Roll No. ....

Y – 3631

B.C.A. (Second Semester) EXAMINATION, May/June-2021

Paper – 201

ADVANCE CALCULUS

Time : Three Hours

Maximum Marks : 80   *Minimum Pass Marks : 32*

Note—Attempt *all* questions.

Unit-I

1. (a) Show that the function $f(x,y) = \sin x + \cos y$ is differentiable everywhere in R^2.   8

    (b) If $f(x, y) = x^2 - 3xy + 2y^2$ then using by mean value theorem to express the difference $f(1,2) - f(2, -1)$ by partial derivatives, compute θ and check that it is between 0 and 1.   8

Unit-II

2. (a) Find the envelop of the ellipses   8

    $$x = a \sin(\theta - \alpha),$$
    $$y = b \cos \theta. \quad \text{where } \alpha \text{ is the parameter.}$$

    (b) Find the evolute of the hyperbola   8

    $$2xy = a^2$$

Unit-III

3. (a) Prove that   8

    $$\overline{|(m)} \; \overline{|(m + \frac{1}{2})} = \frac{\sqrt{\pi}}{2^{2m-1}} \overline{|(2m)}, \text{ where } m > 0$$

    (b) Evaluate $\int_0^\infty \dfrac{dx}{1 + x^4}$ 8

P.T.O.

Unit-IV

4. (a) If R be the region between the parabola $y = x^2$ and straight line $y = x + 6$ then evaluate. 8

$$\iint_R x dA.$$

(b) Change the order of integration in the double integral 8

$$I = \int_0^1 \int_y^1 x^2 \cos (x^2 - xy) \, dy dx$$

and hence evaluate it.

Unit-V

5. (a) Test the cenvergence of 8

$$\int_a^\infty \frac{dx}{x^n}, \text{ where } a > 0.$$

(b) Test the convergence of 8

$$\int_0^\infty \frac{x^{3/2} \, dx}{\sqrt{x^4 - a^4}}$$