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

**SUBJECT: MATHEMATICS HSSC-II (Hard Area)**

| **Q.# /Part #** | **Criteria**  | **Level 1 (Marks)** | **Level 2(Marks)** | **Level 3 (Marks)** | **Level 4 (Marks)** | **Level 5 (Marks)** |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| $$2\left(i\right)$$ | Finding the composition of two functions | Finding the correct values of $f\left(g(x)\right)$, g$\left(f(x)\right)$ and $f\left(f(x)\right)$(4) | Correctly finding any two aspects(3) | Correctly finding any one aspect(3) | Partially correct(1) | Wrong(0) |  |
| $$2(ii)$$ | Evaluating the Limit | Correct rationalization of the expression (1) | Wrong (0) |  |  |  |  |
| Correct simplification of the expression(2) | Partially correct (1) | Wrong(0) |  |  |  |
| Correct evaluation (1) | Partially correct (0.5) | Wrong(0) |  |  |  |
| $$2(iii)$$ | Finding the value of $\frac{dy}{dx}$By chain rule |  Finding the correct value of $\frac{dx}{dt}$ (1) | Correctly finding any three (3) | Correctly finding any two (3) | Correctly finding any one (1) | Partially correct (0.5) | Wrong (0) |
| Finding the correct value of $\frac{dy}{dt}$ (1)  |
| Applying the correct Chain rule (1) |
| Finding the correct value of $\frac{dy}{dx}$ (1) |
| $$2(iv)$$ | Showing the given statement  | Finding the correct derivative of the given function (2) | Partially correct (1) | Wrong (0) |  |  |  |
| Correctly simplifying the resultant and showing the given statement (2) | Partially correct (1) | Wrong (0) |  |  |  |
| $$2(v)$$ | Finding the second derivative by the implicit rule | Finding correctly 1st derivative and simplifying (2) | Partially correct (1) | Wrong (0) |  |  |  |
| Finding correctly 2nd derivative and simplifying (2) | Partially correct (1) | Wrong (0) |  |  |  |
| $$2(vi)$$ | Showing the desired result | Correctly finding the 1st derivative by chain rule (2) | Partially correct (1) | Wrong (0) |  |  |  |
| Correctly finding the 2nd derivative and showing the required statement (2) | Partially correct (1) | Wrong (0) |
| $$2(vii)$$ | Finding area under the curve  | Correctly finding the x-intercepts(1) | Partially correct (0.5) | Wrong (0) |  |  |  |
| Correctly finding area below x-axis (1) | Partially correct (0.5) | Wrong (0) |
| Correctly finding area above x-axis (1) | Partially correct (0.5) | Wrong (0) |
| Correctly finding the required area (1) | Partially correct (0.5) | Wrong (0) |
| 2 (viii) | Evaluating the integral by substitution | Correct substitution in new variable (1) | Partially correct (0.5) | Wrong (0) |  |  |  |
| Correct integration in new variable (2) | Partially correct (1) | Wrong (0) |  |  |  |
| Correct evaluation by back substitution (1) | Partially correct (0.5) | Wrong (0) |
| $2(ix$) | Finding the point two-fifth of the way along the line segment | Correctly stating the ratio (1) | Partially correct (0.5) | Wrong (0) |  |  |  |
| Correctly applying the ratio formula (1) | Partially correct (0.5) | Wrong (0) |  |  |  |
| Correctly simplifying and finding the required point (2) | Partially correct (1) | Wrong (0) |
| $2(x$) | Finding the angle between the lines | Correctly finding slopes of the two lines (1) | Partially correct (0.5) | Wrong (0) |  |  |  |
| Applying the correct formula (1) | Partially correct (0.5) | Wrong (0) |  |  |  |
| Correctly finding the required angle (2) | Partially correct (1) | Wrong (0) |
| $$2(xi)$$ | Graphing the feasible Solution region and finding the corner points | Correctly finding the intercepts (1) | Partially correct (0.5) | Wrong (0) |  |  |  |
| Correctly sketching the lines (1) | Partially correct (0.5) | Wrong (0) |
| Correctly finding the corner point (1) | Partially correct (0.5) | Wrong (0) |
| Correctly showing the shaded feasible region (1) | Partially correct (0.5) | Wrong (0) |
| $$2(xii)$$ | Finding the equation of parabola with the given elements  | Correctly stating the equation of the parabola (1) | Partially correct (0.5) | Wrong (0) |  |  |  |
| Correctly finding the value of $a$ (2) | Partially correct (1) | Wrong (0) |
| Correctly finding the required equation(1) | Partially correct (0.5) | Wrong (0) |
| 2(xiii) | Finding the equation of parabola with the given elements  | Correctly stating the equation of the parabola (1) | Partially correct (0.5) | Wrong (0) |  |  |  |
| Correctly finding the value of $a$ (2) | Partially correct (1) | Wrong (0) |
| Correctly finding the required equation(1) | Partially correct (0.5) | Wrong (0) |
| $$2(xiv)$$ | Finding the equation of ellipse with the given elements | Correctly stating the equation of the ellipse (1) | Partially correct (0.5) | Wrong (0) |  |  |  |
| Correctly finding the centre of the ellipse (1) | Partially correct (0.5) | Wrong (0) |
