FOURTH SEMESTER B.Sc. MATHEMATICS
EXAMINATION
MATHEMATICS (CORE COURSE)
MM4BO4: MATHEMATICS

Model Question Paper 1

Time :3 hours weightage: 30

I. Objective Questions

(Answer all 12 questions. Weightage =12 x ¼ =4)

1. Logarithm was invented by...

2. True or false ? 2 + cosx = O(2)

3. The domain of $\text{Cot}^{-1}(x)$ is ……..

4. Give an example of a divergent series $\sum a_n$ where the series $\sum a_n^2$ is convergent.

5. The eccentricity of the ellipse $x^2/a^2 + y^2/b^2 = 1$ (a>b) is e =...

6. Give an example of a sequence which is neither bounded above nor bounded below?

7. What is the eccentricity of a circle?

8. The parabola $y^2 = 16x$ is symmetrical about the .....axis

9. Give an example of abounded sequence which is not convergent.

10. The graph of the polar equation r = -1 is …….

11. The general quadratic equation $ax^2 + cy^2 + dx + ey + f = 0$ represents a circle if

12. If $\sum a_n$ converges, then lim (a_n) = ...

Short Answer Questions

(Answer all Questions. Weightage :9 x 1 = 9)

13. Makeup an infinite series of nonzero terms whose sum is 2.

14. Prove that $\cosh^2 x - \sinh^2 x = 1$

15. Find k, if $e^{2k} = 10$

16. Find the focus and directrix of the parabola $y^2 = 10x$.

17. What do you mean by saying that x + sinx = O(x)

18. Check whether the sequence $\{a_n\}$ where $a_n = \{2^n 3^n\} / n!$ is non-increasing and bounded above

19. Find $\lim_{x \to 0} x^{1/x}$

20. Does the sequence $\{a_n\}$ where $a_n = \{(n+1) / (n-1)\}^n$ converge? If so, find the limit.

21. Check the convergence of the infinite series $\sum 1 /(n+1)^2$

Short essay or Paragraph questions

(Answer any 5 questions.Weightage : 5 x2 =10)

22. Find the Maclaurin series for the function 1 / (1-x)

23. Find an equation for the parabola with eccentricity 3/2 and directrix x =2

$\int_{\ln 4}^{\ln 2} \coth x \, dx$

24. Evaluate $\int \coth x \, dx$

25. Check the convergence of the infinite series $\sum \ln(n)/ n^{3/2}$ 26. The ellipse $x^2/16 + y^2/9 = 1$ is shifted 4 units to the right and 3 units up . Find the equation of the new ellipse and find the foci , vertices and centre of the new ellipse.

27. The X and Y axis are rotated through an angle of $\pi/4$ radians about the origin. Find the equation for the hyperbola 2xy=9 in the coordinates

28. Find the area of the region in the plane enclosed by the cardioid $r = 2(1+\cos\theta)$

IV. Essay questions

(Answer any two questions. Weightage : 2 x 4 = 8)

29. (i). State and prove the ratio test for a series of positive real numbers

(ii). Test the convergence (a). $\sum_{n=0}^{\infty} (2^n + 5)/3^n$ (b). $\sum_{n=0}^{\infty} (2n)!/n!n!$

30. (a). Find the area of the region that lies inside the circle r=1 and outside the cardioids $r = 1 - \cos\theta$

(b). Find the length of the cardioid $r = 1 - \cos\theta$

31.Put the equation $6x^2-9y^2 = 54$ in standard form and sketch the ellipse. Include the foci in your sketch.
