F.E-Sem-II-OLD -18/11/15

AM-II

QP Code : 3053

(3 Hours) **[Total Marks : 100**

1. Q 1 is compulsory.
2. Solve any four out of the remaining from Q. No. 2 to Q No 7
3. Fig on right hand side indicates full marks.

Q. 1.

a) Using Taylors series method solve $\frac{dy}{dx} = x^2y - 1$ with

$x_0 = 0, y_0 = 1$ *and carry to* $x = 0.2$ 3

b) Solve $(D^3 + 1)y = 0$ 3

c) Evaluate $\int_0^1 \int_{x^2}^{x} xy(x + y)\, dydx$ 3

d) Evaluate $\int_0^a \int_0^{a-x} \int_0^{a-x-y} x^2 dxdydz$ 3

e) Evaluate $\int_0^{2a} x\sqrt{2ax - x^2}dx$ 4

f) Using Euler's method, find the approximate value of y when $\frac{dy}{dx} = x + y$, and y=1 when x=0 at x=1 in five steps. 4

Q.2. a) Prove that $\int_0^a \frac{dx}{(a^n - x^n)^{\frac{1}{n}}} = \frac{\pi}{n} cosec\left(\frac{\pi}{n}\right)$. 6

b) Solve using Runge- Kutta method of fourth order $\frac{dy}{dx} = x + y^2$, with the condition x=0 at y=1,find y at x=0.2 with h= 0.1. 6

c) Solve $\frac{dy}{dx} = e^{x-y}(e^x - e^y)$ 8

Q.3. a) Solve [1+log (xy)] dx + $[1+\frac{x}{y}]dy = 0$ 6

b) Solve using method of variation of parameters, $(D^2 + 1)y = \frac{1}{(1+sinx)}$ 6

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c) Show that $\int_0^\infty \frac{tan^{-1}ax}{x(1+x^2)} dx = \frac{\pi}{2}\log(1+a)$ 8

Q.4. a) Solve y(x y+e^x) dx - e^xdy = 0 6

b) Solve, $x^2\frac{d^2y}{dx^2} - x\frac{dy}{dx} + 2y = xlogx$ 6

c) Solve $(D^2+2)y = x^2e^{3x} + e^x - cos2x$ 8

Q.5. a) In a electric circuit containing inductance L, resistance R, and voltage E $\sin\omega t$,the current i is given by $L\frac{di}{dt} + Ri = E\sin\omega t\,.\,Find$ the current i at time t, if at t=0 when i=0 and L,R,E are constants. 6

b) Change the order of integration. $\int_0^a \int_{\frac{x^2}{a}}^{2a-x} f(x,y)dxdy$ 6

c) Evaluate $\iiint xyz\, dxdydz$, over the positive octant of the sphere

$x^2 + y^2 + z^2 = a^2$ 8

Q. 6. a) Find the length of the cardioide, r =a (1- cos θ) lying outside the circle $r = a\cos\theta$. 6

b) Change to polar coordinates and evaluate $\int_0^a \int_y^a x\, dxdy$ 6

c) Evaluate $\iint_R (x^2+y^2)dxdy$ Over the region R of a triangle whose vertices are (0,1),(1,1) and (1,2). 8

Q.7. a) Change the order of integration and evaluate $\int_0^5 \int_{2-x}^{2+x} dxdy.$ 6

b) Find by double integration the area of region bounded by the circles

$r = 2a\sin\theta, and\ r = 2b\sin\theta, (b > a).$ 6

c) Find the volume bounded by the cylinder $x^2 + y^2 = a^2, and\ the\ planes\ z = 0\ and\ y + z = b$ 8
