Paper Code No: M27

Question Booklet No. 200056

ENTRANCE EXAMINATION – 2021 – 22

SET – D

Roll No. M21000069

Signature of Invigilator

Total Marks: 100

Time: 1 Hour 30 Minutes

Instructions to Candidates

1. Do not write your name or put any other mark of identification anywhere in the OMR Response Sheet. IF ANY MARK OF IDENTIFICATIONS IS DISCOVERED ANYWHERE IN OMR RESPONSE SHEET, the OMR sheet will be cancelled, and will not be evaluated.
2. **This Question Booklet contains the cover page and a total of 100 Multiple Choice Questions of 1 mark each.**
3. Space for rough work has been provided at the beginning and end. Available space on each page may also be used for rough work.
4. There is negative marking in Multiple Choice Questions. For each wrong answer, 0.25 marks will be deducted.
5. USE/POSSESSION OF ELECTRONIC GADGETS LIKE MOBILE PHONE, iPhone, iPad, pager ETC. is strictly PROHIBITED.
6. Candidate should check the serial order of questions at the beginning of the test. If any question is found missing in the serial order, it should be immediately brought to the notice of the Invigilator. No pages should be torn out from this question booklet.
7. Answers must be marked in the OMR Response sheet which is provided separately. OMR Response sheet must be handed over to the invigilator before you leave the seat.
8. The OMR Response sheet should not be folded or wrinkled. The folded or wrinkled OMR/Response Sheet will not be evaluated.
9. Write your Roll Number in the appropriate space (above) and on the OMR Response Sheet. Any other details, if asked for, should be written only in the space provided.
10. There are four options to each question marked A, B, C and D. Select one of the most appropriate options and fill up the corresponding oval/circle in the OMR Response Sheet provided to you. The correct procedure for filling up the OMR Response Sheet is mentioned below.

CORRECT METHOD
(A) ● (C) (D)

WRONG METHODS					
(A) ⊗ (C) (D)	(A) (B) (C) (D)	(A) ◐ (C) (D)	(A) ◉ (C) (D)	(A) ● (C) ●	(A) ● (C) ●

Q1. A body falls from rest freely under gravity. If the speed is v when it has lost an amount P of gravitational potential energy, then what is the mass of the body?

A. $\frac{P}{2v^2}$
B. $\frac{P}{v^2}$
C. $\frac{P}{g}$
D. $\frac{2P}{v^2}$

Q2. When a particle is projected at an angle of $45°$ to the horizontal, then the maximum horizontal range is

A. $\frac{u^2}{g}$
B. $u^2 g$
C. ug
D. u/g

Q3. What is the distance of centre of gravity from origin of the volume formed by the revolution of the portion of the parabola $y^2 = 4ax$ cut off by $x = h$ about the axis of x?

A. $\frac{h}{4}$
B. $\frac{h}{3}$
C. $\frac{h}{2}$
D. $\frac{2h}{3}$

Q4. The vertex and the focus of the parabola $y^2 - 4y - 4x - 8 = 0$ are respectively

A. (3, -2), (2, -2)
B. (-3,2), (2, -2)
C. (-3,2), (-2,2)
D. (-3, -2), (2,2)

Q5. If $3x + 4y + k = 0$ is a tangent to the hyperbola $9x^2 - 16y^2 = 144$, then the value of k is

A. 0
B. 1
C. -1
D. -3

Q6. The equation $x^2 - y^2 - 2x + 1 = 0$ represents:

A. a pair of straight lines
B. a circle
C. a parabola
D. an ellipse

Q7. How many arbitrary constants does the general equation of a quadratic cone with a given condition have?

A. 3
B. 4
C. 5
D. none of these

Q8. What is the equation of cone with vertex at origin and passing through the circle $x^2 + y^2 = 4, z = 2$?

