

**Kakatiya University, Warangal (TS)**  
**Ph.D Entrance Test**  
**Mathematics**  
**Model Question Paper**

Time: ~~20~~ 90 MIN.

Max. Marks: 100

The Question Paper consists of 100 questions in multiple choices covering the entire syllabus.

Choose the correct answer.

1. Let  $N$  be a normal subgroup of a finite group  $G$  with  $|N| = 3$  such that  $N \not\subset Z(G)$ . Then  $G$  has a subgroup  $K$  such that  
(a)  $[G:K] = 3$       (b)  $[G:K] = 2$       (c)  $[G:K] = 1$       (d)  $[G:K] = 4$
2. Let  $G$  be a group and  $p$  be a prime number. If  $p \nmid O(G)$ , then  $G$  has an element of order  
(a)  $p$       (b)  $p^2$       (c)  $p+1$       (d)  $p-1$
3. Monotone Convergence theorem need not hold for  
(a) increasing sequence of functions      (b) decreasing sequence of functions  
(c) bounded sequence of functions      (d) discontinuous sequence of functions.
4. An absolutely continuous function  $F$  satisfies a Lipschitz condition if and only if  
(a)  $|F|$  is bounded      (b)  $|F|$  is unbounded  
(c)  $|F'|$  is unbounded      (d)  $|F'|$  is bounded.
5. Each  $\sigma$ -finite measure is  
(a) infinite      (b) finite      (c) semifinite      (d) empty
6. The sequence  $\{f_n(x)\}$  defined by  $f_n(x) = n^c x(1-x^2)^n$ , for  $x$  real and  $n \geq 1$  converges point-wise on  $[0,1]$  for  
(a) some real  $c$       (b) some complex  $c$       (c) every real  $c$       (d) either  $c = 0$  or  $c = 1$
7. If  $T$  is bounded linear operator on a Banach Space such that  $T$  is an idempotent and  $T \neq 0, T \neq 1$  then the spectrum is  
(a)  $\{0,2\}$       (b)  $\{0,1\}$       (c)  $\{0,2,1\}$       (d)  $\{0,1,2\}$
8. If  $f(z) = \frac{z+2}{2}$  and the semi circle  $C : z = 2e^{i\theta}; (0 \leq \theta \leq \pi)$  then the value of  $\int_C f(z) dz$  is  
(a)  $4 + 2\pi i$       (b)  $4 - 2\pi i$       (c)  $-4 + 2\pi i$       (d)  $-4 - 2\pi i$
9. The singular solution of  $z = px + qy + pq$  is  
(a)  $z = xy$       (b)  $z = -xy$       (c)  $z = x^2 y$       (d)  $z = -x^2 y^2$
10. Residue of  $z \cos\left(\frac{1}{z}\right)$  at  $z = 0$  is  
(a)  $-\frac{1}{2}$       (b)  $\frac{1}{2}$       (c) 0      (d)  $\infty$