Mock Test-1
For Lecturer (Mathematics)

Name ..... An effort by: *Akhtar Abbas*

1. Uniform continuity implies...
   A. discontinuity B. continuity C. piecewise continuity D. differentiability

2. If A and B are disjoint subsets of a metric space, then:
   A. $d(A,B) < 0$ B. $d(A,B) = 0$ C. $d(A,B) > 0$ D. none of these

3. $[-1,1]$ is a neighborhood of...
   A. 2 B. 3 C. 0 D. 1

4. The set $\{1/2, 1/3, 1/4, ...\}$ is an open cover of ...
   A. -3 B. -2 C. 0 D. 2

5. The diameter $\delta(A)$ of a nonempty A in a metric space (X,d) is defined by $\delta(A) =$...
   A. B. C. D.

6. Which of the following is not a separable metric space?
   A. $\mathbb{R}$ B. $\mathbb{C}$ C. l^p D. l^∞

7. For any subsets A and B of a metric space (X,d), $\overline{A} \cap \overline{B}$ ... $\overline{A \cap B}$.
   A. $\subseteq$ B. $=$ C. $\supseteq$ D. $\neq$

8. The image of an open set under continuous mappping ...
   A. must be open B. must be closed C. need not be open D. need not be closed

9. In a metric space, every Cauchy sequence is:
   A. bounded B. unbounded C. convergent D. divergent

10. Let X be an n dimensional vector space, then any proper subspace of X has dimension:
    A. less than n B. equal n C. greater than n D. 0

11. For any subspace Y of a vector space X, the codimension of Y is defined by:
    A. $dim(Y)$ B. $dim(X-Y)$ C. $dim(Y - \{0\})$ D. none of these

12. A subspace Y of a Banach space is complete if and only if Y is:
    A. compact B. closed C. open D. closed and open

13. Let T be a linear operator, then $dimD(T)$... $dimR(T)$.
    A. $=$ B. $\leq$ C. $\geq$ D. $\neq$

14. Let T be a bounded linear operator, then the null space $N(T)$ is:
    A. *bounded* B. *closed* C. *open* D. *compact*

15. Let $A = (0, 1]$, then exterior of A is:

A. $(0, 1)$ B. $(-\infty, 0) \cup (1, \infty)$ C. $(-\infty, 0] \cup (1, \infty)$ D. $(-\infty, 0) \cup [1, \infty)$

16. The domain of $arctanx$ is:

A. $[0, \pi]$ B. $[-1, 1]$ C. $\mathbb{R}$ D. none of these

17. A projectile makes an angle of $30^{\cdot}$ with horizontal axis moving with velocity $30m/s$. Then its time of flight is:

A. $15sec$ B. $20sec$ C. $30sec$ D. $60sec$

18. The least upper bound of the set $\{\frac{1}{m} + \frac{1}{n} : m, n \in \mathbb{N}\}$ is:

A. 0 B. 1 C. -1 D. 2

19. If $z_1 = -2 + 2i$ and $z_2 = 3i$, then $Arg(\frac{z_1}{z_2})$ equals:

A. $-\frac{3\pi}{4}$ B. $\frac{3\pi}{4}$ C. $\frac{\pi}{4}$ D. $-\frac{\pi}{4}$

20. A finite set in a metric space is:

A. closed B. bounded C. open D. open and closed

21. If $f(z)$ is analytic and $|f(z)| = k = constant$ in a domain D, then $f(z)$ is constant, is a statement of:

A. $Lioville's\ Theorem$ B. $Morera's\ Theorem$ C. $Cauchy's\ Theorem$ D. none of these

22. Which of the following are $Cauchy - Riemann$ equations:

A. $u_r = \frac{1}{r}v_\theta, v_r = -ru_\theta$ B. $u_r = \frac{1}{r}v_\theta, v_r = \frac{1}{r}u_\theta$ C. $u_r = rv_\theta, v_r = -\frac{1}{r}u_\theta$ D. $u_r = \frac{1}{r}v_\theta, v_r = -\frac{1}{r}u_\theta$

23. The periodicity of e^z is:

A. πi B. π C. $2\pi i$ D. 2π

24. $\oint (z - z_\circ)^{-2} dz = ...$, where C is the unit circle centered at $z_\circ$.

A. 0 B. π C. $2\pi i$ D. none of these

25. $\oint \bar{z} dz = ...$, where C is the unit circle centered at origin.