A. $x^2 + y^2 + z^2 = 4$
B. $x^2 + y^2 - z^2 = 0$
C. $x^2 + y^2 - z^2 = 2$
D. $x^2 + y^2 + z^2 = 2$

Q9. The equation of the plane passing through the points A(1,2, −3) and B(2,3, −4) and perpendicular to the plane $x + y + z + 1 = 0$ is

A. $x - y + 1 = 0$
B. $x + y + z = 1$
C. $x + y - z = 1$
D. $x - y + z = 1$

Q10. The plane $2x - 2y + z + 12 = 0$ touches the sphere $x^2 + y^2 + z^2 - 2x - 4y + 2z - 3 = 0$ at the point

A. (1,4,2)
B. (−1,4,2)
C. (−1,4, −2) −1, −2,
D. (1, −4, −2)

Q11. The equation of the plane through the line of intersection of the planes $x + y + z = 6$ and $2x + 3y + 4z = 5$ and passing through the point (1, 1, 1) is

A. $20x - 17y + 26z = 69$
B. $20x + 17y + 26z = 69$
C. $20x + 17y - 26z = 69$
D. none of these

Q12. RAM stands for:

A. Random access memory
B. Read only memory
C. Read access memory
D. Random aided memory

Q13. The father of computer is known:

A. Charles Babbage
B. Joseph Jaeward
C. Abacus
D. Parcal

Q14. 1 kilobyte consists of:

A. 124 byte
B. 102 byte
C. 1024 byte
D. 1042 byte

Q15. Which of the following is not an operating system?

A. Linus
B. DOS
C. Window 95
D. Oracle

Q16. How many symbols are in hexa-decimal number system?

A. 16
B. 10
C. 8
D. 15

Q17. How much data can a CD store?

A. 650 kilobyte
B. 650 megabyte
C. 650 gigabyte
D. none of these

Q18. C programs are converted into machine language with the help of:

A. An Editor
B. A Compiler
C. An O.S,
D. none of these

Q19. Which of the following is an interpreted language?

A. C
B. FORTRAN
C. C++
D. BASIC

Q20. Which of the following computer language is used for artificial intelligence?

A. FORTRAN
B. C
C. COBOL
D. none of these

Q21. Which of the following is internal memory?

A. Disks
B. Pen Derives
C. RAM
D. CDs

Q22. Let G be a group of order 77. Then, the centre of G is isomorphic to

A. Z_{22}
B. Z_7
C. Z_{11}
D. Z_{77}

Q23. The number of elements of order 5 in the symmetric group S_5 is

A. 5
B. 20
C. 24
D. 12

$A^K = 0.$

Q24. The number of idempotent and nilpotent elements in Z_4, respectively

A. 1, 3
B. 3, 1
C. 2, 2
D. 0, 1

Q25. Let m and n be coprime natural number then the kernel of the ring homomorphism $\phi: Z \to Z_m \times Z_n$ defined by $\phi(x) = (\bar{x}, \bar{x})$ is (where $\bar{x}$ is reduced mod m when abscissa and reduced mod n when ordinate)

A. mZ

B. mnZ
C. nZ
D. Z

Q26. The probability distribution function of x is

$$f(x) = \begin{cases} 3e^{-3x}, & x > 0 \\ 0, & elsewhere \end{cases}$$

The cumulative distribution function of x is

A. $F(x) = \begin{cases} 0, & x \geq 0 \\ 1 - e^{-3x}, & x < 0 \end{cases}$
B. $F(x) = \begin{cases} 0, & x \leq 0 \\ 1 + e^{-3x}, & x > 0 \end{cases}$
C. $F(x) = \begin{cases} 0, & x \leq 0 \\ 1 - e^{-3x}, & x > 0 \end{cases}$
D. none of these

Q27. If X and Y are correlated variates each having poisson distribution. Then, $X + Y$ cannot be

