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SATHYABAMA UNIVERSITY

(Established under section 3 of UGC Act,1956)

Course & Branch :B.Arch - ARCH
Title of the Paper :Mathematics – I Max. Marks :80
Sub. Code :521101 Time : 3 Hours
Date :25/05/2011 Session :FN

PART - A (8 x 4 = 32)

Answer ALL the Questions

1. Express $\sin^4 x$ into cosines of multiples of x.

2. If $c\cos(A-iB)=x+iy$, prove that $\dfrac{x^2}{c^2\cosh^2 B}+\dfrac{y^2}{c^2\sinh^2 B}=1.$

3. Find the eigen vectors corresponding to the eigen values 2 and 5 of the matrix $A=\begin{bmatrix}3 & 1 & 4\\ 0 & 2 & 6\\ 0 & 0 & 5\end{bmatrix}$

4. If $A=\begin{bmatrix}1 & 0\\ 4 & 5\end{bmatrix}$, express A^3 interms of A and I using Cayley-Hamilton Theorem.

5. Evaluate $\displaystyle\int_0^{\frac{\pi}{2}} \frac{\sin^3 x}{\sin^3 x+\cos^3 x}dx$.

6. Evaluate $\displaystyle\int_3^4\int_1^2 \left(xy+e^y\right)dxdy$

7. Solve $\left(D^2+4\right)y=\cos 2x$

8. Use method of variation of parameters to solve $\left(D^2+1\right)y=e^x$

PART – B (4 x 12 = 48)

Answer ALL the Questions

9. Expand $\sin^4\theta\cos^3\theta$ interms of multiples of θ.

(or)

10. If $\tan(A+iB)=x+iy$, prove that $x^2+y^2+2x\cot 2A=1$ and $x^2+y^2-2y\cot 2B=-1$.

11. Verify Cayley-Hamilton Theorem for the matrix $A=\begin{bmatrix} 2 & -1 & 1 \\ -1 & 2 & -1 \\ 1 & -1 & 2 \end{bmatrix}$ and hence find A^{-1}.

(or)

12. Reduce $8x^2+7y^2+3z^2-12xy+4xz-8yz$ into canonical form by an orthogonal transformation.

13. Change the order of integration in $\int_0^{12}\int_y^{-y} xy\,dx\,dy$ and hence evaluate it.

(or)

14. Solve $\left(x^2D^2+4xD+2\right)y=x^2+\sin(\log x)$.

15. Find the length and equation of the shortest distance between the lines:

$$\frac{x-1}{2}=\frac{y-2}{3}=\frac{z-3}{4} \textit{ and } \frac{x-2}{3}=\frac{y-4}{4}=\frac{z-5}{5}$$

(or)

16. Find the equation of the sphere having its centre on the plane $4x-5y-z=3$ and passing through the circle

$$x^2+y^2+z^2-2x-3y+4z+8=0, \quad x^2+y^2+z^2+4x+5y-6z+2=0.$$