# MA8151 MATHEMATICS – I

## 13 Mark Important Questions

### Part-B

### Unit-I

1. Guess the value of the limit (if it exists) for the function $\lim_{x\to o}\frac{e^{5x}-1}{x}$ by evaluating the function at the given numbers x=± 0.5, ± 0.1, ± 0.01, ± 0.001, ± 0.0001 (correct to six decimal places.
2. For the function f(x) = 2 + $2x^2 - x^4$ , find the intervals of increase or decrease, local maximum and minimum values, the intervals of concavity and the inflection points.
3. (i) Find the values of a and b that make f continuous on $(-\infty,\infty)$.

   f(x) = $\begin{cases} \frac{x^3-8}{x-2}, if\ x<2 \\ ax^2-bx+3, if\ 2x \le x \le 3 \\ 2x-a+b, if\ x \ge 3 \end{cases}$

   (ii)find the derivative of f(x) =$\cos^{-1}\left(\frac{b+a\cos x}{a+b\cos x}\right)$

   (iii)find $y'$ for $\cos(xy) = 1+\sin y$

4. If f(x)= $\frac{1-x}{2+x}$ then, find the equation for f '(x) using the concept of derivatives.
5. Find the derivative of f(x) = $\tanh^{-1}\left[\tan\frac{X}{2}\right]$.

### Unit-II

1. If $u = f\left(\frac{y-x}{xy}, \frac{z-x}{xz}\right)$, find $x^2\frac{\partial u}{\partial x} + y^2\frac{\partial u}{\partial y} + z^2\frac{\partial u}{\partial z}$
2. Find the maxima and minima of $f(x,y) = x^4 + y^4 - 2x^2 + 4xy - 2y^2$
3. Find the Taylor's series expansion of function of $f(x) = \sqrt{1+x+y^2}$ powers of $(x,y)$ and $y$ up to second degree terms.
4. Find the minimum distance from the point (1,2,0) to the cone $z^2 = x^2 + y^2$.
5. For the given function z=$\tan^{-1}\left(\frac{x}{y}\right) - (xy)$, verify whether the statement $\frac{\partial^2 z}{\partial x \partial y} = \frac{\partial^2 z}{\partial x \partial y}$.

## Unit-III

1. Using integration by parts, evaluate $\int \frac{(lnx)^2}{x^2} dx$
2. Evaluate $\int_{\frac{\sqrt{2}}{3}}^{\frac{2}{3}} \frac{dx}{x^5\sqrt{9x^2-1}}$.
3. Establish a reduction formula for $I_n = \int sin^n x\, dx$. Hence, find $\int_0^{\frac{\pi}{2}} sin^n x\, dx$.
4. Evaluate $\int e^x\, sinx\, dx$ by using integration by parts.
5. Evaluate $\int_0^x sin^2 x\, cos^4 x\, dx$.

## Unit-IV

1. Evaluate $\iint xy(x+y)dxdy$ over the area between $y = x^2$ and $y = x$.
2. Express $\int_0^a \int_y^a \frac{x^2}{(x^2+y^2)^{\frac{3}{2}}}\, dxdy$ in polar coordinates and then evaluate it.
3. Find the area bounded by the parabolas $y^2 = 4 - x\ and\ y^2 = x$.
4. Evaluate $\iint (xy)dx\, dy$ over the positive quadrant of the circle $x^2+y^2=a^2$.
5. Change the order of integration for the given integral $\int_0^a \int_{\frac{x}{a}}^{\sqrt{\frac{x}{a}}} (x^2+y^2)dy\, dx$ and evaluate it.



## Unit-V

1. Solve $(D^2+4D+5)\ y = e^x + x^3 + cos2x + 1$.
2. Solve $x^2 \frac{d^2y}{dx} - x\frac{dy}{dx} + y = \left(\frac{\ln x}{x}\right)^2$
3. Solve $\frac{dx}{dt} - \frac{dy}{dt} + 2y = \cos 2t,\ \ \frac{dx}{dt} - 2x + \frac{dy}{dt} = sin2t$.
4. Solve $y'' - 4y' + 4y = (x+1)e^{2x}$ by the method of variation of parameters.
5. Solve the simultaneous differential equation Dx + y = sin 2t and -X +Dy =cos 2t.