A. Binomial variate
B. Poisson variate
C. Normal variate
D. Hypergeometric variate

Q28. The value of c for which function

$$f(x) = \begin{cases} \frac{c}{\sqrt{x}}, & 0 < x < 4 \\ 0, & elsewhere \end{cases}$$

is a probability distribution function, $P(x > 1)$ is

A. $\frac{1}{4}, 0$
B. $-\frac{1}{4}, \frac{1}{2}$
C. $\frac{1}{4}, \frac{1}{2}$
D. $1/2, 1$

Q29. Let A and B be events with $P(A) = \frac{3}{8}$, $P(B) = \frac{5}{8}$ and $P(A \cup B) = \frac{3}{4}$. Then $P(A/B)$ is

A. $\frac{3}{8}$
B. $\frac{1}{4}$
C. $\frac{2}{5}$
D. $\frac{2}{3}$

Q30. Consider the LP problem

Maximize $\quad x_1 + x_2$

Subject to $\begin{aligned} x_1 - 2x_2 &\le 10 \\ x_2 - 2x_1 &\le 10 \\ x_1, x_2 &\ge 0 \end{aligned}$

Then,

A. the LP problem admits an optimal solution
B. the LP problem is unbounded
C. the LP problem admits no feasible solution
D. the LP problem admits a unique feasible solution

Q31. A basic solution of the system $Ax = b$ is called degenerate, if

A. atmost one of the basic variables vanishes
B. exactly one of the basic variables vanishes
C. atleast one of the basic variables vanishes
D. more than one of the basic variables vanishes

Q32. If the value of the objective function is unbounded in primal, then the dual of the problem have

A. infeasible solution
B. feasible solution
C. bounded solution
D. unbounded solution

Q33. Given, $\begin{pmatrix}1 & 2 & 1\\ 2 & 1 & 5\end{pmatrix}\begin{pmatrix}x_1\\ x_2\\ x_3\end{pmatrix} = \begin{pmatrix}4\\ 5\end{pmatrix}$ the maximum possible basic solution is __

A. 3
B. 4
C. 2
D. 6

Q34. For Binomial distribution, $n = 10$ and $p = 0.6$, $E(X^2)$ is

A. 30
B. 38
C. 8
D. 38.4

Q35. The set of all limit points of the set $S = \left\{\frac{1}{n} : n \in N\right\}$ is

A. ϕ
B. $\{0\}$
C. N
D. none of these

Q36. If $n(A) = 3, n(B) = 6$ and $A \subseteq B$. Then the number of elements in $A \cup B$ is equal to

A. 3

B. 9
C. 6
D. none of these

Q37. The sequence $< 1 + (-1)^n >$ has

A. exactly one constant subsequence
B. exactly two constant subsequence
C. exactly three constant subsequence
D. exactly four constant subsequence

Q38. Series $\sum_{n=1}^{\infty} \left[\frac{1}{n} + \frac{(-1)^{n+1}}{\sqrt{n}}\right]$ is

A. convergent
B. divergent
C. oscillatory
D. none of these

Q39. Series $\sum \left(1 + \frac{1}{n}\right)^{-n^2}$ is

A. convergent
B. divergent
C. conditionally convergent
D. none of these

Q40. The series $\sum \frac{1}{4^n}$

A. converge to 1/3
B. converge to 1/4
C. converge to 1/2
D. divergent

Q41. The sequence $\left\{\frac{(-1)^n}{n}\right\}$ is

A. bounded
B. decreasing
C. increasing
D. none of these

Q42. $\int_0^1 x^{m-1}(1-x)^{n-1}\, dx$

A. integral exist when $m > 0, n < 0$
B. integral exist when $m < 0, n > 0$
C. integral exist when $m, n > 0$
D. integral exist when $m, n = 0$

Q43. Which of the following is true?

