F.Y.B.SC. SEM – II (2014 COURSE) : SUMMER - 2018

SUBJECT : MATHEMATICS : INTEGRAL CALCULUS & DIFFERENTIAL EQUATIONS (M – 22)

Day : **Saturday** Time : **03.00 PM TO 05.00 PM**
Date : **28/04/2018** **S-2018-0703** Max. Marks : 40

N.B.:

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

Q.1 Attempt **ANY TWO** of the following: **[10]**

a) Show that $\int \tan^n x\, dx = \frac{\tan^{n-1} x}{n-1} - \int \tan^{n-2} x\, dx$. Hence evaluate $\int \tan^4 x\, dx$.

b) Evaluate : $\int \frac{(x-1)(x-2)(x-3)}{(x+1)(x+2)(x+3)}\, dx$.

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

Q.2 Attempt **ANY TWO** of the following: **[10]**

a) Show that the necessary and sufficient condition for the equation $Mdx + Ndy = 0$, 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 the differential equation $\frac{dy}{dx} + \frac{4xy}{x^2+1} = \frac{1}{(x^2+1)^3}$.

c) Solve : $\frac{dy}{dx} = \frac{6x-4y+3}{3x-2y+1}$.

Q.3 Attempt **ANY TWO** of the following: **[10]**

a) The area bounded by the hyperbola $xy = 4$ and the line $x + y = 5$ is revolved about the x – axis. Find the volume of the solid thus generated.

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

c) Find the length of an arc of the curve $r = ae^{\theta \cot \alpha}$, taking $\theta = 0$ to θ.

Q.4 Attempt **ANY FIVE** of the following: **[10]**

a) Evaluate : $\int_0^{\pi/2} \sin^{10} x\, dx$.

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

c) Show that $\int_0^{\pi/2} \sin^n x\, dx = \frac{n-1}{n} \int_0^{\pi/2} (\sin x)^{n-2}\, dx$.

d) Find the circumference of circle $x^2 + y^2 = a^2$.

e) Solve the differential equation $(1 + xy^2)\, dx + (1 + x^2y)\, dy = 0$.

f) Obtain the differential equation of $ax^2 + by^2 = 1$, where a and b are arbitrary constants.

g) Obtain the integrating factor of the differential equation

$$(x^3 + xy^4)\, dx + 2y^3\, dy = 0.$$

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