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Code No. 2017 / E

FACULTIES OF ARTS AND SCIENCE

B.A. / B.Sc. I – Year Examination, March / April 2016

Subject : MATHEMATICS

Paper – I : Differential Equations and Solid Geometry

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

Note : Answer Six questions from Part-A & Four questions from Part-B. Choosing at least one from each Unit. Each question in Part-A carries 6 marks and in Part-B carries 16 marks.

Part – A (6 X 6 = 36 Marks)

Unit - I

1 Solve $\sec^2 y \frac{dy}{dx} + 2x\tan y = x^3$.

2 Find the orthogonal trajectories of the family of rectangular hyperbolas $y = c_1/x$.

Unit – II

3 Solve $y'' + 3y' + 2y = 12e^x$

4 Solve $(D^2 - 3D + 2)y = 3\sin 2x$.

Unit - III

5 Find the equation of the plane which passes through the points (-1, 1, 1), (1, -1, 1) and (1, 1, -1).

6 Find the point where the line joining (2, -3, 1), (3, -4, -5) cuts the plane 2x + y + z = 7.

Unit - IV

7 Find the equation of the cone whose vertex is at the origin and the direction cosines of whose generators satisfy the relation $3\ell^2 - 4m^2 + 5n^2 = 0$.

8 Find the equation of the cylinder whose generators are parallel to the line $\frac{x}{1} = \frac{y}{-2} = \frac{z}{3}$ and whose guiding curve is the ellipse $x^2 + 2y^2 = 1$, z = 0.

Part – B (4 X 16 = 64 Marks)

Unit - I

9 a) Prove that the integrating factor of non-exact differential equation Mdx+Ndy=0 is 1/Mx+Ny if the differential equation is homogeneous and Mx + Ny ≠ 0.
b) Solve $(1+y^2)dx = (\tan^{-1}y - x)dy$.

10 a) Explain the method of solving Clairaut's equation y = px + f(p)
b) Solve $(x^2 + y^2 + 2x)\,dx + 2y\,dy = 0$

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Unit - II

11 a) Explain the method of solving second order Cauchy Euler equation $a_2x^2\frac{d^2y}{dx^2}+a_1x\frac{dy}{dx}+a_0y=Q(x)$ where a_0, a_1 and a_2 are constants which are non-zero.

b) Solve $(D^2-3D+2)y=xe^{2x}+\sin x$.

12 a) Solve $(D^2+4D+4)\,y = 4x^2 + 6e^x$ by undetermined coefficients.

b) Apply method of variation of parameters to solve $(D^2-2D)\,y = e^x \sin x$.

Unit - III

13 a) A variable plane is at a constant distance 3p from the origin and meets the axes in A, B and C. Show that the locus of the centroid of the triangle ABC is $x^{-2} + y^{-2} + z^{-2} = p^{-2}$

b) Find the shortest distance between the lines $\frac{x-1}{2}=\frac{y-2}{3}=\frac{z-3}{3}$ and $\frac{x-2}{3}=\frac{y-3}{4}=\frac{z-4}{5}$.

14 a) Find the equation of the sphere which pass through the points (0,0,0), (0,1,-1), (-1,2,0) and (1,2,3).

b) Find the equation of the sphere which pass through the circle $x^2+y^2+z^2=5,\ x+2y+3z=3$ and touch the plane $4x + 3y = 15$.

Unit - IV

15 a) Prove that $2x^2+2y^2+7z^2-10yz-10zx+2x+2y+26z-17=0$ represents a cone with vertex at (2,2,1).

b) Find the angle between the lines of intersection of $4x - y - 5z = 0$ and $8yz + 3zx - 5xy = 0$.

16 a) Find the equation of the cylinder whose generators touch the sphere $x^2 + y^2 + z^2 = a^2$ and are parallel to the line $\frac{x}{\ell}=\frac{y}{m}=\frac{z}{n}$.

b) Find the equation of the right circular cylinder of radius 3 and whose axis is the line $\frac{x-1}{2}=\frac{y-3}{2}=\frac{5-z}{7}$.

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