

FE sem II All Branches

A. Maths 22/11/2012

V-L-II-HF-Ex-12-B-40

Con. 8824-12.

KR-3531

(3 Hours)

[Total Marks : 100

- N.B. : (1) Question No. 1 is compulsory.
 (2) Attempt any four from remaining six questions.

1. (a) Using Taylor's series find $y(0.4)$ where $\frac{dy}{dx} = 1 + xy$ with $y(0) = 2$. 3
- (b) Find the Complementary function of $\frac{d^3y}{dx^3} - 6\frac{d^2y}{dx^2} + 11\frac{dy}{dx} - 6y = 0$. 3
- (c) Evaluate $\int_{-1}^1 \int_0^{1-x} x^{1/3} y \, dx \, dy$. 3
- (d) Evaluate $\int_0^2 \int_0^2 \int_0^{yz} xyz \, dx \, dy \, dz$. 3
- (e) Show that $\int_0^{\pi/2} \frac{d\theta}{\sqrt{\sin\theta}} \int_0^{\pi/2} \sqrt{\sin\theta} \, d\theta = \pi$. 4
- (f) Using Euler's method solve $\frac{dy}{dx} = x + y$, $y(0) = 1$ find the value of y at $x = 1$, taking $h = 0.2$. 4
2. (a) Evaluate $\int_0^1 \sqrt{1-\sqrt{x}} \, dx \int_0^{\frac{1}{2}} \sqrt{2y-4y^2} \, dy = \frac{\pi}{30}$. 6
- (b) Use Runge-Kutta method of fourth order to solve :-
 $\frac{dy}{dx} = \frac{1}{x+y}$, $y(0) = 1$ find $y(0.2)$ with $h = 0.1$. 6
- (c) Solve $\frac{dy}{dx} + x \sin 2y = x^3 \cos^2 y$. 8
3. (a) Solve $\frac{dy}{dx} + \frac{y \cos x + \sin y + y}{\sin x + x \cos y + x} = 0$. 6
- (b) Solve $(D^2 - 1)y = \frac{2}{1+e^x}$ using variation of Parameter. 6
- (c) Evaluate $\int_0^{\pi/2} \frac{dx}{1 + a \cos^2 x}$ and hence deduce that $\int_0^{\pi/2} \frac{\cos^2 x}{(3 + \cos^2 x)^2} dx = \frac{\pi \sqrt{3}}{96}$. 8

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4. (a) Solve $(xy^3 + y)dx + 2(x^2y^2 + x + y^4)dy = 0$. 6
- (b) $(1 + 2x)^2 \frac{d^2y}{dx^2} - 2(1 + 2x) \frac{dy}{dx} - 12y = 6x$. 6
- (c) Solve $\frac{d^2y}{dx^2} + 2y = x^2 e^{3x} + e^x - \cos 2x$. 8
5. (a) In a circuit containing inductance L , resistance R , and voltage E , the current i is given by $L \frac{di}{dt} + Ri = E$. find the current i at time t , at $t = 0, i = 0, L, R, E$ are constants. 6
- (b) Change the order of integration $\int_0^a \int_{\sqrt{a^2 - y^2}}^{y+a} f(x, y) dx dy$. 6
- (c) Evaluate $\iiint \frac{dx dy dz}{\sqrt{a^2 - x^2 - y^2 - z^2}}$ over the volume of Sphere $x^2 + y^2 + z^2 = a^2$. 8
6. (a) Find the length of the parabola $x^2 = 4y$ which lies inside the circle $x^2 + y^2 = 6y$. 6
- (b) Change into polar and evaluate $\int_0^2 \int_0^{\sqrt{2x-x^2}} \frac{x dx dy}{\sqrt{x^2 + y^2}}$. 6
- (c) Evaluate $\iint_R xy \sqrt{1-x-y} dx dy$ over the area of the triangle formed by—
 $x = 0, y = 0, x + y = 1$. 8
7. (a) Change the order of integration and evaluate :— 6
- $$\int_0^a \int_0^x \frac{dx dy}{(y+a) \sqrt{(a-x)(x-y)}}$$
- (b) Find the area outside the circle $r = a$ and inside the cardioid $r = a(1 + \cos\theta)$. 6
- (c) Find the volume common to the cylinders $x^2 + y^2 = a^2, x^2 + z^2 = a^2$. 8