VIRTUAL UNIVERSITY OF PAKISTAN

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Sample Test for MS Mathematics Program

Weightage Distribution:

Section No.	Section Title	Weight
I	English	25%
II	Mathematics	75%

Section No. I - English

Syllabus:

1. Analytical Ability
   a) Logical Reasoning (5%)
   b) Analytical Reasoning (5%)

2. Verbal Ability
   a) Sentence Completion (Grammar) (5%)
   b) Analogy (5%)
   c) Antonyms (5%)

Sample Test Questions

1. "A meadow in springtime is beautiful, even if no one is there to appreciate it."
   This statement would be a logical opposite to which of the following claims?
   A. People will see only what they want to see.
   B. Beauty exits only in the eyes of the beholder.
   C. Beauty does not depend on seasons.
   D. The greatest pleasure available to mankind is the contemplation of beauty.

2. A map representing countries R, S, W, X, Y and Z is to be drawn. Adjacent countries cannot have the same color in the map. The countries adjacent to each other are as follows:
   A. Each of R, S, X and Y is adjacent to W.
   B. X is adjacent to Y.
   C. Each of R and S is adjacent to Z.

3. Which of the following is a pair of countries that can be the same color?
   A. R and S
   B. S and W
   C. W and X
   D. X and Y

4. Many surveys _____ out the idea that effective communication is essential for success and promotion in every field.
   A. are bearing
   B. should have borne

C. has borne
D. have borne

5. IMAGINE : IMAGINATION

A. Therapy : Thermomete
B. Bowl : Bowdlerize
C. Oblivion : Obvious
D. Liturgy : Literature

6. Choose the lettered word or phrase that is most nearly opposite in meaning to the word DISINTEGRATE.

A. Coalesce
B. Pulverize
C. Annihilate
D. Severe
E. Trounce

Section No. II - Mathematics

Syllabus:

Each of the following subjects contributes 25% towards the overall 75%.

1. Calculus and Analytical Geometry (25%)
2. Linear Algebra (25%)
3. Differential Equations (25%)

Sample Test Questions

1) If a vector $\vec{b} \in R^m$ is in the column space of a matrix A, then which of the following is true about it?
   A. It must be written as a linear combination of columns of A.
   B. It must be written as a linear combination of rows of A.
   C. It may or may not be written as a linear combination of columns of A.
   D. It may or may not be written as a linear combination of rows of A.

2) If $c_1\vec{v}_1 + c_2\vec{v}_2 + c_3\vec{v}_3 + ... + c_p\vec{v}_p = 0$, and vectors $\vec{v}_1, \vec{v}_2, \vec{v}_3, \ldots, \vec{v}_p$ all are linearly independent then which of the following is true ?
   A. $c_1 = c_2 = c_3 = \ldots = c_p = 0$
   B. $c_1 \neq c_2 \neq c_3 \neq \ldots \neq c_p \neq 0$
   C. $c_1 \neq c_2 = c_3 = \ldots = c_p = 0$
   D. $c_1 \neq c_2 = c_3 = \ldots = c_p \neq 0$

3) Let a set S is a basis of a vector space V **,** then which of the following is NOT true about it?
   A. It spans V **.**
   B. It is linearly independent**.**
   C. It is linearly dependent**.**
   D. Each element of S belongs to V **.**

]

4) If $A = \begin{bmatrix} 1 & 3 \\ 2 & 4 \end{bmatrix}$ and $\vec{x} \in \text{Row}(A)$ **,** then which of the following is the most appropriate option ?
   A. $\vec{x} = c_1(1, 3) + c_2(2, 4)$
   B. $\vec{x} = c_1(1, 2) + c_2(3, 4)$
   C. $\vec{x} = c_1(1, 4) + c_2(3, 2)$
   D. $\vec{x} = c_1(2, 3) + c_2(4, 1)$

5) If 5 is an eigenvalue of $\boldsymbol{A}$ and $\boldsymbol{x}$ is a corresponding eigenvector, then the eigenvalue of $\boldsymbol{A^2}$ is.....
   A. 5
   B. 25
   C. 10
   D. 15

6) The function $f(x) = \dfrac{x^2 - 7}{x - 3}$ is discontinuous at.....

A. $x=7$

B. $x=\sqrt{7}$

C. $x=3$

D. $x=-3$

7) If $\int_0^1 f(x)\,dx=2$ and $\int_1^5 f(x)\,dx=1$ then $\int_0^5 f(x)\,dx$=.....

