R15

Code: 15A54101

B.Tech I Year I Semester (R15) Regular & Supplementary Examinations November/December 2018

MATHEMATICS – I

(Common to all Branches)

Time: 3 hours Max. Marks: 70

PART – A

(Compulsory Question)

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1 Answer the following: (10 X 02 = 20 Marks)

(a) Solve $(5x^4 + 3x^2y^2 - 2xy^3)\,dx + (2x^3y - 3x^2y^2 - 5y^4)dy = 0$.

(b) Solve $x\,log\,x\,\frac{dy}{dx} + y = 2\log x$.

(c) Find the particular integral of $(D^2 - 2D + 1)y = xe^x sinx$.

(d) Solve $(x^2D^2 + xD)y = 0$.

(e) Find the radius of curvature for the curve $y = e^x$ at the point where it crosses the $y - axis$.

(f) If $u = \frac{2x-y}{2}$, $v = \frac{y}{2}$, find $\frac{\partial(u,v)}{\partial(x,y)}$.

(g) Evaluate $\int_0^1 \int_x^1 (x^2 + y^2)dy\,dx$.

(h) Find the area of a circle of radius 'a' by double integration in polar-co-ordinates.

(i) Find the directional derivative of $f = xyz\ at\ (1,1,1)$ in the direction of $\vec{i} + \vec{j} + \vec{k}$.

(j) Find the valve of 'a' so that the vector $\vec{F} = (x + 3y)\,\vec{i} + (y - 2z)\vec{j} + (x + az)\vec{k}\ is$ solenoidal.

PART – B

(Answer all five units, 5 X 10 = 50 Marks)

UNIT – I

2 (a) Solve $\frac{dy}{dx} + xsin\,2y = x^3cos^2y$.

(b) Solve $\frac{d^2y}{dx^2} - 2\frac{dy}{dx} + 5y = e^{2x}sin\,x$.

OR

3 (a) Find the orthogonal trajectory of the cardioids $r = a(1 - cos\theta)$.

(b) Solve $(D^2 - 2D + 1)y = x^2\,e^{3x}$.

UNIT – II

4 Solve $\frac{d^2y}{dx^2} + 4y = 4\tan 2x$ using method of variation of parameters.

OR

5 Solve $(2x + 5)^2\,\frac{d^2y}{dx^2} - 6(2x + 5)\frac{dy}{dx} + 8y = 6x$.

UNIT – III

6 (a) Expand $tan^{-1}\left(\frac{y}{x}\right)$ in the neighborhood of (1, 1).

(b) Examine $f(x,y) = x^3 + y^3 - 3xy$ for maximum and minimum values.

OR

7 (a) If $y_1 = \frac{x_2\,x_3}{x_1}$, $y_2 = \frac{x_3\,x_1}{x_2}$, $y_3 = \frac{x_1\,x_2}{x_3}$, find $\frac{\partial\,(y_1,y_2,y_3)}{\partial(x_1,x_2\,x_3)}$.

(b) Find the dimensions of the rectangular box without a top of maximum capacity, whose surface is 108 sq.cm

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UNIT – IV

8 (a) Evaluate $\iint_R (x^2+y^2)dx\,dy$ where R is the region in the positive quadrant for which $x+y \le 1$.

(b) Evaluate $\int_0^{\infty}\int_x^{\infty} \frac{e^{-y}}{y} dy\,dx$ by changing the order of integration.

OR

9 (a) Find the area bounded between the curves $y^2 = 4ax\ and\ x^2 = 4ay$.

(b) Evaluate $\int\int_D \int\ xy\,z\,dx\,dy\,dz$, where D is the region bounded by the positive octant of the sphere $x^2+y^2+z^2=a^2$.

UNIT – V

10 (a) Evaluate $\int_C \vec{F}\cdot\vec{dr}\ \ where\ \vec{F} = 3x^2\vec{i} + (2xz-y)\vec{j} + z\,\vec{k}$ and C is the straight line from A(0,0,0) to B(2,1,3).

(b) Using Stoke's theorem, evaluate $\int_c \vec{F}\cdot\vec{dr}$ for the function $\vec{F} = (x^2-y^2)\,\vec{i} + xy\vec{j}$ in the rectangular region in the XOY-Plane bounded by the lines $x=0, x=a,\ y=0$ and $y=b$.

OR

11 Verify the Gauss divergence theorem for $\vec{F} = 4xz\vec{i} - y^2\vec{j} + yz\vec{k}$ over the cube bounded by $=0$, $x=1, y=0, y=1, z=0, z=1$.

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