Andhra University, Visakhapatnam

I B.Sc/ I B.A Mathematics Paper-I

Model Paper

(For Students studying I B.Sc/I B.A during 2008-09)

Time : 3 Hrs **Max. Marks : 100**

Note: Follow the instructions carefully, given in each section.

SECTION –A

Answer all the FOUR questions. Each question carries 15 marks.**(4X15 = 60 Marks)**

1. (a). (i). Solve $(1+y^2)dx=(\text{Tan}^{-1}y-x)dy$ (8M)
   (ii). Solve $ap^2+py-x=0$ (7M)

   Or

   (b).(i). Show that the family of confocal conics $x^2/(a^2+\lambda)+y^2/(b^2+\lambda)=1$ is self orthogonal. Where λ is the parameter (8M)
   (ii). Solve $(py+x)(px-y)=2p$ (7M)

2. (a).(i). Solve $(D^2+1)y=x^2\sin 2x$ (8M)
   (ii). Solve $[(x-1)D^2-xD+1]y=(x-1)^2$ by the method of variation of parameters. (7M)

   Or

   (b). (i).Solve $(D^2-2D)y=e^x\sin x$ by the method of undetermined coefficients. (8M)
   (ii). Solve $dx/dt = 3x+2y$, $dy/dt+5x+3y=0$. (7M)

3. (a).
   (i). Prove that the lines $(x+1)/1=(y+1)/2=(z+1)/3$ and $x+2y+3z-8=0=2x+3y+4z-11$. are intersecting and find the point of their intersection find also the equation to the plane containing them. (8M)
   (ii). A sphere is inscribed in the tetrahedron with faces $x=0$, $y=0$, $z=0$, $2x+6y+3z=14$. Find the equation of the sphere. (7M)

   Or

   (b).
   (i). Find the equation of the sphere which touches the plane $3x+2y-z+2=0$ at $(1,-2,1)$ and cuts orthogonally the sphere $x^2+y^2+z^2-4x+6y+4=0$ (8M)
   (ii). Find the bisecting plane of the acute angle between the planes $3x-2y-6z+2=0$, $-2x+y-2z-2=0$ (7M)

4. (a).
   (i). Find the equations of the tangent planes to the cone $9x^2-4y^2+16z^2=0$ which contains the line $x/32=y/72=z/27$. (8M)
   (ii). Find the equation to the right circular cylinder whose guiding circle is $x^2+y^2+z^2=9$, $x-y+z=3$ (7M)

Or

   (b).
   (i). Find the equation to the right circular cone whose vertex is P(2,-3,5), axis PQ which makes equal angles with the axes and which passes through A (1,-2, 3). (8M)
   (ii). Find the equation of the cylinder whose generators are parallel to $X/1=y/2=z/3$ and which passes through the curve $x^2+y^2=16$, $z=0$. (7M)

SECTION – B

Answer any FIVE out of EIGHT questions. Each carries 4 Marks. **5 X 4 = 20 Marks**

5. Solve $(xy \sin xy+ \cos xy)\, y\, dx + (xy \sin xy - \cos xy)\, x\, dy=0$
6. Solve $dx/z(x+y) =dy/z(x-y)=dz/x^2+y^2$
7. Solve $(D^2-6D+13)y=8e^{3x} \sin 2x$.
8. Solve $x^2\, d^2y/dx^2 - 3x\, dy/dx+5y=x^2 \sin(\log x)$
9. A variable plane is at a constant distance P from the origin and meets the axes in A,B,C. Show that the locus of the centroid of the tetrahedron OABC is $x^{-2}+y^{-2}+z^{-2}=16p^{-2}$
10. Find the image of the point (2,-1,3) in the plane $3x-2y+z = 9$.
11. Find the equation to the cone which passes through the three coordinate axes and the lines $x/1=y/-2=z/3$ and $x/2=y/1=z/1$
12. Show that the two lines of intersection of the plane $ax+by+cz=0$ with the cone $yz+zx+xy = 0$ will be perpendicular if $1/a+1/b+1/c=0$.

SECTION – C

Answer all the ten questions. Each question carries 2 marks 10 **X 2 = 20 Marks**

13. Solve $(y+z)dx + (z+x)dy + (x+y)dz=0$
14. Find the orthogonal trajectory of $y=cx$ where c is the parameter.
15. Solve $p=\log(px-y)$
16. Solve $(D^2 + D + 1)y = 0$
17. Show that the system $Dx+2Dy=e^t$, $Dx+2Dy = t$ is degenerate.
18. Foot of the perpendicular from the origin to a plane is (2,-3,4). Find the equation to the plane.
19. Show that the line $(x+1)/-1 = (y+2)/3 = (z+5)/5$ lies in the plane $x+2y-z = 0$
20. Find t if the radius of the sphere $x^2+y^2+z^2+6x-8y-t = 0$ is 6.
21. Find polar plane of the point (0,-1,1) with respect to the sphere $x^2+y^2+z^2-2x+4y+6z-11=0$
22. Show that $x/1 = y/-1 = z/-1$ is a generator of the cone $5yz + 8zx + 3xy = 0$

18-5-20
CHAIRMAN, BOS (Maths)
MANGALORE UNIVERSITY