

MAR IVANIOS COLLEGE (AUTONOMOUS) THIRUVANANTHAPURAM

Reg. No. :....

Fourth Semester B.A. Degree Examination, June 2016 First Degree Programme under CBCSS Complementary Course: Mathematics – IV (for Economics) AUMM431.1a: Mathematics for Economics – IV

Time: 3 Hours

Max. Marks: 80

SECTION – A

Answer ALL questions / problems in one or two sentences.

- 1. Find the order and degree of the differential equation $\left(\frac{d^3y}{dx^3}\right)^2 + \frac{dy}{dx} + y = 0.$
- 2. Write the differential equation corresponding to y = cx.
- 3. Give the general form of a first degree ordinary differential equation.
- 4. Find the slope of the curve $y = 3x^2 + 4$.
- 5. Give an example of a differential equation in variable separable form.
- 6. Give the necessary and sufficient condition for the differential equation Pdx + Qdy = 0 to be exact.

7. Find the integrating factor of the differential equation $\frac{dy}{dx} + y \tan x = \cos x$.

- 8. Write the auxiliary equation of the differential equation $\frac{d^2y}{dx^2} 7\frac{dy}{dx} + 6y = e^{2x}$.
- 9. Find the general solution of the differential equation $(D^2 6D + 9)y = 0$.
- 10. Is $y = \cos x$ a solution of $\frac{d^2y}{dx^2} + y = 0$.

 $(10 \times 1 = 10 \text{ Marks})$

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 $\frac{dy}{dx} = e^{x+y}$.

Name :.....

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- 13. Solve the differential equation $xy^2dx + x^2ydy = 0$.
- 14. Solve the differential equation $\frac{dy}{dx} + 6y = 4$.
- 15. Solve the differential equation $\frac{d^2y}{dx^2} 6\frac{dy}{dx} + 8y = 0.$
- 16. Solve the differential equation $(D^2 8D + 16)y = 0$.
- 17. Solve the differential equation $\frac{d^2y}{dx^2} + 2\frac{dy}{dx} + 5y = 0.$
- 18. Solve the differential equation $(D^2 + 4D + 3)y = e^{3x}$.
- 19. Find the particular integral for the differential equation $\frac{d^2y}{dx^2} + 2\frac{dy}{dx} + y = 2e^{3x} + x^2.$
- 20. Find the particular integral for the differential equation $(D^2 + 2D + 1)y = 2x + x^2$.
- 21. If the marginal cost function is $p'(x) = 2 + x + x^2$, find the total cost function when p(0) = 50.
- 22. Show that the solution of the differential equation xdx + ydy + zdz = 0 is a system of spheres.

$(8 \times 2 = 16 \text{ Marks})$

SECTION – C

Answer any SIX questions. Each question carries 4 marks.

- 23. Solve the differential equation (1 + x)ydx + (1 y)xdy = 0.
- 24. Solve the differential equation $e^{y}dx + (xe^{y} + 2y)dy = 0$.
- 25. Solve the differential equation $\frac{dy}{dx} + 2xy = 3x$.
- 26. Solve the differential equation $(D^2 + 25)y = 2 \sin 5x$.
- 27. Solve the differential equation $(D^2 D 2)y = 44 76x$.
- 28. Solve the differential equation $\frac{d^2y}{dx^2} 2\frac{dy}{dx} + y = e^{2x} \cos x$.
- 29. Find the demand function, if the elasticity of demand is given by $\frac{a}{bx} 1$, where *a* and *b* are positive constants.
- 30. The marginal cost is given by $MC = 25 + 30q 9q^2$. 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 $\frac{dP}{dx} = 3 - 2(P + x).$ Find *P* if *P* = 10 at *x* = 10.

 $(6 \times 4 = 24 \text{ Marks})$

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 $y = e^x (A \cos 2x + B \sin 2x)$ is a solution, where A and B are arbitrary constants.
- 33. Solve the following differential equations
 - i). (x + y)dx + (x y)dy = 0
 - ii). $(x^2 4xy 2y^2)dx + (y^2 4xy 2x^2)dy = 0$
- 34. Solve the following differential equations
 - i). $(D^2 + 2D + 1)y = x^2$
 - ii). $(D^2 + 3D + 2)y = x^2 + \sin x$
- 35. Derive Domar's capital expansion model.

 $(2 \times 15 = 30 \text{ Marks})$