LAST MOMENT TUITIONS

Applied Mathematics 2 - Dec 17

First Year Engineering (Semester 2)

Total marks: 80
Total time: 3 Hours

INSTRUCTIONS
(1) Question 1 is compulsory.
*(2) Attempt any **three** from the remaining questions.*
(3) Draw neat diagrams wherever necessary.

1.a. Evaluate $\int_0^\infty \frac{e^{-x^2}}{\sqrt{x}}dx$ (3 marks)

1.b. Solve $(D^3+1)^2y=0$ (3 marks)

1.c. Solve the ODE $(y+\frac{1}{3}y^3+\frac{1}{2}x^2)dx+(x+xy^2)dy=0$ (3 marks)

1.d. Use Taylor's series method to find a solution of $\frac{dy}{dx}=1+y^2, y(0)=0$ at x = 0.1 taking h = 0.1 correct to three decimal value. (3 marks)

1.e. Given $\int_0^x \frac{dx}{x^2+y^2}=\frac{1}{a}\tan^{-1}(\frac{x}{a})$, using DUIS find the value of $\int_0^x \frac{dx}{(x^2+a^2)^2}$ (4 marks)

1.f. Find the perimeter of the curve $r=a(1-\cos\theta)$ (4 marks)

2.a. Solve $(D^3+D^2+D+1)y=\sin^2x$ (6 marks)

2.b. Change the order of integration $\int_0^a \int_{\sqrt{a^2-x^2}}^{x+3a} f(x,y)dx\,dy$ (6 marks)

2.c. Evaluate $\int\int_R \frac{2xy^2}{1+x^2y^2-y^4}dx\,dy$, where R is a triangle whose vertices are (0, 0), (1,1), (0,1). (8 marks)

3.a. Find the volume enclosed by the cylinder $y^2=x$ and $y=x^2$. Cut off by the planes z = 0, x + y + z =2 (6 marks)

3.b. Using modified Euler's method, find an appropriate value of y at x = 0.2 in two step taking h = 0.1 and using iteration, given that $\frac{dy}{dx}=x+3y, y=1$ when x=0.dydx=x+3y,y=1 when x=0. (6 marks)

3.c. Solve $(1+x)^2\frac{d^2y}{dx^2}+(1+x)\frac{dy}{dx}+y=4\cos\log(1+x)$ (8 marks)

4.a. Show that $\int_0^\propto \sqrt{\frac{x^3}{a^3-x^3}}$ (6 marks)

4.b. Solve $(D^2+2)y=e^x\cos x+x^2e^{3x}$ (6 marks)

4.c. Use polar co-ordinates to evaluate $\int\int \frac{(x^2+y^2)^2}{x^2y^2}$ over the area Common to the circle $x^2+y^2=ax$ and $x^2+y^2=by, a>b>0$ (8 marks)

5.a. Solve $y\,dx+x(1-3x^2y^2)dy=0$ (6 marks)

5.b. Find the mass of a lamina in the form of an eclipse $\frac{x^2}{a^2}+\frac{y^2}{b^2}-1$, if the density at any point varies as the product of the distance from the azes of the ellipse. (6 marks)

5.c. Compute the value of $\int_0^{\pi/2} \sqrt{\sin x + \cos x}$ using

(i) Trapezoidal rule

(ii) Simpson's $(1/3)^{rd}$ rule

(iii) Simpson's $(3/8)^{th}$ rule by dividing into six subintervals (8 marks)

6.a. Evaluate $\int\int\int_v \ x^2\,dx\,dy\,dz$ over the volume bounded by the planes $x=0, y=0, z=0$ and $\frac{x}{a}+\frac{y}{b}+\frac{z}{c}=1$

(6 marks)

6.b. Change the order of integration and evaluate $\int_0^2 \int_{\sqrt{2y}}^2 \frac{x^2}{\sqrt{x^2-4y^2}}$ (6 marks)

6.c. Solve by the method of variation of parameters $\frac{d^2y}{dx^2}-6\frac{dy}{dx}+9y=\frac{e^{3x}}{x^2}$ (8 marks)