A. A constant function is Riemann integrable

B. Constant function is not Riemann integrable
C. A constant function may or may not be Riemann integrable
D. none of these

Q44. The improper integral $\int_a^b \frac{dx}{(x-a)^n}$ is

A. convergent if $n < 1$
B. convergent if $n > 1$
C. divergent if $n > 1$
D. divergent if $n < 1$

Q45. The integral $\int_0^2 \frac{dx}{(2x-x^2)}$ is

A. divergent
B. convergent
C. 0
D. 1

Q46. The uniform limit of the sequence of real valued function

$f_n(x) = x - \frac{x^n}{n}$, $\forall\, x \in [0,1]$ is

A. $f(x) = 0, \ \forall x$
B. $f(x) = \begin{cases} 0, & x = 0 \\ 1, & else \end{cases}$
C. $f(x) = \begin{cases} 0, & x = 0 \\ 1, & x = 1 \\ x, & 0 < x < 1 \end{cases}$
D. $f(x) = x, \ \forall x$

Q47. If $f_n(x) = < x^n >, \forall\, x \in [0,1]$, then the sequence $< f_n(x) >$

A. converges to the zero function on $[0,1]$
B. converges uniformly
C. does not converge point-wise
D. converges point-wise to a discontinuous function

Q48. Let f be the function defined on R as follows

$$f(x) = \begin{cases} 1 - 2x, & when\ x < 0 \\ 0, & when\ x = 0 \\ 1 + 3x, & when\ x > 0 \end{cases}$$

Then,

A. f is continuous at 0
B. f is discontinuous at 0
C. f is nowhere continuous
D. f is everywhere discontinuous

Q49. The value of 'C' of Lagrange's mean value theorem, if

$$f(x) = x(x-1)(x-2); a = 0, b = \frac{1}{2} \text{ is}$$

A. $\frac{1}{4}$
B. $\frac{1}{3}$
C. $\frac{6-\sqrt{21}}{6}$
D. $\frac{6+\sqrt{21}}{6}$

Q50. If $f(x) = \begin{cases} x^n \cos\frac{1}{x}, & x \neq 0 \\ 0, & x = 0 \end{cases}$ is differentiable at $x = 0$, then

A. $n < 1$
B. $n > 1$
C. $n = 1$
D. n may be positive or zero

Q51. The function $f(x) = \begin{cases} x, & when\ x\ is\ rational \\ 1-x, & when\ x\ is\ irrational \end{cases}$ is

A. continuous only at $x = \frac{1}{2}$
B. continuous, $\forall x \in R$
C. differentiable, $\forall x \in R$
D. none of these

Q52. The particular integral of $(D^2 - 2D + 4)y = e^x \cos x$ is

A. $\cos x$
B. $\sin x$
C. $\frac{1}{2} e^x \cos x$
D. $\frac{1}{2} e^x \sin x$

Q53. Solution of $(1 + y^2)dx = (\tan^{-1} y - x)\, dy$ is

A. $x = \tan^{-1} y - 1 + ce^{-\tan^{-1} y}$
B. $y = \tan^{-1} x - 1 + ce^{-\tan^{-1} x}$
C. $x = \tan^{-1} y + ce^{-\tan^{-1} y}$
D. $y = \tan^{-1} x + ce^{-\tan^{-1} x}$

Q54. The differential equation $y'' + 6y' + 9y = 50\, e^{2x}$ have particular integral

A. $\frac{2e^{2x}}{3}$
B. $2e^{2x}$
C. e^{2x}
D. none of these

Q55. The necessary condition for the equation $M(x,y)dx + N(x,y)dy = 0$, to be exact

A. $\frac{\partial N}{\partial y} = \frac{\partial M}{\partial x}$
B. $\frac{\partial N}{\partial y} = -\frac{\partial M}{\partial x}$
C. $\frac{\partial M}{\partial y} = \frac{\partial N}{\partial x}$
D. $\frac{\partial M}{\partial y} = -\frac{\partial N}{\partial x}$

Q56. A metric space X is compact, if

A. it is complete
B. it is incomplete
C. it is unbounded
D. none of these

Q57. The set $\left\{\frac{x^2}{1+x^2} : x \in \mathbb{R}\right\}$ is

A. connected but NOT compact in $\mathbb{R}$
B. compact but NOT connected in $\mathbb{R}$
C. compact and connected in $\mathbb{R}$
D. neither compact nor connected in $\mathbb{R}$

