FOURTH SEMESTER B.Sc MATHEMATICS EXAMINATION
MATHEMATICS (CORE COURSE)
MM4B04: MATHEMATICS
Model Question Paper 2

Time :3 hours   weightage: 30

I. Objective Questions
(Answer all 12 questions.   Weightage = 12 x ¼ = 3)

1. The range of the exponential function $y = e^x$ (x real) is ...

2. The Geometric Series $\sum a r^{n-1}$ converges when

   i) r = 1   ii) r >1   iii)   -1< r < 1

3.Let $\sum a_n$ be a series with positive terms. The Ratio Test Fails when

     Lim (a_{n+1}/a_n) =...

4. What is the domain of $\tanh^{-1}(x)$?

5.The necessary condition for the convergence of an infinite series $\sum a_n$ is ...

   i) lim a_n=0   ii) lim $a_n \neq 0$ iii) lim a_n does not exist

6.   The eccentricity e of a hyperbola is ...

       i) e = 1   ii) e < 1   iii) e > 1

7. The alternating series $\sum (-1)^n / n$ converges to ...

8. $x^2 + xy + y^2 - 1$ represents a

  i) parabola   ii) ellipse   iii) hyperbola

9.The series $\sum \sin (1/n)$ is ...

10. The polar equation $r=a(1+\cos \theta)$ represents the curve

   i) circle   ii) parabola   iii)   cardioid

11. $\log_a x * \log_e a =$

12. $\lim$ $\sin x / x$ =   ?

   $x \to 0$

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

13. $\lim$ $(3^{\sin x} - 1) / x$
   $x \to 0$

14.   Find the eccentricity of the hyperbola $9x^2 - 16y^2 = 144$

15.   Find the sum of the series $\sum 1/n(n+1)$

16. Define the Logarithmic Function   ln x

17. If $\sum a_n$ converges show that lim a_n =0

18. Prove that $f(x)= x - \ln x$ is increasing for $x \geq 1$

19. Express a^x as an exponential function of x

20. What is the path of P(x,y) moving in the XY plane given by the equation $x = t^{1/2}$, $y = t$, $t \geq 0$

21. Find the derivative of 7^x

22. Find the length of the cardioid $r = 1 - \cos\theta$

23. Graph the Curve $r^2 = \sin 2\theta$

24. Solve the initial value problem

$d^2y/dx^2 = 2e^{-x}$, $y(0) = 1$, $y^1(0) = 0$

25. Order the following functions from slowest growing to

fastest growing as $x \to \infty$

2^x, x^2, $(\ln x)^x$, e^x

26. Check the convergence of the infinite series $\sum \sin n / n^2$

27.   Find $\lim\limits_{x \to 0}$ $(1/\sin x - 1/x)$

28. Get an expression for $\sinh^{-1}(x)$ using logarithms

IV. Essay questions

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

29. (a) State and prove Taylors Theorem

(b) Find the Taylor series and Taylor polynomials generated by

$f(x) = \cos x$ at $x = 0$

30. Check the convergence of the following infinite series

i) $\sum (2^n + 5)/3^n$ ii) $\sum 4^n n! \, n!/(2n)!$ iii). $\sum \ln (n)/n^{3/2}$

31. Decide whether the equation $x^2 + 2xy + y^2 + 2x - y + 2 = 0$ represent parabola, ellipse or hyperbola. Rotate the axis with the proper angle and reduce it to an equation without xy term. Find the focii, vertices and directrices of the conic.