BACHELOR OF SCIENCE (CBCS-2018 COURSE)
F. Y. B. Sc. Sem-II : WINTER :- 2021
SUBJECT: MATHEMATICS : INTEGRAL CALCULUS & DIFFERENTIAL EQUATIONS

Day : Tuesday
Date 1/2/2022

W-18335-2021

Time : 02:00 PM-05:00 PM
Max. Marks: 60

N.B.:

1) All questions are **COMPULSORY**.
2) Figures to the right indicate **FULL** marks.

Q.1 Attempt **ANY TWO** of the following: **[12]**

a) Evaluate : $\int \frac{dx}{a+b\cos x}$ if : **i)** $a > b$ **ii)** $a < b$.

b) Evaluate : $\int \frac{x^2-1}{x^4+1}\,dx$.

c) Evaluate : $\int \frac{(x-1)(x-2)(x-3)}{(x-4)(x-5)(x-6)}\,dx$.

Q.2 Attempt **ANY TWO** of the following: **[12]**

a) Prove that the necessary and sufficient condition for the equation $M\,dx + N\,dy = 0$, where M and N are functions of x and y, to be exact is that $\frac{\partial M}{\partial y} = \frac{\partial N}{\partial x}$.

b) Solve : $y(xy+1)\,dx + x\left(1+xy+x^2y^2\right)dy = 0$.

c) Find the orthogonal trajectories of the family of curves given by $y = ce^{-2x}$, where c is the parameter.

Q.3 Attempt **ANY TWO** of the following: **[12]**

a) Evaluate the surface area of the solid generated by revolving the cycloid $x = a(\theta - \sin\theta)$, $y = a(1-\cos\theta)$ about the line $y = 0$.

b) Find the volume generated by revolving about x – axis, the area cut off from the parabola $9y = 4\left(9-x^2\right)$ by the line $4x+3y = 12$.

c) Solve : $3\frac{dy}{dx} + \frac{2}{x+1}y = \frac{x^3}{y^2}$.

P.T.O.

Q.4 Attempt **ANY THREE** of the following: **[12]**

a) Define homogeneous differential equation and explain the method of its solution.

b) Solve the differential equation $\left(x^2 + y^2\right) dx = 2xy\, dy$.

c) Evaluate : $\int \frac{1}{\sqrt{3x^2 - 4x + 1}}\, dx$.

d) Evaluate : $\int \frac{dx}{5\sin x + 12\cos x}$.

Q.5 Attempt **ANY FOUR** of the following: **[12]**

a) Evaluate : $\int_0^{\pi/2} \sin^6 x \cos^8 x\, dx$.

b) Obtain the differential equation of which $xy = ae^x + be^{-x}$ is the solution where a and b are arbitrary constants.

c) Define : **i)** Bernoulli's equation **ii)** Integrating factor.

d) Find the length of the arc of the curve $y = \log \sec x$ from $x = 0$ to $x = \frac{\pi}{3}$.

e) Solve : $\int_0^{\pi/2} \sin^{11} x\, dx$.

f) Solve : $\left(x^2 y + y^3\right) dx + \left(\frac{2}{3}x^3 + 4xy^2\right) dy = 0$.

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