Q58. If (X, ρ) is metric space, then for all $x, y \in X$

A. $\rho(x,y) \leq 0$
B. $\rho(x,y) = 0$ for some $x \neq y$
C. $\rho(x,y) = 0$ if $x = y$
D. none of these

Q59. The value of m so that $2x - x^2 + my^2$ may be harmonic is

A. 0
B. 1
C. 2
D. 3

Q60. The only function among the following, that is analytic, is

A. $f(z) = Re(z)$
B. $f(z) = Im(z)$
C. $f(z) = \bar{z}$
D. $f(z) = \sin z$

Q61. The function $f(z) = \sec z$ is

A. analytic for all z
B. analytic for $z = \frac{3\pi}{2}$
C. not analytic for $z = \frac{\pi}{2}$
D. none of these

Q62. The function $f(z) = |z|^2$ is

A. everywhere analytic
B. nowhere analytic
C. analytic at $z = 0$
D. none of these

Q63. General solution of $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = 0$ is of the form,

A. $u = f(x + iy) + g(x - iy)$
B. $u = f(2x - iy) + g(2x + iy)$
C. $u = f(x + iy) - g(x - iy)$
D. $u = f(x - iy) - g(x - iy)$

Q64. The differential equation $f_{xx} + 2f_{xy} + 4f_{yy} = 0$, is classified as

A. elliptic
B. hyperbolic
C. parabolic
D. none of these

A=1 B=2, C=4
4-4(4) = -4

Q65. Solution of $\frac{\partial^3 z}{\partial x^3} - 3\frac{\partial^3 z}{\partial x^2 \partial y} + 4\frac{\partial^3 z}{\partial y^3} = e^{x+2y}$, is

A. $z = \phi_1(y - x) + \phi_2(y + 2x) + x\phi_3(y + 2x) + \frac{e^{x+2y}}{27}$
B. $z = \phi_1(y + x) + \phi_2(y + 2x) + x\phi_3(y + 2x) + \frac{e^{x+2y}}{27}$
C. $z = \phi_1(y - x) + \phi_2(y - 2x) + x\phi_3(y - 2x) + \frac{e^{x+2y}}{27}$
D. $z = \phi_1(y + x) + \phi_2(y - 2x) + x\phi_3(y - 2x) - \frac{e^{x+2y}}{27}$

Q66. Consider the series $x_{n+1} = \frac{x_n}{2} + \frac{9}{8x_n}$, $x_0 = 0.5$ obtained from the Newton-Raphson method. The series converges to

A. 1.5
B. $\sqrt{2}$
C. 1.6
D. 1.4

Q67. The value of $\int_0^1 \frac{dx}{1+x^2}$ by using Simpson's $\frac{3}{8}th$ rule is

A. 0.539785
B. 0.785395
C. 1.00314
D. none of these

Q68. The first term of the series whose second and subsequent terms are $8, 3, 0, -1, 0$ is

A. 5
B. 10
C. 15
D. 20

Q69. A second-degree polynomial passes through $(0,3), (1,6), (2,11), (3,18)$ and $(4,27)$. The polynomial is

A. $x^2 + x + 1$
B. $x^2 + 2x + 3$
C. $x^2 + 2x + 1$
D. $x^2 + x + 2$

Q70. Let $\left\{0, \frac{1}{2}, 1\right\}$ be the three distinct points on $[0, 1]$. Let p be the unique interpolating polynomial of suitable degree on $[0, 1]$ such that $p(0) = 0, p\left(\frac{1}{2}\right) = 0, p(1) = 1$, then $p\left(\frac{1}{4}\right)$ is equal to

A. $-\frac{1}{8}$
B. $-\frac{1}{2}$
C. $\frac{2}{5}$
D. $\frac{3}{7}$

Q71. The first approximate root of equation

$$x^3 - 3x - 5 = 0, \text{ where } x_0 = 3 \text{ is}$$

A. 1.4583
B. 2.4583
C. 3.4583
D. none of these

Q72. The number of elements of order 10 in Z_{30} is

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

Q73. If n is the order of element a of group G then $a^m = e$, an identity element iff

A. $m | n$
B. $n | m$
C. $m \nmid n$
D. $n \nmid m$

are

Q74. Set $\{1,2,3,4\}$ is a finite abelian group of order.......... under multiplication modulo............. as composition.