A. 0 B. π C. $2\pi i$ D. none of these

26. If $f(z)$ is continuous in a simply connected domain D and if $\oint f(z)dz = 0$ for every closed path in D, then $f(z)$ is:

A. $constant$ B. $differentiable$ C. $analytic$ D. $integrable$

27. The radius of convergence of the series $\sum \frac{(2n)!}{(n!)^2}(z - 3i)^n$ is:

A. 3 B. 0 C. $\frac{1}{4}$ D. $\frac{1}{3}$

28. $z - \frac{z^2}{2} + \frac{z^3}{3} + ...$ is a series representation of:

A. $Ln(1 + z)$ B. $Ln(1 - z)$ C. $Ln(z)$ D. $Ln(z + i)$

29. The function $f(z) = \frac{1}{z(z-5)^2} + \frac{3}{(z+2)^5}$ has a simple pole at:

A. 0 B. 2 C. -2 D. 5

30. Residue of the function $f(z) = \frac{9z+i}{z^3+z}$ at pole $z = i$ is:

A. 0 B. $5i$ C. $-5i$ D. none of these

31. The area of the cardioid $r = a(1 + cos\theta)$ is:

A. $8\pi i$ B. $2\pi a^2$ C. $4\pi a^2$ D. $\frac{3\pi a^2}{2}$

32. In 5 dimensional vector space V, any set of cardinality more than 5 is:

A. *linearly independent* B. *linearly dependent* C. *basis* D. none of these

33. The set $A = \{(1, 2, 3), (3, 1, 2), (0, 0, 0)\}$ is:

A. *linearly independent* B. *linearly dependent* C. *basis* D. none of these

34. Number of non-isomorphic groups of order 8 is:

A. 2 B. 3 C. 4 D. 5

35. Let $G =< a : a^{23} = e >$, then order of a^{10} equals:

A. 2 B. 10 C. 12 D. 23

36. For a scalar point function $\phi(x, y, z)$, $div(grad\phi)$ is:

A. scalar point function B. gauge function C. vector point function D. none of these

37. Let G be a group and $H, K \leq G$, then HK:

A. need not to be a subgroup B. is a subgroup C. is a normal subgroup of G D. is commutative

38. The center of the quaternion group Q_8 is:

A. $\{1, -1\}$ B. $\{1, -1, i, -i\}$ C. $\{1, -1, j, -j\}$ D. $\{1, -1, k, -k\}$

39. Let G be a group, then $\bigcap C(a)$, where $a \in G$ and $C(a)$ centralizer of a, is:

A. $N(G)$ B. $N(a)$ C. $Z(G)$ D. G

40. $Z(< a, b : a^7 = b^2 = (ab)^2 = e >)$ equals:

A. $\{e, a, a^2, a^3, a^4, a^5, a^6\}$ B. $\{e, a^2\}$ C. $\{e, b\}$ D. $\{e\}$

41. The group $\mathbb{Z}_{4000}$ has ... elements of order 8.

A. 4 B. 8 C. 16 D. 32

42. Which one of the following is maximal ideal of Z?

A. $< 2 >$ B. $< 4 >$ C. $< 8 >$ D. $< 16 >$

43. A ring that is cyclic under addition is always:

A. $commutative$ B. $non - commutative$ C. $finite$ D. $infinite$

44. $\mathbb{Z}_6$ is a subring of:

A. $\mathbb{Z}$ B. $\mathbb{R}$ C. $\mathbb{Z}_{12}$ D. none of these

45. If S is a pane in Euclidean 3-space containing $(0,0,1)$, $(2,0,0)$ and $(0,0,0)$, then S is:

A. xy-plane B. yz-plane C. xz-plane D. plane $y = z$

46. If $sin^{-1}x = \frac{\pi}{6}$, then the acute angle value of $cos^{-1}x$ is:

A. $\frac{5\pi}{6}$ B. $\frac{\pi}{3}$ C. $1 - \frac{\pi}{6}$ D. 0

47. If $c > 0$ and $f(x) = e^x - cx$ for all real numbers x, then the minimum value of f is:

A. $f(c)$ B. $f(e^c)$ C. $f(\frac{1}{c})$ D. $f(logc)$

48. Suppose that $f(1+x) = f(x)$ for all real x. If f is a polynomial and $f(5) = 11$, then $f(\frac{15}{2})$ is:

A. -11 B. 0 C. 11 D. $\frac{33}{2}$

49. $\lim_{x\to\pi} \frac{e^{-\pi}-e^{-x}}{sinx}$ equals:

A. $-\infty$ B. $-e^{-\pi}$ C. 0 D. 1

50. If $A = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ 1 & 0 & 0 \end{bmatrix}$, then A^{99} equals:

A. $A = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ 1 & 0 & 0 \end{bmatrix}$ B. $A = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$ C. $A = \begin{bmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{bmatrix}$ D. none of these

Best of Luck.