MA8151 MATHEMATICS – I

2 Marks Question Bank

Part-A

Unit-I

1. Find the domain of f(x) = $\sqrt{3-x}$ - $\sqrt{2+x}$.
2. Evaluate $\lim_{t\to 1}\frac{t^4-1}{t^3-1}$.
3. Given that $\lim_{x\to 2} f(x) = 4$ and $\lim_{x\to 2} g(x) = -2$. Find the limit that exists for $\lim_{x\to 2}\left[\frac{3f(x)}{g(X)}\right]$
4. If f(x)=Xe^X then find the expression for f'' (x).
5. Sketch the graph of the function $f(x) = \begin{cases} 1+x; x<-1 \\ x^2; -1\le x\le 1 \\ 2-x; x\ge 1 \end{cases}$ and use it to determine the value of 'a' for which $\lim_{x\to a} f(x)$ exists?
6. Does the curve y = x^4 – $2x^2$ + 2 have any horizontal tangents? If so where?
7. Check whether $\lim_{x\to 3}\frac{3x+9}{|x+3|}$ exist.
8. Find the critical points of y = $5x^3$-6x.
9. Show that $\lim_{x\to 0} x^2 \sin\left(\frac{1}{x}\right) = 0$.
10. Find the $\lim_{x\to\infty}\frac{\ln x}{\sqrt{x}}$.
11. Calculate $\lim_{x\to\infty}\frac{e^x}{x^2}$.
12. Point out $\frac{dy}{dx}$, if y =ln |cos(lnx) |
13. Compute the derivative for y=$\cosh^{-1}$ secx.
14. Predict the values of a and b so that the function f given by $f(x) = \begin{cases} 1; if\ x\le 1 \\ ax+b; 3<x<5 \\ 7; x\ge 5 \end{cases}$ is continuous at x=3 and x=5.
15. Where the function f(x) = |x| is differentiable?
16. Estimate $\frac{d}{dx}((sinx)^{cosx})$
17. Calculate $\frac{d}{dx}((x)^{\sqrt{x}})$
18. Compute $\frac{d}{dx}((x)^{sinx})$
19. Estimate $y' if\ x^3 + y^3 = 6xy$

20. Find the critical numbers of the function $f(x) = 2x^3 - 3x^2 - 36x$.

Unit-II

1. Find $\frac{dy}{dx}$, if $x^y + y^x = c$, where c is a constant.
2. State the properties of Jacobians.
3. Verify the Euler's theorem for the function u = X^2+Y^2+2XY.
4. If x=r cos θ and y=r sin θ, then find $\frac{\partial(x,y)}{\partial(r,\theta)}$.
5. If x=r cos θ and y=r sin θ, then find $\frac{\partial r}{\partial x}$
6. If x=u v and y=$\frac{u}{v}$ then find $\frac{\partial(x,y)}{\partial(u,v)}$
7. Find $\frac{du}{dt}$ in terms of t, if $u=x^3+y^3$ where $x=at^2$, y=2at.
8. If $x=u^2-v^2$, y=2uv find the Jacobian of x,y with respect to u and v.
9. If $u = \frac{y}{z} + \frac{z}{x} + \frac{x}{y}$, then find $x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y} + z\frac{\partial u}{\partial z}$.
10. If u=f(x-y, y-z, z-x), then find $\frac{\partial u}{\partial x} + \frac{\partial u}{\partial y} + \frac{\partial u}{\partial z}$.
11. If $x^y + y^x = 1$ then find $\frac{dy}{dx}$.
12. Statement of Euler's Theorem.
13. Find the value of $\frac{\partial u}{\partial t}$, given $u = x^2 + y^2, x = at^2, y = 2at$.
14. If $u = x^3y^2 + x^2y^3 \; where \; x = at^2 \; and \; y = 2at$, then find $\frac{\partial u}{\partial t}$.
15. Find $\frac{\partial u}{\partial t}$ if $u = \frac{x}{y}, where \; x = e^t, y = t^2$.
16. If x=u91+v), y=v(1+u), find $\frac{\partial(x,y)}{\partial(u,v)}$
17. Fid the Taylor series of x^y near the point (1,1) up to first term.
18. Expand xy+2x-3y+2 in powers of (x-1) & (y+2), using Taylor's theorem up to first degree form.
19. State the sufficient condition for f(x,y) to be extremum at a point.
20. Find the minimum point of f(x, y)=$x^2+y^2+6x+12$.

UNIT-III

1. State the fundamentals of calculus.
2. If f is continuous and $\int_0^4 f(x)dx = 10$, find $\int_0^2 f(2x)dx$.
3. Find the derivatives of G(x) = $\int_x^1 \cos\sqrt{t}\, dt$.

