

S. R. Fatehpuria College  
B.Sc. 3rd year Mathematics (Hrs), 2020  
Assignment on paper - V

Answers any two questions (2x10=20) -

- ① (a) A rod of length 'a' is suspended by a string of length 'l', attached to one end of the rod. If the string and the rod revolve about the vertical with uniform angular velocity and their inclination to the downward drawn vertical be 'θ' and 'φ' respectively, then show that

$$\frac{(4 \tan \theta - 3 \tan \phi) \sin \phi}{(\tan \phi - \tan \theta) \sin \theta} = \frac{3l}{a}$$

- (b) Three forces each of magnitude 'p' acts along the sides of a triangle formed by the straight lines  $4x + 3y = 12$ ,  $3x - 4y = 12$ ,  $x \geq 0$ . Find equation of line of action of the resultant.
- ② (a) An imperfectly rough sphere moves from rest down a plane, inclined at an angle 'θ' to the horizon. Discuss the motion.
- (b) Find the condition that a system of coplanar forces may be in astatic equilibrium.
- ③ (a) An ellipse is ~~just~~ just immersed in water with its major axis vertical. Show that if the centre of pressure coincides with the focus, the eccentricity of the ellipse must be  $\frac{1}{4}$ .
- (b) A heavy uniform chain rests on a rough cycloid whose axis is vertical and vertex upwards, the end of the chain being at the vertex and the other at a cusp. If the equilibrium be limiting, then show that

$$(1 + e^2) e^{\frac{c\pi}{2}} = 2$$

S. R. Fatehpuria College  
Internal Assessment, B.Sc Honours (Part-III)  
Subject - Mathematics, Paper - VI (6)

1) Answer any four questions  $4 \times 5 = 20$

a) Prove that a bounded function  $f: [a, b] \rightarrow \mathbb{R}$  having a finite number of points of discontinuities on  $[a, b]$  is Riemann integrable on  $[a, b]$

b) State and prove sufficient conditions for differentiability of a function of two variables

c) Prove that the limit of a power series is continuous on the interval of convergence

d) Consider the function  $f(x) = \begin{cases} 1 & \text{if } 0 \leq x < \pi \\ 0 & \text{if } \pi \leq x < 2\pi \\ 1 & \text{if } x = 2\pi \end{cases}$

Obtain the Fourier series of  $f$ .

e) Solve  $p(p+1) + (b-z)q = 0$  by Charpit's method.

f) Show that arbitrary intersection of complete subspaces, of a metric space is complete.



S. R. Fatehpuria College  
Internal Assessment, B.Sc Honours (Part-III)  
Subject - Mathematics, Paper - VII (7)

1) Answer any four questions  $4 \times 5 = 20$

a) If  $X$  is a binomial  $(n, p)$  variate, then prove that  $\mu_{k+1} = p(1-p) \left[ nk\mu_{k-1} + \frac{d\mu_k}{dp} \right]$ , where  $\mu_k$  is the  $k$ th central moment.

b) Show that the following function  $f(z)$  is not differentiable at the origin even though it satisfies Cauchy-Riemann equation there, where  $f(z) = \begin{cases} \frac{xy^2(x+iy)}{x^2+y^4}, & z \neq 0 \\ 0, & z = 0 \end{cases}$

c) What do you mean by the confidence interval for a parameter of a distribution? Find a confidence interval for mean of a normal  $(\mu, \sigma)$  population when  $\sigma$  is known.

d) Verify Stokes theorem for  $\vec{A} = (2x-y)\hat{i} - yz^2\hat{j} - y^2z\hat{k}$  where  $S$  is the upper half surface of the sphere  $x^2+y^2+z^2=1$  and  $C$  is its boundary.

e) If  $A^i$  is an arbitrary contravariant vector and  $C_{ij}A^iA^j$  is an invariant, show that  $C_{ij} + C_{ji}$  is a covariant tensor of second order.

f) What do you mean by scatter diagram? If  $r$  be the sample correlation coefficient of a bivariate sample of size  $n$ , then prove that  $-1 < r < 1$ .



S.R. Fatehpuria college  
B.Sc. 3rd year Mathematics (Hons), 2020  
Assignment on paper - VIII

Answer any two questions (2x10=20) :-

1.
  - a) Explain the Newton-Raphson method for computing a real root of an equation  $f(x) = 0$ . Show that this method has a quadratic convergence (3+5).
  - b) Write a C-program to find multiplication of two matrices.
2.
  - a) Describe Gaussian Elimination method for finding solution of a system of linear algebraic equations.
  - b) Draw a flowchart to calculate the factorial of a given positive integer.
3.
  - a) Establish Newton's forward interpolation formula.
  - b) Write a C-program for solving quadratic equation with real coefficients.



S.R. Fatepuria college  
B.Sc 2nd year Mathematics (Men), 2020

Assignment on paper - III

Answer any two questions (2x10=20):-

- (1) (a) when is a coplanar system of forces said to be in 'astatic equilibrium'? Find the condition that a system of coplanar forces may be in astatic equilibrium.
- (b) write a program in FORTRAN for solving ~~for~~ quadratic equation with real coefficients. (1+4=5)
- (2) (a) Explain simple harmonic motion and its time period.
- (b) write planetary motion's Kepler's laws and modified Kepler's law.
- (3) (a) Prove that a system of coplanar forces not in equilibrium can be reduced to either a single force or a single couple.
- (b) write a FORTRAN programming to arrange ten numbers in ~~order~~ ascending order.