M.Sc. Part-II
Sample Questions For Online exam

Q. 1 (1 point) Which amongst the following is not a nilpotent group?

1. $p; p$ is prime
2. $p^2.q; p$ and q are odd prime and $q>p$
3. 42
4. 120

Q. 2 (1 point) A group G is said to be solvable if there is a chain of subgroups $\{e\} = G_0 \subseteq G_1 \subseteq G_2 \subseteq\subseteq ...... \subseteq G_n = G$ such that G_i_____G_{i+1} and G_{i+1}/G_i is _______.

1. Subgroup, abelian
2. Normal subgroup, abelian
3. Normal subgroup, simple
4. Subgroup, simple

Q. 3 (1 point) Every degree 1 representation of G is _____.

1. Reducible
2. Irreducible
3. May be reducible
4. Can't Say

Q. 4 (1 point) Which amongst the following is FALSE?

1. Intersection of any non-empty collection of submodules of a R–module M is a submodule of M.
2. b) Let $N_1 \subseteq N_2 \subseteq ....$ be an ascending chain of submodules of an R–module M. Then $N = \bigcup_1^\infty N_i$ is a submodule of M.
3. Let N_1, N_2 be submodules of an $R-$ module M, then $N_1 + N_2 = \{a + b : a \in N_1, b \in N_2\}$ is a submodule of M.
4. An increasing union of finitely generated submodules of M is finitely generated.

Q. 5 (1 point) Number of abelian groups of order 360 are

1. 4
2. 3
3. 6
4. 2

Q. 6 (1 point) Let $\mathbb{F}$ be a field with 512 elements. What is the total number of proper subfields of $\mathbb{F}$?

1. 3
2. 6
3. 8
4. 5

Q. 7 (1 point) The extention $\mathbb{Q}\sqrt{(2)}$ over $\mathbb{Q}$ is:

1. not algebraic
2. not finite
3. algebraic
4. of degree four

Q. 8 (1 point) Let $\omega \neq 1$ be a cube root of unity. Then, the degree of the extension $\mathbb{Q}(\omega)$ over $\mathbb{Q}$ is:

1. Four
2. Three
3. Two
4. One

Q. 9 (1 point) The degree of the splitting field of X^5-2 over $\mathbb{Q}$ is:

1. Twenty
2. Ten
3. Five
4. One

Q. 10 (1 point) Which of these constructions is possible using ruler and compass?

1. Trisecting angles
2. Doubling cubes
3. Equilateral triangles
4. Squaring circles

Q. 11 (2 points) Let $f, g : A \to \mathbb{R}$ be integrable. For any partition P of A and sub rectangle S, then which of following is true.

1. $m_S(f) + m_S(g) \leq m_S(f+g)$
2. $m_S(f) + m_S(g) > m_S(f+g)$
3. $M_S(f+g) > M_S(f) + M_S(g)$
4. $m_S(f) + m_S(g) = 0$

Q. 12 (2 points) If $\{A_i\}$ countable collection with $A = \cup_{i=1}^{\infty} A_i$ and each A_i has measure zero. Then which of following is true.

1. measure of A is greater than zero.
2. measure of A is zero.
3. A has content zero.
4. A is compact.

Q. 13 (3 points) Given $U : C[0,1] \to C[0,1]$ defined by $U(f(x)) = xf(x)$, what is norm of U?

1. 1
2. 2
3. 3
4. 4

Q. 14 (3 points) Which of the following family of functions is equicontinuous on $[0,1]$?

1. $f_n(x) = x^n, n \in \mathbb{N}$
2. $f_n(x) = sinnx, n \in \mathbb{N}$
3. $f_n(x) = \dfrac{sinnx}{n^2}, n \in \mathbb{N}$
4. $f_n(x) = \dfrac{x^2}{x^2 + (1-nx)^2}; n \in \mathbb{N}$

Q. 15 (3 points) What is the closure of l_p in l_∞ for $1 \leq p < \infty$?

1. c_0
2. l_p
3. l_∞
4. $\emptyset$

Q. 16 (3 points) Let V and W be normed linear spaces and $T \in L(V,W)$.Then which of the following statement is not equivalent to the others?

1. T is bounded
2. T is continuous everywhere in V
3. T is continuous at 0 in V
4. T is a vector space isomorphism

Q. 17 (3 points) The value of t for which the vector $(3,1,t)$ is parallel to the plane $2x + 4y + 5z = 12$ is

1. -4
2. -3
3. -2

4. -1

Q. 18 (3 points) L_p is a Hilbert space if and only if $p =$ __.

1. 1
2. 2
3. 3
4. 4

Q. 19 (3 points) The equation of hyperplane passing through points $p = (1, 2, 1), q = (-2, -1, 3)$ and $r = (2, -3, -1)$

1. $8x + 2y + 9z = 13$
2. $8x + 2y - 9z = 13$
3. $8x - 2y + 9z = 13$
4. $8x - 2y - 9z = 13$

Q. 20 (3 points) If S with the parametrization X for open U and if $\alpha : [0, 1] \rightarrow S$ a regular parametrized curve. Then the tangent surface of α is

