



UNIVERSITY OF THE PUNJAB

Mathtcity.org
Solving Man and maths

A/2014

Examination:- B.A./B.Sc.

Roll No.

Subject: Mathematics General
PAPER: A

TIME ALLOWED: 3 hrs.
MAX. MARKS: 100

Attempt any SIX questions, selecting TWO from Section-I, TWO from Section-II,
ONE question from Section-III and ONE question from Section-IV.

Section-I

Q.1. a) Solve the inequality $|x| + |x-1| > 1$

9+8

b) If $f(x) = \frac{-\cos x}{2\sin^2 x} + \frac{1}{2} \ln \tan\left(\frac{x}{2}\right)$, find $f'(x)$

Q.2. a) Find, by Maclaurin's Formula, the first four terms of the expansion of
 $f(x) = e^{ax} \cos bx$ and write the remainder after n terms.

9+8

b) Evaluate $\lim_{x \rightarrow 1} \left(\frac{x}{x-1} - \frac{1}{\ln x} \right)$

Q.3. a) Find equations of the asymptotes of the curve
 $2xy = x^2 + 3$

9+8

b) Locate the points of relative extrema of the curve $f(x) = e^x \cos(x-a)$

Q.4. a) Find the position and nature of the multiple points on the curve
 $y^3 = x^3 + ax^2$

9+8

b) Prove that the radius of curvature at the point $(2a, 2a)$ on the curve

$$x^2 y = a(x^2 + y^2) \text{ is } 2a.$$

Section - II

Q.5. Evaluate the integrals

a) $\int \frac{dx}{(x^2-1)\sqrt{x^2+1}}$

b) $\int \frac{\cos x}{2-\cos x} dx$

9+8

P.T.O

Q.6. a) Show that $\int_0^{\pi/2} \ln(\sin x) dx = -\frac{\pi}{2} \ln 2$

9+8

b) Use Trapezoidal rule to evaluate the integral $\int_0^1 e^{-x} dx$ with $n=6$

Q.7. a) Find the area of the region bounded by the loop of the curve $(x+y)^2(x^2+y^2) = 2axy$.

9+8

b) Sketch the graph of the curve $r = 3 - 2\cos \theta$

Q.8. a) Find the length of the loop of the curve $3ay^2 = x(a-x)^2$.

9+8

b) Find the area of the surface generated by revolving $r = 2a \sin \theta$ about the polar axis.

Section – III

Q.9. a) Determine the series $\sum_{n=1}^{\infty} \frac{1}{(n+1)[\ln(n+1)]^2}$ converges or diverges.

8+8

b) Test the series for absolute convergence, conditional convergence

or divergence $\sum_{n=1}^{\infty} \frac{n!}{(-2)^n}$

Q.10.a) Determine the series $\sum_{n=1}^{\infty} \frac{1^n + 2^n}{3^n}$ converges or diverges.

8+8

b) Find the radius and interval of convergence for the series

$$\sum_{n=1}^{\infty} n^2 (x-2)^n$$

Section - IV

Q.11.a) If $f(x, y) = \frac{x^2 + y^2}{x + y}$, prove that $(f_x - f_y)^2 = 4(1 - f_x - f_y)$

8+8

b) Use differential to approximate $\sqrt[3]{123}$

Q.12:a) Find $\frac{dy}{dx}$ if $3(x^2 + y^2)^2 = 25(x^2 - y^2)$

8+8

b) Find the extrema of $f(x, y) = 6x^3y^2 - x^4y^2 - x^3y^3$