| Correctly finding the value of $a$ and $b$ (1) | Partially correct (0.5) | Wrong (0) |
| Correctly finding the required equation(1) | Partially correct (0.5) | Wrong (0) |  |  |  |
| 2 (xv) | Proving the required result | Correctly finding the two unit vectors (1) | Partially correct (0.5) | Wrong (0) |  |  |  |
| Correctly stating the cross product of the unit vectors (1) | Partially correct (0.5) | Wrong (0) |
| Correctly finding the cross product (1) | Partially correct (0.5) | Wrong (0) |
| Correctly proving the result (1) | Partially correct (0.5) | Wrong (0) |
| 2(xvi) | Finding the value of a constant when the vectors are given coplanar | Correctly applying the condition of the coplanar vectors (1) | Partially correct (0.5) | Wrong (0) |  |  |  |
| Correctly determining the quadratic equation (1) | Partially correct (0.5) | Wrong (0) |  |
| Correctly finding the values of $α$ (2) | Partially correct (0.5) | Wrong (0) |  |
| $$3$$ | Proving $\lim\_{θ\to 0}\frac{sinθ}{θ}$ when $θ$ is measured in radians. | Correctly drawing the figure and giving the correct explanation (2) | Correctly drawing the figure and giving the incorrect explanation (1) | Wrong (0) |  |  |  |
| Correctly finding areas of two triangles and one sector (3) | Any two correct areas (2) | Any one correct area (1) | Wrong (0) |  |  |
| stating the inequality of the areas (1) | Partially correct (0.5) | Wrong (0) |  |  |  |
| Evaluating the correct result (2) | Partially correct (1) | Wrong (0) |  |  |  |
| 4 | Finding the extreme values of the function in the given interval | Correctly finding the values of $f^{'}(x)$ and $f^{''}(x)$ (3) | Finding the correct value of $f^{'}(x)$ and the incorrect value of $f^{''}(x)$ (2) | Partially correct (1) | Wrong (0) |  |  |
| Setting $f^{'}\left(x\right)=0$ (1) | Partially correct (1) | Wrong (0) |  |  |  |
| Correctly finding the four values of $x$ (2) | Correctly finding any three values (1.5) | Correctly finding any two values (1) | Correctly finding any one value (0.5) | Wrong (0) |  |
| Correctly finding the four extreme values (2) | Correctly finding any three extreme values (1.5) | Correctly finding any two extreme values (1) | Correctly finding any one extreme value (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 four constants (4) | Correctly finding the values of three constants (3) | Correctly finding the values of two constants (2) | Correctly finding the value of one constant (1) | Wrong (0) |  |
| Correctly integrating three integrands (3) | Correctly integrating two integrands (2) | Correctly integrating the one integrand (1) | Partially correct (0.5) | Wrong (0) |  |
| 6 | Finding slopes, angle, equations and the intersecting point of the given two lines | Correctly finding the slopes of the two lines (2) | Correctly finding the slope of one line (1) | Partially correct (0.5) | Wrong (0) |  |  |
| Applying the correct formula and finding the correct angle between the two lines (2) | Applying the correct formula and finding the incorrect angle between the two lines (1) | Partially correct (0.5) | Wrong (0) |  |  |
| Correctly finding equations of the two lines (2) | Correctly finding the equation of one line (1) | Partially correct (0.5) | Wrong (0) |  |  |
| Correctly finding the point of contact of the two lines (2) | Partially correct (1) | Wrong (0) |  |  |  |
| 7 | Finding the extreme values of $f$ and $g$ under the given constraints. | Correctly finding the intercepts of the constraints (1) | Partially correct (0.5) | Wrong (0) |  |  |  |
| Correctly sketching the three lines (3) | Correctly sketching any two lines (2) | Correctly sketching any one line (1) | Partially correct (0.5) | Wrong (0) |  |
| Correctly finding the corner points (1) | Partially correct (0.5) | Wrong (0) |  |  |  |
| Correctly showing the shaded feasible region (1) | Wrong (0) |  |  |  |  |
| Correctly finding the extreme values of $f$ and $g$ (2) | Correctly finding the extreme value of $f$ OR $g$ (1) | Partially correct (0.5) | Wrong (0) |  |  |
| 8 | Finding the equations of tangent and normal to ellipse and finding the value of C using the condition of tangency | Correctly stating the formula for the equation of the tangent to the ellipse (0.5)  | Wrong (0) |  |  |  |  |
| Correctly finding the equation of the tangent to the ellipse (2) | Partially correct (1) | Wrong (0) |  |  |  |
| Correctly stating the formula for the equation of the normal to the ellipse (0.5)  | Wrong (0) |  |  |  |  |
| Correctly finding the equation of the normal to the ellipse (2) | Partially correct (1) | Wrong (0) |  |  |  |
| Correctly stating the condition of tangency to the ellipse (1) | Partially correct (0.5) | Wrong (0) |  |  |  |
| Finding the correct value of C (2) | Partially correct (1) | Wrong (0) |