Entrance Examination - 2016: M.Sc. Mathematics

Hall Ticket Number

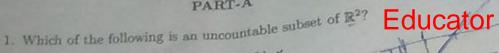
Time: 2 hours Max. Marks: 100 Part A:25 Marks Part B:75 Marks

Instructions

- Hall Ticket Number on the OMR Answer 1. Write your Sheet given to you. Also write the Hall Ticket Number in the space provided above.
- 2. Answers are to be marked on the OMR sheet.
- 3. Please read the instructions carefully before marking your answers on the OMR answer sheet.
- 4. Hand over the OMR answer sheet at the end of the examination.
- 5. The question paper can be taken by the candidate at the end of the examination.
- 6. No additional sheets will be provided. Rough work can be done in the question paper itself/space provided at the end of the booklet.
- 7. Calculators are not allowed.
- 8. There are a total of 50 questions in PART A and PART B together.
- 9. There is a negative marking in PART A. Each correct answer carries 1 mark and each wrong answer carries -0.33 mark. Each question in PART A has only one correct option.
- 10. There is no negative marking in PART B. Each correct answer carries 3 marks. In PART B some questions have more than one correct option. All the correct options have to be marked in OMR sheet otherwise zero marks will be credited.
- 11. The appropriate answer(s) should be coloured with either a blue or a black ball point or a sketch pen. DO NOT USE A PENCIL.
- 12. R denotes the set of real numbers, C the set of complex numbers, Z the set of integers, Q the set of rational numbers and N the set of all natural numbers.
- 13. This book contains 10 pages including this page and excluding pages for the rough work. Please check that your paper has all the pages.

Parveen Chhikara, Mathematics Teacher &

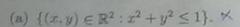
PART-A



- (a) $\{(x,y) \in \mathbb{R}^2 : x \in \mathbb{Q} \text{ or } x+y \in \mathbb{Q}\}. \times$
- (b) $\{(x,y) \in \mathbb{R}^2 : x \in \mathbb{Q} \text{ and } y \in \mathbb{Q}\}$.
- (c) $\{(x,y)\in\mathbb{R}^2:x\in\mathbb{Q}\text{ or }y\in\mathbb{Q}\}.$
- (d) $\{(x,y) \in \mathbb{R}^2 : x \in \mathbb{Q} \text{ or } y^2 \in \mathbb{Q}\}.$

a, c, d

2. Which of the following is an unbounded subset of R2



- $\{(x,y) \in \mathbb{R}^2 : x + y < 1\}.$
 - (c) $\{(x,y) \in \mathbb{R}^2 : |x| + |y| \le 1\}.$
- (d) $\{(x,y) \in \mathbb{R}^2 : |x| + y^2 \le 1\}.$

3. Let $f: \mathbb{R} \to \mathbb{R}$ be a twice differentiable function. Then which of the following is true?

- (a) If f(0) = 0 = f''(0) then f'(0) = 0.
- (b) f is a polynomial. ^

Correct Option: c Jet f' is continuous.

- (d) If f''(x) > 0 for all x in \mathbb{R} then f(x) > 0 for all x in \mathbb{R} . X
- 4. The non-zero values for x_0 and x_1 such that the sequence defined by the recurrence relation $x_{n+2} = 2x_n$, is convergent are
 - (a) $x_0 = 1$ and $x_2 = 1$.

- (c) $x_0 = 1/10$ and $x_1 = 1/20$.
- (d) none of the above.

(b) $x_0 = 1/2$ and $x_1 = 1/4$. Correct Option: d

%. The set of all values of a for which the series $\sum_{n=1}^{\infty} \frac{a^n}{n!}$ converges is

- (b) $(-\infty, 0]$.