1. $x(t, v) = \alpha(t) + v\alpha'(t)$, for $(t, v) \in [0, 1] \times \mathbb{R}$
2. $x(t, v) = v\alpha(t) + \alpha'(t)$, for $(t, v) \in [0, 1] \times \mathbb{R}$
3. $x(t, v) = v\alpha(t) + v\alpha'(t)$, for $(t, v) \in [0, 1] \times \mathbb{R}$
4. $x(t, v) = v(\alpha(t) + t\alpha'(t))$, for $(t, v) \in [0, 1] \times \mathbb{R}$

Q. 21 (3 points) First fundamental form I_q of a plane $P \subset \mathbb{R}^3$ passing through $q = (1, 0, 0)$ containing vectors $(1, 1, 0)$ and $(1, 0, 1)$ is

1. $du^2 + 2dudv + dv^2$
2. $du^2 + dv^2$
3. $du^2 - dv^2$
4. $du^2 - 2dudv + dv^2$

Q. 22 (3 points) The arc-length of one complete turn of the circular helix $\gamma(t) = (a\text{cos}t, a\text{sin}t, bt)$ for $a, b \in \mathbb{R}$.

1. $\pi\sqrt{a^2 + b^2}$
2. $4\pi\sqrt{a^2 + b^2}$
3. $3\pi\sqrt{a^2 + b^2}$
4. $6\pi\sqrt{a^2 + b^2}$

Q. 23 (3 points) The curvature of the function $f(x) = x^2 + 2x + 1$ at $x = 0$ is?

1. $\frac{3}{2}$

2. 2
3. 0
4. $|\frac{2}{5^{1.5}}|$

Q. 24 (3 points) Which of following is true statement.

1. The set of rationals $\mathbb{Q}$ is G_δ set in the reals.
2. If X is compact Hausdroff space then X is Baire space.
3. $\mathbb{Z}_+$ is not Baire space.
4. $\mathbb{R}$ is not a Baire space.

Q. 25 (4 points) What is the maximum number of edges in a bipartite graph having 10 vertices?

1. 24
2. 21
3. 25
4. 16

Q. 26 (4 points) Let G be a connected planar graph with 10 vertices. If the number of edges on each face is three, then the number of edges in G is _.

1. 24
2. 20
3. 32
4. 64

Q. 27 (4 points) The smallest n such that the complete graph Kn has at least 600 edges.

1. 35
2. 36
3. 45
4. 37

Q. 28 (4 points) Complete graph K_p has

1. Cut Vertex
2. Cut edge
3. Cut edge if $p = 2$
4. D. Cut vertex if $p = 2$

Q. 29 (4 points) A connected graph has Eulerian trail if it has

1. at most two vertices of odd degree

2. exactly two vertices of odd degree
3. at least two vertices of odd degree
4. at least three vertices of odd degree

Q. 30 (4 points) If every vertex is M saturated then M is called

1. Minimum matching
2. Perfect matching
3. Maximum Matching
4. Middle Matching

Q. 31 (4 points) The minimum number of colors required for proper vertex coloring of a null graph on p vertices is

1. p
2. p-1
3. 1
4. 2p

Q. 32 (4 points) If G is a simple planar graph then G contains a vertex of degree

1. at most 4
2. at most 5
3. at least 4
4. 5

Q. 33 (4 points) Ford-Fulkerson algorithm is used to

1. find the shortest path from a specified vertex to another.
2. find maximum flow value in a network
3. to scan all vertices in a graph
4. to scan all edges in a graph

Q. 34 (4 points) Smallest eigen value of laplacian matrix Q of graph G is _.

1. 2
2. -1
3. 1
4. 0

Q. 35 (5 points) If $(101.01)_2 = (x)_{10}$, then what is the value of x?

1. 505.05
2. 10.101

3. 101.01
4. 5.25

Q. 36 (5 points) Rate of convergence of the modified Newton-Raphson method is generally _.

1. Linear
2. Quadratic
3. Super-linear
4. Cubic

Q. 37 (5 points) The rate of convergence of Gauss Seidel Method is _ that of Gauss Jacobi Method.

1. once
2. twice
3. thrice
4. reciprocal

Q. 38 (5 points) If $f(x)$ is a polynomial of degree n in x then nth difference of this polynomial is

1. Constant
2. Variable
3. Zero
4. One

Q. 39 (5 points) In Simpson's one-third rule the curve $y = f(x)$ is assumed to be

1. Circle
2. Parabola
3. Hyperbola
4. Line

Q. 40 (5 points) The process of finding the equation of the curve of best fit, which may be most suitable for predicting the unknown values, is known as _.

1. curve fitting
2. theory of equation
3. interpolation
4. extrapolation

Q. 41 (5 points) For $y' = y + x$ with $y(0) = 1$ and $h = 0.1$ the value of $K1$ in Runge-Kutta fourth order method is.

1. 0.1
2. 1.0
3. 0.01
4. 0.11

Q. 42 (5 points) What is the value of λ under which Crank-Nicholson Formula?

1. 1
2. -1
3. 2
4. $\frac{-1}{2}$