A. -3

B. -1

C. 3

D. 1

8) The direction of gradient at any point on the surface is ..... to the tangent plane at that point.

A. Parallel.

B. Perpendicular.

C. Opposite direction.

D. None of these.

9) Given a vector valued function $\vec{r}(t)=\frac{1}{(t-3)}\hat{i}+e^t\hat{j}$ and its anti-derivative $\vec{R}(t)=\ln(t-3)\hat{i}+e^t\hat{j}$, then $\int\vec{r}(t)dt$ =.....

A. $\ln(t-3)\hat{i}+e^t\hat{j}+\vec{c}$

B. $(t-3)\hat{i}+\frac{e^t}{2}\hat{j}+\vec{c}$

C. $(t-3)^{-1}\hat{i}+\frac{e^t}{2}\hat{j}+\vec{c}$

D. $\frac{1}{(t-3)}\hat{i}+e^t\hat{j}+\vec{c}$

10) Let the functions $P(x,\ y)$ and $Q(x,\ y)$ are finite and continuous inside and at the boundary of a closed curve C in the xy-plane. If $\left(P\ dx+Q\ dy\right)$ is an exact differential then the value of $\oint_C\left(P\ dx+Q\ dy\right)$ is .....

A. Zero

B. Finite

C. Infinite

D. One

11) By using Green's theorem, a double integral over a plane region R can be transformed into a .....over the boundary c of the region.

A. Surface integral

B. Volume integral

C. Definite integral

D. Line integral

12) For the double integral, $\int_c^d\int_a^b f(x,y)dxdy$ order of integration does not matter provided that $f(x,y)$ is .....

A. Bounded

B. Discontinuous

C. Defined

D. Continuous

13) If $R=\{(x,y): 0\le x\le 2 \text{ and } 0\le y\le 3\}$, then $\iint_R (1-ye^{xy})dA = ...$

A. $\int_0^2 \int_0^3 (1-ye^{xy})dydx$

B. $\int_0^2 \int_0^3 (1-ye^{xy})dxdy$

C. $\int_2^3 \int_0^0 (1-ye^{xy})dxdy$

D. $\int_0^2 \int_2^3 (4xe^{2y})dydx$

14) In order to change the Bernoulli Equation $\frac{dy}{dx}+p(x)y=q(x)y^n$ into linear differential equation, we choose.....

A. $v=y^{n-1}$

B. $v=y^{1-n}$

C. $v=y^n$

D. $v=y'$

15) The orthogonal trajectory to the family of curves $x+2y=2$ is.....

A. $y=-2x$

B. $y-2x=c$

C. $2x-3y=c$

D. $4x+3y=c$

16) If $y_1=xe^{-x}$ is the first solution of the differential equation $\frac{d^2y}{dx^2}+2\frac{dy}{dx}+y=0$, then its second solution is.....

A. $xe^{-x}\int \frac{2}{e^{-2x}}dx$

B. $xe^{-x}\int \frac{2}{x^2e^{-2x}}dx$

C. $xe^{-x}\int \frac{1}{x^2e^{-2x}}dx$

D. $xe^{-x}\int \frac{1}{x^2}dx$

17) If $x(t)=\frac{2\sqrt{10}}{3}e^{-t}\sin[3t+4.391]$ is the solution of $\frac{d^2x}{dt^2}+2\frac{dx}{dt}+10x=0 \quad with\, x(0)=-2\,, x'(0)=0$. Then its Quasi-period is ..... seconds.

A. π

B. $\frac{\pi}{2}$

C. $\frac{3\pi}{2}$

D. $\frac{2\pi}{3}$

18) Consider a power series $\sum_{n=1}^{\infty} a_n x^n = \sum_{n=1}^{\infty} \frac{1}{\sqrt{n}} x^n$ so that the power series is.....

A. Convergent
B. Divergent
C. Inconclusive
D. Bounded

19) Irregular singular point(s) of the differential equation $(x^2-4)^2 y'' + (x-2)y' + y = 0$, is (are)....

A. $x = 2$
B. $x = -2$
C. $x = -2, 2$
D. $x = 0,2,-2$

19) If $\frac{1}{2}\int_{-1}^{1} P_n(x)P_n(x)(2n+1)dx = 1$, then for -1<**x**<1 , the Legendre's polynomial is said to be orthogonal with respect to weight function $\omega(x) = ...$

A. $\frac{2x+1}{2}$
B. $2x+1$
C. $\frac{2x+1}{2}$
D. $\frac{2x+3}{2}$