F.Y.B.SC. SEM – II (2014 COURSE) : WINTER - 2017
SUBJECT : MATHEMATICS : INTEGRAL CALCULUS & DIFFERENTIAL EQUATIONS (M – 22)

Day : **Thursday** Time : **03.00 PM TO 05.00 PM**
Date : **09/11/2017** Max. Marks : 40

W-2017-0611

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) Prove that $\int_0^{\pi/2} (\cos x)^n \, dx = \frac{n-1}{n} \int_0^{\pi/2} (\cos x)^{n-2} \, dx$ and hence evaluate $\int_0^{\pi/2} \cos^6 x \, dx$.

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

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

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

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 $ye^{\int P dx} = \int e^{\int P dx} . Q dx + c$.

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

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

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

a) Find the area of the surface of revolution generated by revolving about the y – axis, the curve $x = y^3$ from $y = 0$ to $y = 2$.

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) 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.

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

a) Prove that $\int \sec^n dx = \frac{\sec^{n-2} x . \tan x}{n-1} + \frac{n-2}{n-1} \int \sec^{n-2} x \, dx$.

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

c) Evaluate : $\int_0^{\pi/2} \cos^7 x \sin^{10} x \, dx$.

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

e) Solve the differential equation : $(2x^3 + 3y)\, dx + (3x + y - 1)\, dy = 0$.

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

g) Obtain the integrating factor of the differential equation
$(x^2y - 2xy^2)\, dx + (3x^2y - x^3)\, dy = 0$.

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