A. 3,4
B. 4,5
C. 1,2
D. 2,3

Q75. If p is a prime number and G is non-abelian group of order p^3, then the centre of G has

A. exactly $p-1$ elements
B. exactly p elements
C. exactly p^3 elements
D. none of these

Q76. If $H \subseteq K$ are two subgroups of G and if $[G:H] = 8$ and $[G:K] = 4$, then $[K:H]$ is

G

A. 2
B. 3
C. 5
D. none of these

Q77. In the group $(Z, +)$ the subgroup generated by 2 and 7 is

A. Z
B. $5Z$
C. $9Z$
D. $14Z$

Q78. Let G be a group of order 30. Let A and B be normal subgroup of order 2 and 5, respectively. Then, the order of group G/AB is

A. 10
B. 3
C. 2
D. 5

Q79. The number of unit elements in the ring $(Z_{15}, +_{15}, \cdot_{15})$ are

A. 8
B. 6
C. 4
D. 2

Q80. Let A and B be two ideals of a ring R, then

A. $AB \subseteq A + B \subseteq A \subseteq A \cap B$
B. $AB \subseteq A \subseteq A \cap B \subseteq A + B$
C. $AB \subseteq A \cap B \subseteq A \subseteq A + B$
D. $AB \subseteq A \cap B \subseteq A + B \subseteq A$

Q81. Which of the following is true for the rings $(Z,+,\cdot)$ and $(E,+,\cdot)$?

A. $Z \cong E$ and both are commutative
B. $Z \ncong E$ and both are with unity
C. $Z \cong E$ and both are with zero divisors
D. $Z \ncong E$ and both are without zero divisors

Q82. Let R be a ring with unity 1 under usual addition and multiplication. Using its elements $\bar{R}$ forms a group with the operation $\oplus$ defined by $a \oplus b = a + b + 1, \forall\, a, b \in R$. If b is the inverse of $a \in \bar{R}$, then $b =$

A. $a+2$
B. $-(a+2)$
C. $a-2$
D. $-a+2$

Q83. The mapping $f: Z \to Z$ such that $f(x) = 2x, \forall x \in Z$ is

A. neither a group homomorphism nor a ring homomorphism
B. a group homomorphism as well as ring homomorphism
C. a group homomorphism but not a ring homomorphism
D. none of the above

Q84. If V is a vector space of dimension n over the field Z_p, then the number of elements in V are

A. p^n
B. n^p
C. n^n
D. p^p

Q85. Which of the following is true for the vectors $u = (1+i, 2i)$ and $v = (1, 1+i)$ in C^2 ?

A. u and v are linearly independent over C but are linearly dependent over R.
B. u and v are linearly dependent over C but are linearly independent over R.
C. u and v are linearly independent over C as well as over R.
D. u and v are linearly dependent over C as well as over R.

Q86. Which of the following mapping $T: R^2 \to R$ is linear?

A. $T(x,y) = xy,\ \forall (x,y) \in R^2$,
B. $T(x,y) = 5x - 2y,\ \forall (x,y) \in R^2$
C. $T(x,y) = |x+y|,\ \forall (x,y) \in R^2$
D. none of these

Q87. Let V be a 3 dimensional vector space with A and B its subspaces of dimension 2 and 1, respectively. If $A \cap B = \{0\}$, then

2, 1

A. $V = A - B$
B. $V = A + B$
C. $V = A.B$
D. none of these

Q88. If $A = \begin{bmatrix} 3 & -2 \\ 4 & -2 \end{bmatrix}$ satisfy the matrix equation $A^2 - kA + 2I = 0$, then what is the value of k?

