**RUBRICS: HSSC 1st ANNUAL EXAMINATION 2022**

**SUBJECT: MATHEMATICS HSSC-II (Local)**

| **Q.# /Part #** | **Criteria**  | **Level 1 (Marks)** | **Level 2(Marks)** | **Level 3 (Marks)** | **Level 4 (Marks)** | **Level 5 (Marks)** | **Level 6 (Marks)** |
| --- | --- | --- | --- | --- | --- | --- | --- |
| $$2\left(i\right)$$ | Finding f-1(x)and verifyingf (f-1(x)) = x | Correctly finding x = f (y) (1) | Partially correct (0.5) | Wrong (0) |  |  |  |
| Correctly finding f-1(x) (1) | Partially correct (0.5) | Wrong (0) |  |  |  |
| Correctly verifying the expressionf (f-1(x)) = x(2) | Partially correct (1) | Wrong (0) |  |  |  |
| $$2(ii)$$ | Evaluating the Limit of the function | Correctly simplifying in the evaluated form of the function (2) | Partially correct simplification (1) | Wrong (0) |  |  |  |
| Correctly applying the limit and finding the correct answer (2) | Partially correct response (1) | Wrong (0) |  |  |  |
| $$2(iii)$$ | Proving the given statement  | Correctly taking square on both sides and correctly replacing the value of y (2) | Partially correct response (1) | Wrong (0) |  |  |  |
| Correctly finding the derivative and correctly proving the required expression (2) | Partially correct response (1) | Wrong (0) |  |  |  |
| $$2(iv)$$ | Proving the statement by using Taylor’s series | Correctly stating the Taylor’s series expansion (1) | Wrong (0) |  |  |  |  |
| Correctly finding the successive derivatives (2) | Correctly finding any two derivatives (1) | Correctly finding any one derivative (0.5) | Wrong (0) |  |  |
| Correctly showing the given statement (1) | Partially correct (0.5) | Wrong (0) |  |  |  |
| $$2(v)$$ | Proving the given statement  | Correctly finding the first derivative and simplifying (2) | Partially correct (1) | Wrong (0) |  |  |  |
| Correctly finding the second derivative and simplifying (2) | Partially correct (1) | Wrong (0) |  |  |  |
| $$2(vi)$$ | Evaluating the given integral  | Correctly applying the chain rule (2) | Partially correct (1) | Wrong (0) |  |  |  |
| Correctly simplifying the resultant (2) | Partially correct (1) | Wrong (0) |  |  |  |
| $$2(vii)$$ | Evaluating the given integral | Correctly converting the expression into proper fraction and separating the integrals (1) | Partially correct (0.5) | Wrong (0) |  |  |  |
| Correctly integrating the two terms (2) | Partially correct (1) | Wrong (0) |  |  |  |
| Correctly simplifying the resultant (1) | Partially correct (0.5) | Wrong (0) |  |  |  |
| 2 (viii) | Solving the differential equation  | Correctly separating the variables (2) | Partially correct (1) | Wrong (0) |  |  |  |
| Correctly integrating the expression (2) | Partially correct (1) | Wrong (0) |  |  |  |
| $2(ix$) | Finding the equation of perpendicular bisector of line | Correctly finding the midpoint of the given line (1) | Wrong (0) |  |  |  |  |
| Correctly finding slope of the required line (1) | Partially correct (0.5) | Wrong (0) |  |  |  |
| Correctly applying point-slope form (1) | Wrong (0) |  |  |  |  |
| Correctly finding the equation of required line (1) | Partially correct (0.5) | Wrong (0) |  |  |  |
| $2(x$) | Finding the value of k  | Correctly applying the condition of concurrency of three straight lines (1) | Partially correct (0.5) | Wrong (0) |  |  |  |
| Correctly expanding the determinant (1) | Partially correct (0.5) | Wrong (0) |  |  |  |
| Correctly simplifying and finding the value of k (2) | Partially correct (1) | Wrong (0) |  |  |  |
| $$2(xi)$$ | Graphing the feasible region  | Correctly finding the intercepts (1) | Partially correct (0.5) | Wrong (0) |  |  |  |
| Correctly sketching the two lines (2) | Correctly sketching any one line (1) | Partially correct (0.5) | Wrong (0) |  |  |
| Correctly shading the feasible region (1) | Partially correct (0.5) | Wrong (0) |  |  |  |
| $$2(xii)$$ | Finding the equation of circle | Correctly stating the equation of circle (1) | Wrong (0) |  |  |  |  |
| Correctly finding the center and radius of circle (2) | Correctly finding any one aspect (1) | Partially correct (0.5) | Wrong (0) |  |  |
| Correctly finding the circle equation (1) | Partially correct (0.5) | Wrong (0) |  |  |  |
| 2(xiii) | Finding the equation of parabola | Correctly stating an arbitrary point on the parabola and finding the distance between point and focus (1) | Partially correct (0.5) | Wrong (0) |  |  |  |
| Correctly finding the perpendicular distance between the point and the directrix (1)  | Partially correct (0.5) | Wrong (0) |  |  |  |
| Correctly applying the definition for eccentricity (1) | Wrong (0) |  |  |  |  |
| Correctly finding the equation of parabola (1) | Partially correct (0.5) | Wrong (0) |  |  |  |
| $$2(xiv)$$ | Find equation of the tangent to hyperbola | Correctly finding the values of a and b from equation of the hyperbola (1) | Correctly finding the value of a OR b from equation of the hyperbola (0.5) | Wrong (0) |  |  |  |
