

9. (a) If

$$u = \frac{xy}{x+y}$$

show that

$$x \frac{\partial u}{\partial x} + \frac{\partial u}{\partial y} = u.$$

(b) State and prove Euler's theorem.

10. (a) Find the sum to infinity of the series

$$1 - \frac{1}{5} + \frac{1 \cdot 4}{5 \cdot 10} - \frac{1 \cdot 4 \cdot 7}{5 \cdot 10 \cdot 15} + \dots$$

(b) Find the value of e correct to 4 decimal places :

$$e = 1 + \frac{1}{1!} + \frac{1}{2!} + \frac{1}{3!} + \frac{1}{4!} + \dots$$

Register Number :

Name of the Candidate :

5 2 6 8

B.Sc. DEGREE EXAMINATION, 2013

(MATHEMATICS)

(FIRST YEAR)

(PART - III : GROUP : A - MAIN)

(PAPER - I)

530. ANALYSIS - I

May.] [Time : 3 Hours

Maximum : 100 Marks

Answer any FIVE questions.

ALL questions carry EQUAL marks.

1. (a) Show that there exists no rational number whose square is 8.

(b) Show that

$$\lim_{n \rightarrow \infty} \frac{3n^2 + 2n + 5}{6n^2 + 4n + 7} = \frac{1}{2}.$$

Turn Over

2. (a) Show that a sequence (a_n) in \mathbb{R} is convergent iff it is a Cauchy sequence.

(b) Show that

$$\sum \frac{1}{4n^2 - 1} = \frac{1}{2}.$$

3. (a) Differentiate

$$\tan^{-1} \frac{\cos x}{1 + \sin x}.$$

- (b) Find the n^{th} differential co-efficient of

$$\cos^5 \theta \sin^7 \theta.$$

4. (a) State and prove Rolle's theorem.

- (b) State and prove intermediate value theorem.

5. (a) Find the radius of curvature of the cardioid

$$r = a(1 - \cos \theta).$$

- (b) Find the asymptotes of

$$x(x^2 - y^2) - y(x + y) - x + 1 = 0.$$

6. (a) If

$$\lim_{x \rightarrow a} f(x) = l,$$

prove that

$$\lim_{x \rightarrow a} f^k(x) = l^k,$$

where k is any real number.

- (b) State and prove Archimedean property of the real number system.

7. (a) Determine the maxima and minima of $x^3(x-2)^3$.

- (b) Prove that the maximum rectangle inscribed in a circle is a square.

8. (a) Evaluate :

$$\lim_{x \rightarrow 0} \left(\frac{1}{x} - \cot x \right)$$

- (b) Evaluate :

$$\lim_{x \rightarrow 0} \frac{\log x}{\cot x}$$