A. 0
B. 1
C. 2
D. 3

Q89. The dimension of the subspace of R^3 spanned by $(-3,0,1)$, $(1,2,1)$ and $(3,0,-1)$

A. 0
B. 1
C. 2
D. 3

Q90. The system of equation

$$\begin{aligned} 2x + y &= 5 \\ x - 3y &= -1 \\ 3x + 4y &= k \end{aligned}$$ is consistent, when k is

A. 1
B. 2
C. 5
D. 10

Q91. Consider the following matrix $A = \begin{bmatrix} 2 & 3 \\ x & y \end{bmatrix}$. If the eigen values of A are 4 and 8, then

A. $x = 4,\ y = 10$
B. $x = 5,\ y = 8$
C. $x = -3,\ y = 9$
D. $x = -4,\ y = 10$

Q92. If $f(x,y) = \begin{cases} 3x + 4y, & (x,y) \neq (1,2) \\ 6, & else \end{cases}$

Then, $\lim_{(x,y)\to\left(e,\frac{1}{e}\right)} f(x,y)$ is

A. $e(3e^2 + 4)$
B. $e^{-1}(3e^2 + 4)$
C. $e(3 + 4e^2)$
D. $e^{-1}(3 + 4e^2)$

Q93. For what value of k, the function

$$f(x,y) = \begin{cases} \dfrac{\sin^{-1}(xy-2)}{\tan^{-1}(3xy-6)}, & (x,y) \neq (1,2) \\ k, & (x,y) = (1,2) \end{cases}$$ is continuous?

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

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

C. $\frac{1}{4}$

D. $\frac{3}{4}$

Q94. If $f(x, y) = x^3 y + e^{xy^2}$. Then, which one of the following is correct?

A. $f_{xy} > f_{yx}$

B. $f_{xy} < f_{yx}$

C. $f_{xy} = f_{yx}$

D. $f_{xy} \geq f_{yx}$

Q95. For the function $f(x, y) = 2x^4 - 3x^2 y + y^2$ has

A. maximum at (0,0)

B. maximum at (0,0)

C. neither maxima nor minima at (0,0)

D. doubtful case at (0,0) always

Q96. Which of the following is correct?

A. The intersection of an arbitrary collection of closed sets is closed.

B. The intersection of an arbitrary collection of closed sets is open.

C. The intersection of an arbitrary collection of closed sets is not closed.

D. The intersection of an arbitrary collection of closed sets is empty.

Q97. For a set A of rational numbers between 0 and 1. If $\{I_n\}$ is finite collection of open intervals that covers A, then

A. $\sum l(I_n) \geq 1$

B. $\sum l(I_n) \leq 1$

C. $\sum l(I_n) = \infty$

D. $\sum l(I_n) = 0$

Q98. Let $f(x, y) = \begin{cases} \dfrac{xy^2}{x^2 + y^4}; & (x, y) \neq (0,0) \\ 0 \ ; & (x, y) = (0,0) \end{cases}$. Then

A. $f(x, y)$ is not defined at origin

B. $f_x(0,0) = 1$

C. $f_x(0,0) = 0$

D. $f_y(0,0)$ does not exist

Q99. If a particle is moving according to the law $v^2 = 2(x + \sin x$ [illegible] velocity and x is the distance described, what is its acceleration?

A. $x \sin x$

B. $x \cos x$

C. $\frac{x \cos x}{v}$

D. $\frac{x \sin x}{v}$

Q100. If a system of three forces acting on a rigid body is represented in magnitude [illegible] of line of action by the side of a triangle, taken in order, then the body will

A. be in equilibrium

B. more along the smallest side

C. more along the largest side

D. be acted upon by a couple

$$a = \sqrt{\frac{d^2v}{dx^2} + \frac{d^2v}{dy^2}}$$