| Correctly finding slope of the given line (1) | Wrong (0) |  |  |  |  |
| Correctly applying the tangent formula (1) | Wrong (0) |  |  |  |  |
| Correctly finding equation of the required tangent (1) | Partially correct (0.5) | Wrong (0) |  |  |  |
| 2 (xv) | Finding the value of scalar  | Correctly applying the condition of perpendicularity of two vectors (1) | Wrong (0) |  |  |  |  |
| Correctly finding the dot product (2) | Partially correct (1) | Wrong (0) |  |  |  |
| Correctly finding the value of α (1) | Partially correct (0.5) | Wrong (0) |  |  |  |
| 2(xvi) | Finding the volume of tetrahedron  | Correctly determining the three vectors of the co terminal edges (2) | Correctly determining any two edges (1) | Correctly determining any one edge (0.5) | Wrong (0) |  |  |
| Correctly applying the volume formula of tetrahedron (1) | Wrong (0) |  |  |  |  |
| Correctly finding the volume of tetrahedron (1) | Partially correct (0.5) | Wrong (0) |  |  |  |
| $3$  | Finding the values of unknown using limiting method | Correctly evaluating the left and right hand limits of the function (2) | Partially correct (1) | Wrong (0) |  |  |  |
| Correctly evaluating the limit and value of the function and stating them equal (2) | Correctly finding any one value (1) | Partially correct (0.5) | Wrong (0) |  |  |
| Correctly finding the values of m and n (2) | Any one value (1) | Partially correct (0.5) | Wrong (0) |  |  |
| Correctly sketching the graph of function (2) | Partially correct (1) | Wrong (0) |  |  |  |
| 4 | Finding the maximum area of the triangle  | Correctly stating the dimensions of the triangle, formulating perimeter and area of the triangle as an explicit function (2) | Correctly formulating the perimeter OR the area of the triangle as an explicit function (1) | Partially correct (0.5) | Wrong (0) |  |  |
| Correctly finding f ’ (x) and f ” (x) (2) | Correctly finding any one (1) | Partially correct (0.5) | Wrong (0) |  |  |
| For extreme values setting f ’ (x) = 0 and correctly finding the value of x (2) | Partially correct (1) | Wrong (0) |  |  |  |
| Correctly applying the second derivative test for extreme values and finding the correct dimensions of the triangle (2) | Correctly applying the second derivative test for extreme values OR finding the correct dimensions of the triangle (1) | Partially correct (0.5) | Wrong (0) |  |  |
| 5. | Evaluating the integral by using the partial fractions | Correctly stating the identity (1) | Partially correct (0.5) | Wrong (0) |  |  |  |
| Correctly finding the values of the four constants (4) | Correctly finding the values of the three constants (3) | Correctly finding the values of the two constants (2) | Correctly finding the values of the one constant (1) | Wrong (0) |  |
| Correctly integrating the three integrands (3) | Correctly integrating the two integrands (2) | Correctly integrating the one integrand (1) | Partially correct (0.5) | Wrong (0) |  |
| 6. | Finding slopes, angles, equations of sides and area of the triangle  | Correctly finding the slopes of AB, BC, AC (2) | Correctly finding any two aspects (1.5) | Correctly finding any one aspect (1) | Wrong (0) |  |  |
| Correctly finding the angle between AB and BC and the angle between AB and AC (2) | Correctly finding any one aspect (1) | Partially correct (0.5) | Wrong (0) |  |  |
| Correctly finding equations of the sides AB and BC (2) | Correctly finding any one aspect (1) | Wrong (0) |  |  |  |
| Correctly finding the area of triangle and checking the condition of collinearity (2) | Any one correct aspect (1) | Partially correct (0.5) | Wrong (0) |  |  |
| 7 | Maximizing the given objective function | Correctly stating the objective function and the constraints (1) | Partially correct (0.5) | Wrong (0) |  |  |  |
| Correctly finding the intercepts (1) | Partially correct (0.5) | Wrong (0) |  |  |  |
| Correctly sketching two lines and shading the feasible region (3) | Correctly sketching two lines without shading the feasible region (2) | Correctly sketching any one line without shading the feasible region (1) | Wrong (0) |  |  |
| Correctly finding the corner point (1) | Partially correct (0.5) | Wrong (0) |  |  |  |
| Correctly finding the maximum profit (2) | Partially correct (1) | Wrong (0) |  |  |  |
| 8 | Finding the elements of given conic | Correctly stating the given equation in standard form of the vertical ellipse (2) | Partially correct (1) | Wrong (0) |  |  |  |
| Correctly finding the values of a, b and c (1) | Partially correct (0.5) | Wrong (0) |  |  |  |
| Correctly finding center, foci, eccentricity, vertices and equation of directrix (5) | Correctly finding any four (4) | Correctly finding any three (3) | Correctly finding any two (2) | Correctly finding any one (1) | Wrong (0) |