Code: 15A54101

R15

B.Tech I Year I Semester (R15) Supplementary Examinations June 2017

MATHEMATICS - I

(Common to CE, EEE, CSE, ECE, ME, EIE and IT)

Time: 3 hours Max. Marks: 70

PART - A

(Compulsory Question)

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

(a) Find the solution of the differential equation. $\frac{dy}{dx}+\frac{y}{x}=x^2$ under the condition $y=1$ when $x=1$.

(b) Find the particular integral of $(D^2+a^2)y=cosax$.

(c) Solve $y''+6y'+9y=0,\ y(0)=-4\ and\ y'(0)=14$

(d) Transform the Cauchy's homogeneous equation $(x^2D^2+xD+4)y=logx.\cos(2logx)$ into a linear equation with constant coefficients.

(e) If $u=xcosy,\quad v=ysinx$, then find $\frac{\partial(u,v)}{\partial(x,y)}$.

(f) If $f(x,y)=xy+(x-y)$, then find the stationary points.

(g) Evaluate $\int_0^3\int_0^2(4-y)^2dydx$.

(h) Evaluate $\int_{-1}^{1}\int_{-2}^{2}\int_{-3}^{3}dx\,dy\,dz$.

(i) If $\bar{F}=x(y+z)\bar{\imath}+y(z+x)\bar{\jmath}+z(x+y)\bar{k}$ then find $div\bar{F}$.

(j) State Green's theorem in a plane.

PART - B

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

UNIT - I

2 (a) Solve $\left(1+e^{\frac{x}{y}}\right)dx+e^{x/y}\left(1-\frac{x}{y}\right)dy=0$.

(b) Solve $x^3sec^2y\frac{dy}{dx}+3x^2tany=cosx$.

OR

3 (a) If the air is maintained at 15℃ and the temperature of the body drops from 70℃ to 40℃ in 10 minutes. What will be its temperature after 30 minutes.

(b) A circuit has in series on electromotive force given by $E=100\sin(40t)\,V$ a resistor of 10Ω and an inductor of 0.5 H. If the initial current is 0, find the current at time $t>0$.

UNIT - II

4 (a) Solve $(D^2-2D)y=e^xsinx$ by the method of variation of parameters.

(b) Solve $3x^2\frac{d^2y}{dx^2}+x\frac{dy}{dx}+y=x$.

OR

5 A particle is executing S.H.M with amplitude 5 meters and time 4 seconds. Find the time required by the particle in passing between points which are at distances 4 and 2 meters from the centre of force and are on the same side of it.

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UNIT - III

6 (a) Find the Taylor's series expansion of $sin2x$ about $x = \frac{\pi}{4}$.

(b) Verify $\frac{\partial^2 u}{\partial x\, \partial y} = \frac{\partial^2 u}{\partial y\, \partial x}$ for the function $u = tan^{-1}\frac{x}{y}$.

OR

7 (a) Find the minimum value of $x^2 + y^2 + z^2$ given that $xyz = a^3$.

(b) Find the point on the plane $x + 2y + 3z = 4$ that is closest to the origin.

UNIT - IV

8 (a) Evaluate $\int\int (x^2 + y^2) dx\, dy$ over the area bounded by the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$.

(b) Evaluate the double integral $\int_0^a \int_0^{\sqrt{a^2-b^2}} (x^2 + y^2) dy\, dx$.

OR

9 (a) Find the area of the loop of the curve $r = a(1 + cos\theta)$.

(b) Evaluate $\iiint_R (x + y + z) dz\, dy\, dx$ where R is the region bounded by the planes $x = 0, x = 1$, $y = 0, y = 1$, $z = 0, z = 1$.

UNIT - V

10 (a) If $\bar{A}$ is irrotational vector, evaluate $div(\bar{A} \times \bar{r})$ where $\bar{r} = x\bar{i} + y\bar{j} + z\bar{k}$.

(b) Evaluate the line integral $\int_C [(x^2 + xy)dx + (x^2 + y^2)dy]$ where C is the square formed by the lines $x = \pm 1$ and $y = \pm 1$.

OR

11 Verify Green's theorem for $\int_C [(xy + y^2)dx + x^2 dy]$ where C is bounded by $y = x$ and $y = x^2$.

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