# MAR IVANIOS COLLEGE (AUTONOMOUS) THIRUVANANTHAPURAM 

Reg. No. :
Name :

# Fourth Semester B.A. Degree Examination, June 2016 <br> First Degree Programme under CBCSS <br> Complementary Course: Mathematics - IV (for Economics) <br> AUMM431.1a: Mathematics for Economics - IV <br> Max. Marks: 80 

Time: $\mathbf{3}$ Hours

## SECTION - A

Answer ALL questions / problems in one or two sentences.

1. Find the order and degree of the differential equation $\left(\frac{d^{3} y}{d x^{3}}\right)^{2}+\frac{d y}{d x}+y=0$.
2. Write the differential equation corresponding to $y=c x$.
3. Give the general form of a first degree ordinary differential equation.
4. Find the slope of the curve $y=3 x^{2}+4$.
5. Give an example of a differential equation in variable separable form.
6. Give the necessary and sufficient condition for the differential equation $P d x+Q d y=0$ to be exact.
7. Find the integrating factor of the differential equation $\frac{d y}{d x}+y \tan x=\cos x$.
8. Write the auxiliary equation of the differential equation $\frac{d^{2} y}{d x^{2}}-7 \frac{d y}{d x}+6 y=e^{2 x}$.
9. Find the general solution of the differential equation $\left(D^{2}-6 D+9\right) y=0$.
10. Is $y=\cos x$ a solution of $\frac{d^{2} y}{d x^{2}}+y=0$.
( $10 \times 1=10$ Marks $)$

## SECTION - B

Answer any EIGHT questions / problems. Each question carries 2 marks.
11. Find the differential equation of all straight lines passing through the origin.
12. Solve the differential equation $\frac{d y}{d x}=e^{x+y}$.

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13. Solve the differential equation $x y^{2} d x+x^{2} y d y=0$.
14. Solve the differential equation $\frac{d y}{d x}+6 y=4$.
15. Solve the differential equation $\frac{d^{2} y}{d x^{2}}-6 \frac{d y}{d x}+8 y=0$.
16. Solve the differential equation $\left(D^{2}-8 D+16\right) y=0$.
17. Solve the differential equation $\frac{d^{2} y}{d x^{2}}+2 \frac{d y}{d x}+5 y=0$.
18. Solve the differential equation $\left(D^{2}+4 D+3\right) y=e^{3 x}$.
19. Find the particular integral for the differential equation

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\frac{d^{2} y}{d x^{2}}+2 \frac{d y}{d x}+y=2 e^{3 x}+x^{2}
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20. Find the particular integral for the differential equation $\left(D^{2}+2 D+1\right) y=2 x+x^{2}$.
21. If the marginal cost function is $p^{\prime}(x)=2+x+x^{2}$, find the total cost function when $p(0)=50$.
22. Show that the solution of the differential equation $x d x+y d y+z d z=0$ is a system of spheres.
( $8 \times 2=16$ Marks )

## SECTION - C

Answer any SIX questions. Each question carries 4 marks.
23. Solve the differential equation $(1+x) y d x+(1-y) x d y=0$.
24. Solve the differential equation $e^{y} d x+\left(x e^{y}+2 y\right) d y=0$.
25. Solve the differential equation $\frac{d y}{d x}+2 x y=3 x$.
26. Solve the differential equation $\left(D^{2}+25\right) y=2 \sin 5 x$.
27. Solve the differential equation $\left(D^{2}-D-2\right) y=44-76 x$.
28. Solve the differential equation $\frac{d^{2} y}{d x^{2}}-2 \frac{d y}{d x}+y=e^{2 x}-\cos x$.
29. Find the demand function, if the elasticity of demand is given by $\frac{a}{b x}-1$, where $a$ and $b$ are positive constants.
30. The marginal cost is given by $M C=25+30 q-9 q^{2}$. The fixed cost is 55 . Find the 1) total cost 2 ) average cost.
31. The change in the net profit $P$, as advertising expenditure $(x)$ changes, is given by $\frac{d P}{d x}=3-2(P+x)$. Find $P$ if $P=10$ at $x=10$.

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\text { ( } 6 \times 4=24 \text { Marks })
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## SECTION - D

Answer any TWO questions. Each question carries 15 marks.
32. i). Find the differential equation of the family of curves given by the equation $y=e^{m \tan ^{-1} x}$, where $m$ is a parameter.
ii). Find the differential equation of which $y=e^{x}(A \cos 2 x+B \sin 2 x)$ is a solution, where A and B are arbitrary constants.
33. Solve the following differential equations
i). $(x+y) d x+(x-y) d y=0$
ii). $\left(x^{2}-4 x y-2 y^{2}\right) d x+\left(y^{2}-4 x y-2 x^{2}\right) d y=0$
34. Solve the following differential equations
i). $\left(D^{2}+2 D+1\right) y=x^{2}$
ii). $\left(D^{2}+3 D+2\right) y=x^{2}+\sin x$
35. Derive Domar's capital expansion model.
( $\mathbf{2} \times \mathbf{1 5}=\mathbf{3 0}$ Marks)

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