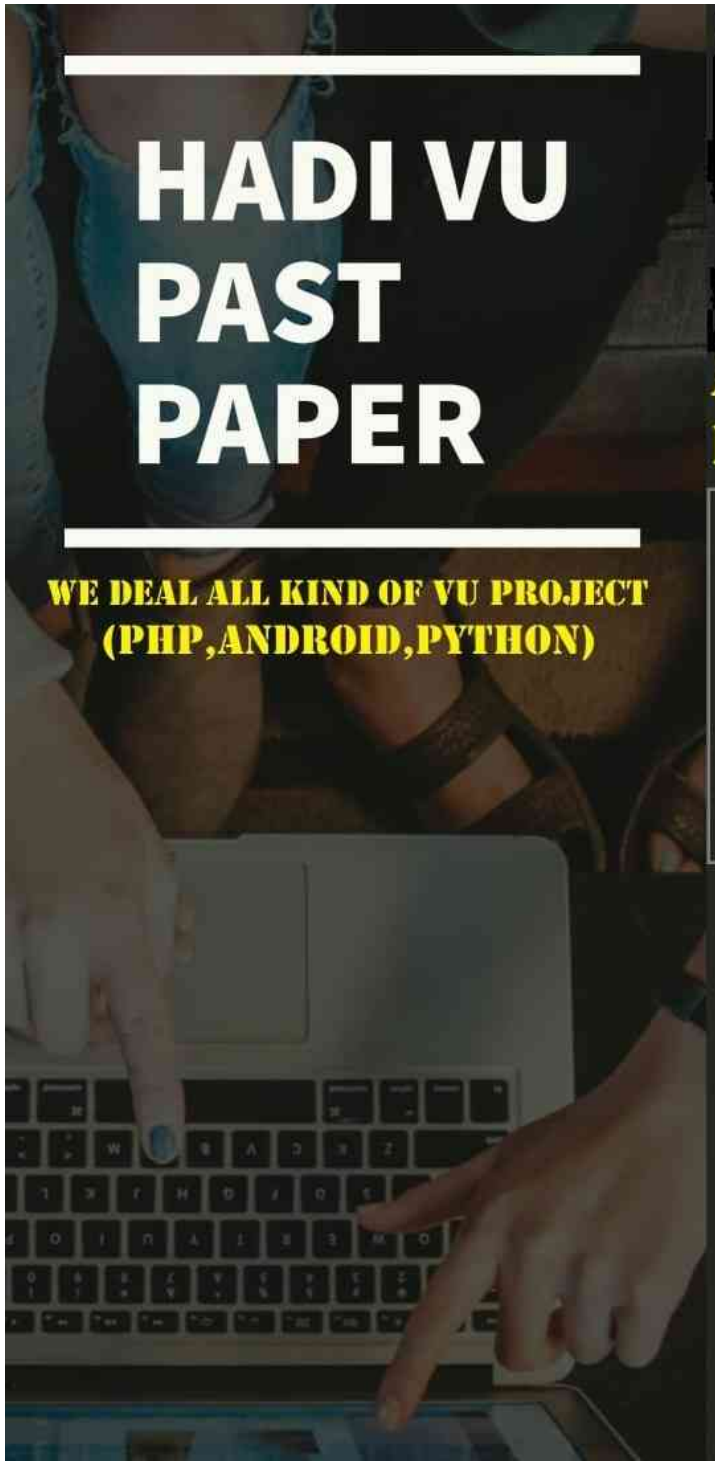
Question No : 26 of 26 Marks: 5 (Budgeted Time 10 Min)

Using Newton's Law of Cooling with initial condition $T(o)=T_0$ and if temperatures at time t_1 and t_2 are known then show that

$$\frac{T(t_1)-T_m}{T(t_2)-T_m}=e^{k(t_1-t_2)}$$

Answer (Please click here to Add Answer)





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