4. Determine whether the given integral $\int_0^\infty e^x$dx is convergent or divergent.
5. What is wrong with the equation$\int_{-1}^{2} \frac{4}{x^3} dx = \left[\frac{-2}{x^2}\right]_{-1}^{2} = \frac{3}{2}$?
6. Evaluate $\int_4^\infty \frac{1}{\sqrt{4}} dx$ and determine whether it is convergent or divergent.
7. Evaluate $\int_0^{\frac{\pi}{2}} \frac{dx}{1+\tan x}$.
8. Evaluate $\int_3^\infty \frac{dx}{(x-2)^{\frac{3}{2}}}$ and determine whether it is convergent or divergent.
9. Prove that the following integral by interpreting each in terms of areas $\int_a^b x dx = \frac{b^2-a^2}{2}$
10. Shoe that $\int_a^b dx = b - a$.
11. Evaluate $\int_0^1 \sqrt{1-x^2}\, dx$ interms of areas.
12. Evaluate $\int_0^3 (x-1)dx$ interms of areas.
13. Evaluate the integral $\int_a^b x dx$ by using Riemann sum method.
14. Calculate $\int \frac{x^3}{\sqrt{4+x^2}} dx$
15. Calculate $\int \sqrt{1+x^2}\, x^5 dx$
16. Find $\int \sqrt{2x+1dx}$
17. Evaluate $\int_0^1 \tan^{-1} x\, dx$
18. Estimate $\int_1^3 \sqrt{x^2+3}\ dx$
19. Find $\int_2^5 \frac{1}{\sqrt{x-2}} dx$
20. Prove that $\int_1^\infty \frac{1}{x} dx$ is divergent.

Unit-IV

1. Evaluate $\int_1^{lnx} \int_0^{lny} e^{x+y}$dx dy.
2. Change the order of integration in $\int_0^l \int_{y^2}^{y} f(x,y)dxdy$.
3. Evaluate $\int_1^2 \int_0^{x^2} (X)dydx$.
4. Express the region x≥0, y≥0, z≥0, $x^2+y^2+z^2 \leq 1$ by triple integration.
5. Find the value of $\int_0^\infty \int_0^y \left(\frac{e^{-y}}{y}\right) dxdy$.
6. Find the limits of integration in the double integral $\iint_R^0 f(x,y)dxdy$ where R is in the first quadrant and bounded x=1, y=0, y^2 =4x.

7. Evaluate $\int_1^a \int_2^b \frac{dxdy}{xy}$.
8. Evaluate $\int_2^3 \int_1^2 \frac{dxdy}{xy}$
9. Evaluate $\int_0^2 \int_0^x \frac{dxdy}{\sqrt{x^2+y^2}}$
10. Estimate $\int_0^\pi \int_0^{sin\theta} rdrd\theta$.
11. Compute the area bounded by the lines x=0, y=1 and y=x.
12. Calculate $\int_0^\pi \int_0^a rdrd\theta$.
13. Compute $\int_0^5 \int_0^2 (x^2 + y^2)dx\, dy$
14. Compute $\int_0^a \int_0^{\sqrt{a^2-x^2}} dydx$.
15. Compute $\int_0^1 \int_1^2 xydxdy$.
16. Evaluate $\int\int dxdy$ over the region bounded by x=0, x=2, y=0 and y=2.
17. Evaluate $\int\int\int(x + y + z)dxdydz$ over the region bounded by x=0, x=1, y=0 and y=1,z=0 , z=1.
18. Change the order of integration $\int_0^1 \int_0^y f(x,y)dxdy$.
19. Change the order of integration $\int_0^1 \int_0^x f(x,y)dxdy$.
20. Change the order of integration $\int_0^\infty \int_x^\infty f(x,y)dxdy$.

Unit-V

1. Solve $(D^3 + 1)$ y = 0
2. Transform the equation xy" + y' + 1 = 0 into a linear equation with constant coefficients.
3. Solve (D^2-2D^2+1) y = 0.
4. Convert xy" + y' = 0 into a linear differential equation with constant coefficients.
5. Convert x^2y' -2xy'+2y = 0 into a linear differential equation with constant coefficients.
6. Find the particular integral of $(D-1)^2y = e^x \sin x$.
7. Find the particular integral of $(D-a)^2y = e^{ax}\sin x$.
8. Solve the equation x^2y"-xy'+y=0.
9. Find the P.I of $(D-1)^2$ y = sinh2x.
10. Find the P.I of $(D+1)^2$ y = cos2x.
11. Find the P.I of $(D+1)^2$ y = sinx.
12. Find the P.I of $(D+2)^2$ y = $x^{2.}$
13. Find the P.I of (D^4-1) y = 0.

14. Solve Dx = -wy; Dy = wx.
15. Solve Dx + y = e^t, x – Dy = t.
16. Find the complementary function of y" – 4y' + 4y = 0.
17. Solve $(D^2 + a^2)$ y = 0.
18. Solve $(D^4 + D^3 + D^2)$y =0
19. Test whether the equation x^2y" +xy' = x is linear equation with constant coefficients if not convert.
20. Find the P.I of (D^2+4D+5) y = e^{-2x}