

Model Question Paper

ADMISSION TEST -- Postgraduate Programme

M.Sc. (Mathematics)

Time: 2 Hours

Max. Marks : 75

SAMPLE QUESTIONS

PART A

Multiple Choice Items. Each question carries ONE mark. 50 Questions.

MODEL QUESTIONS given below:

1) The formula for Arc length of a curve is given by

a) $\sqrt{1 + \left(\frac{dy}{dx}\right)^2} dx$ b) $\sqrt{1 + \left(\frac{dy}{dx}\right)^2} dy$

c) $\sqrt{1 + \left(\frac{dy}{dx}\right)^2} dydx$ d) $\sqrt{1 + \left(\frac{dy}{dx}\right)^2} dx dy$ e) $\sqrt{1 - \left(\frac{dy}{dx}\right)^2} dx dy$

2) A) Every continuous function is differentiable.

B) Every differentiable function is continuous.

a) Statement A is true and Statement B is false

a) Statement A is false and Statement B is true

b) Statement A is false and Statement B is false

c) Statement A is true and Statement B is true

d) Statement A is true and sometimes Statement B is true

3) If $f(z) = \frac{1}{(z-1)(z+1)^2}$, then what is $Res(f, -1)$:

(a) $\frac{-1}{8}$

(b) $\frac{-1}{4}$

(c) $\frac{1}{4}$ (d) 0 (e) $\frac{1}{2}$

4) Let T be a tree, suppose that T has r vertices and s edges. Then which of the following is true.

a. $s = r - 1$

b. $r = s - 1$

c. $r = s$

d. $s = r/2$

e. $r = s/2$

5) The necessary and sufficient condition for a graph to contain an Euler circuit is

- a. Every vertex must have a odd degree
- b. Every vertex must have a even degree
- c. Graph must be connected
- d. Graph must be connected and every vertex must have an odd degree
- e. Graph must be connected and every vertex must have an even degree

6) Which one of the following is true about the solution of the following initial value problem

$$y' = y^{-2}(2 - 3x), \quad y(0) = 19:$$

- A) Non-existent B) Trivial C) Infinite D) Unique
E) Vacuous

7) Identify the following statements as TT,TF,FT,FF:

- a) If Wronskian of 2 functions is zero, then functions are linearly dependent.
- b) If 2 functions are linearly independent, then their Wronskian is zero.

- A) TT B) TF C) FT D) FF
E) Data insufficient

8) The number of proper subgroups of a group of order 11 is

- A) 1 B) 0 C) 3 d) 10 e) 11

9) The characteristic of ring of real numbers is

- A) 0 B) 1 C) 2 D) prime number

10) If R is a ring such that $a^2 = a \quad \forall a \in R$, then R is

- A) Integral domain B) commutative Ring
C) non-commutative ring D) Field E) None of the above

11) The iteration formula for Newton Method for finding root of $f(x) = 0$ is:

- a) $X_{n+1} = X_n - [f(x_n)/f'(x_n)]$
- b) $X_{n+1} = X_n - [f'(x_n)/f(x_n)]$
- c) $X_{n+1} = X_n + [f(x_n)/f'(x_n)]$
- d) $X_{n+1} = f'(x_n) - [X_n/f(x_n)]$
- e) $X_{n+1} = f'(x_n) - [X_n/f(x_n)]$

12) Which one of the following is NOT a property of matrices?

- a) $|AB| = |A| |B|$
- b) $(AB)^{-1} = B^{-1}A^{-1}$
- c) $(AB)^T = A^T B^T$
- d) $(A^T)^{-1} = (A^{-1})^T$
- e) None of the above

13) If X is an exponential random variable with parameter $\lambda = 10$, then its variance is

- (A) $\frac{1}{10}$ (B) $\frac{1}{50}$ (C) $\frac{1}{100}$ (D) $\frac{9}{100}$ (E) $\frac{1}{2}$

14) If the probability density function for a continuous random variable is given by

$$f(x) = \begin{cases} 1 & 0 \leq x \leq 1 \\ 0 & \text{otherwise} \end{cases}, \quad \text{then } E[e^X] \text{ is}$$

- (A) e (B) e^2 (C) 1 (D) $e - 1$ (E) $e + 1$

15) Which one of the following is a linear transformation?

- a. $T: \mathbb{R} \rightarrow \mathbb{R}^2 \ni T(x) = (1, -1)$
- b. $T: \mathbb{R}^2 \rightarrow \mathbb{R}^2 \ni T(x, y) = (x^2, y^2)$
- c. $T: \mathbb{R}^2 \rightarrow \mathbb{R}^3 \ni T(x, y) = (xy, y, x)$
- d. $T: \mathbb{R}^2 \rightarrow \mathbb{R}^3 \ni T(x, y) = (x+y, y, x)$
- e. $T: \mathbb{R}^2 \rightarrow \mathbb{R}^3 \ni T(x, y) = (x+1, y, x)$

PART B

Answer Each question carries FIVE marks.

- 1) Discuss the zeroes and singularities of the function $\frac{(z^2 - 1)(z - 2)^3}{(\sin \pi z)^3}$
- 2) Prove that every finite partial ordered set has at least one maximal element and at least one minimal element.
- 3) Prove that an abelian group of order 21 is cyclic.
- 4) A batch of 100 items contains 6 that are defective and 94 items that are non-defective. If X is the number of defective items in a randomly drawn sample of 10 items from the batch, find (a) $P\{X = 0\}$ (b) $P\{X > 2\}$ using Poisson distribution.

PART C

(C-Programming Questions) Each question carries TWO marks.

1. Write a function to print the sum of cubes of first 1000 natural numbers in 2 - different ways once using for loop and another using do-while loop.
2. Malloc and Calloc return void pointer. What is void pointer? Illustrate it with example? Do we need explicit typecasting to and from void pointer.

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