BACHELOR OF SCIENCE (CBCS-2018 COURSE)
F. Y. B. Sc. Sem-II :SUMMER- 2022
SUBJECT : MATHEMATICS : INTEGRAL CALCULUS & DIFFERENTIAL EQUATIONS

Day : Friday
Date : 15-07-2022

S-18335-2022

Time : 11:00 AM-02:00 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) Prove that : $\int \sec^n x\,dx = \frac{\sec^{n-2} x.\tan x}{n-1} + \frac{n-2}{n-1}\int \sec^{n-2} x\,dx$, and hence evaluate $\int \sec^6 x\,dx$.

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

c) Evaluate : $\int_1^2 \frac{4-x}{x\left(x^2-2x+2\right)}\,dx$. .

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

a) Prove that the solution of the differential equation of the form $\frac{dy}{dx} + Py = Q$ where P and Q are functions of x alone is $ye^{\int Pdx} = \int e^{\int Pdx}.Q\,dx + c$.

b) Solve : $\left(x^2-4xy-2y^2\right)dx + \left(y^2-4xy-2x^2\right)dy = 0.$

c) Find the orthogonoal trajectories of the family of rectangular hyperbolas $xy = c^2$.

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 of the solid generated by revolving the area included between the curves $y^2 = x^3$ and $x^2 = y^3$ about x – axis.

c) Solve : $\tan\frac{y}{x} - \frac{y}{x}\sec^2\frac{y}{x} + \sec^2\frac{y}{x}\frac{dy}{dx} = 0.$

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 : $\left(x^2y-2xy^2\right)dx-\left(x^3-3x^2y\right)dy=0.$

c) Evaluate : $\int \frac{dx}{5+4\sin x}.$

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

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

a) Evaluate : $\int_0^{\pi/2} \cos^{11} x\,dx.$

b) Evaluate : $\int \sin^2 x \cos^4 x\,dx.$

c) Eliminate a and b from the following:

$y=ae^{-2x}+be^{2x}$

d) Determine order and degree of the differential equation

$\sqrt{1-x^2}\;dy+\sqrt{1-y^2}\;dx=0.$

e) Define : **i)** Integrating factor

ii) Exact differential equation .

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

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