F.Y.B.SC. SEM – II (CBCS - 2016 Course) : WINTER - 2018
SUBJECT : MATHEMATICS : INTEGRAL CALCULUS & DIFFERENTIAL EQUATIONS

Day : Thursday **W-2018-0706** Time : 03.00 P.M. To 06.00 P.M
Date : 25/10/2018 Max. Marks :60

N. B. :

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

Q. 1 A) Select the correct alternatives of the following: **(06)**

i) $\int \frac{dx}{x^2+1} =$ ____

a) $\frac{1}{2}\tan^{-1}\left(\frac{x}{2}\right)$ b) $\tan^{-1} x$

c) $\tan^{-1}\left(\frac{x}{2}\right)$ d) $\frac{1}{2}\tan^{-1} x$

ii) $\int_0^{\pi/2} \sin^{10} x\, dx =$ ____

a) $\frac{63\pi}{512}$ b) $\frac{13\pi}{512}$ c) $\frac{\pi}{512}$ d) 0

iii) $\int_0^{\pi/2} \sin^6 x \cos^6 x\, dx =$ ____

a) $\frac{8\pi}{693}$ b) $\frac{1}{693}$ c) $\frac{8}{693}$ d) $\frac{8}{512}$

iv) $y = ax + b$ is an equation where a and b are arbitrary constants then its differential equation is _____

a) $\frac{d^2y}{dx^2} + y = 0$ b) $\frac{dy}{dx} = 0$ c) $\frac{d^2y}{dx^2} = 0$ d) $\frac{d^2y}{dx^2} + xy = 0$

v) Substitution of $\frac{dy}{dx} = \frac{x+2y+1}{2x+4y+3}$ is _____

a) $u = x + y$ b) $u = 2x + 2y$ c) $u = 2x + y$ d) $u = x + 2y$

vi) Solution of differential equation $ydx + xdy + 2zdz = 0$ is _____

a) $xy + z^2 = c$ b) $2x + y = c$ c) $xyz = c$ d) $x + y = c$

B) Solve the following: **(06)**

i) State the formula for obtaining surface area of the curve $r = f(\theta)$

ii) Find order and degree of the differential equation: $L\frac{d^2q}{dt^2} + \frac{1}{c}q = E\sin\omega t$

iii) Find length of a curve $y = f(x)$ between $x = a$ and $x = b$.

iv) Define integrating factor of differential equation.

v) Define Bernoulli's differential equation.

vi) Evaluate $\int_0^{\pi/2} \sin^4 x \cos^4 x\, dx$.

(P.T.O)

Q.2 Attempt **ANY THREE** of the following: **(12)**

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

b) Evaluate $\int \frac{(x-8)}{(2x-1)(x^3+x+3)} dx$

c) Evaluate $\int \frac{x^2+1}{x^4+1} dx$

d) Evaluate $\int \frac{x^2+x+1}{(x-1)^2(x-2)} dx$

Q.3 Attempt **ANY FOUR** of the following: **(12)**

a) Find circumference of circle $x^2+y^2=a^2$, by integration.

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

c) Solve : $(1+y^2)dx=(\tan^{-1}y-x)dy$.

d) Evaluate $\int_0^{\pi/6} \sin^6 3x\, dx$.

e) Evaluate $\int \tan^5 x\, dx$.

Q.4 Attempt **ANY TWO** of the following: **(12)**

a) Prove 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 : $(x^2y-2xy^2)dx-(x^3-3x^2y)dy=0$.

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

Q.5 Attempt **ANY TWO** of the following: **(12)**

a) Evaluate $\int \frac{dx}{a+b\sin x}$ if (i) $a^2>b^2$ (ii) $a^2<b^2$.

b) Find the length of the arc of the parabola $x^2=4ay$ measured from the vertex to one extremity of the latus rectum.

c) 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 $y=0$.

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