(d) (-1,1). Correct Option: C

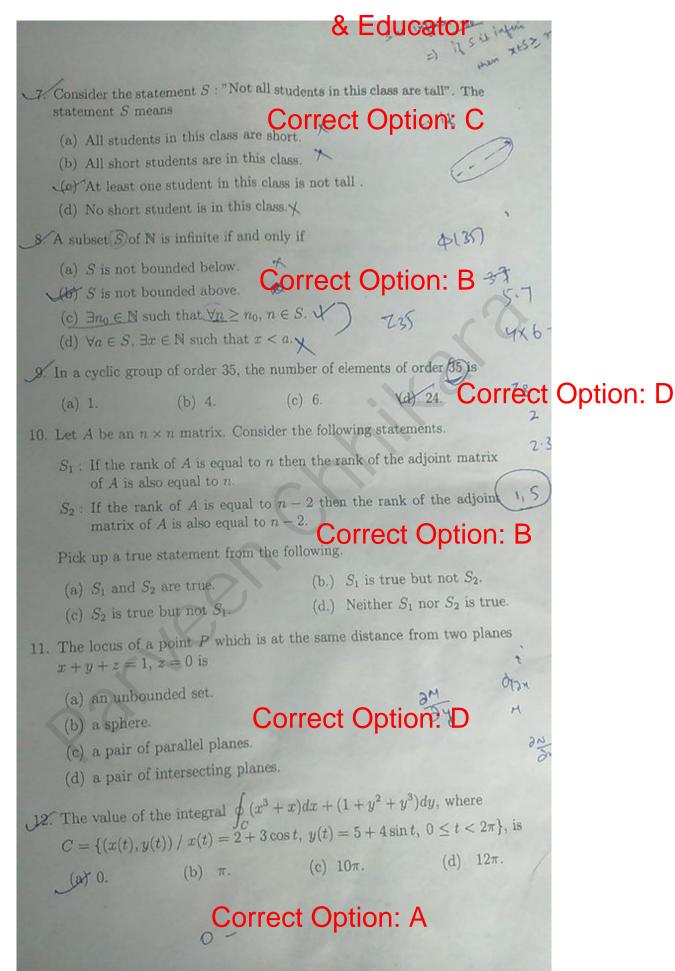
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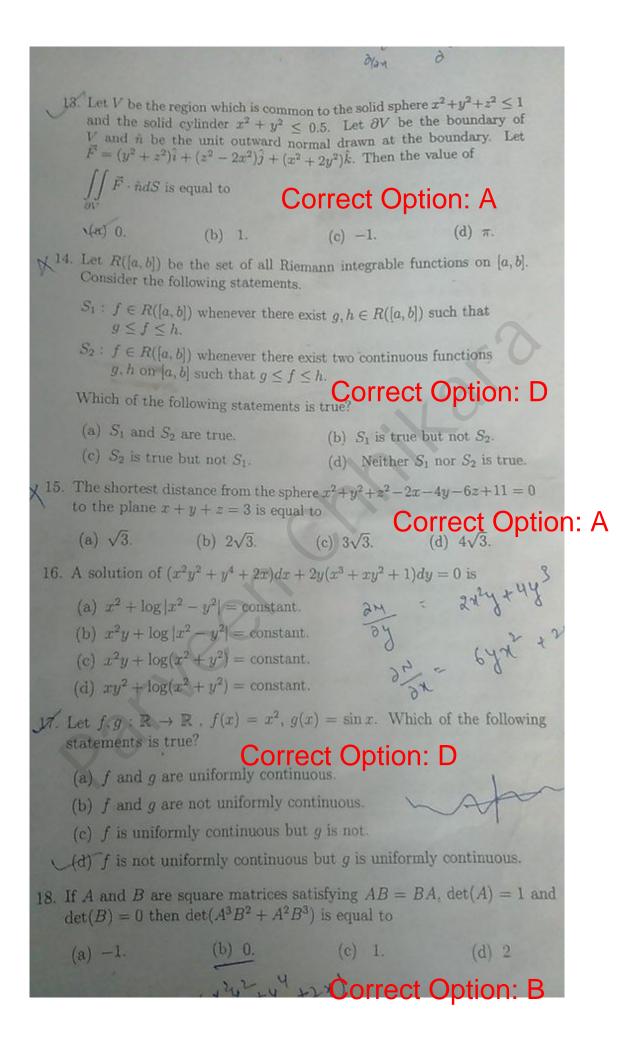
8. Consider $f(x) = \begin{cases} |x|, & \text{if } -1 \le x \le 1, \\ x^2, & \text{otherwise} \end{cases}$ Then

- (a) f is not continuous at 0.
- (b) f is not continuous at 1.
- (c) f is not continuous at -1.
- (d) f is continuous at all points.

Correct Option: D

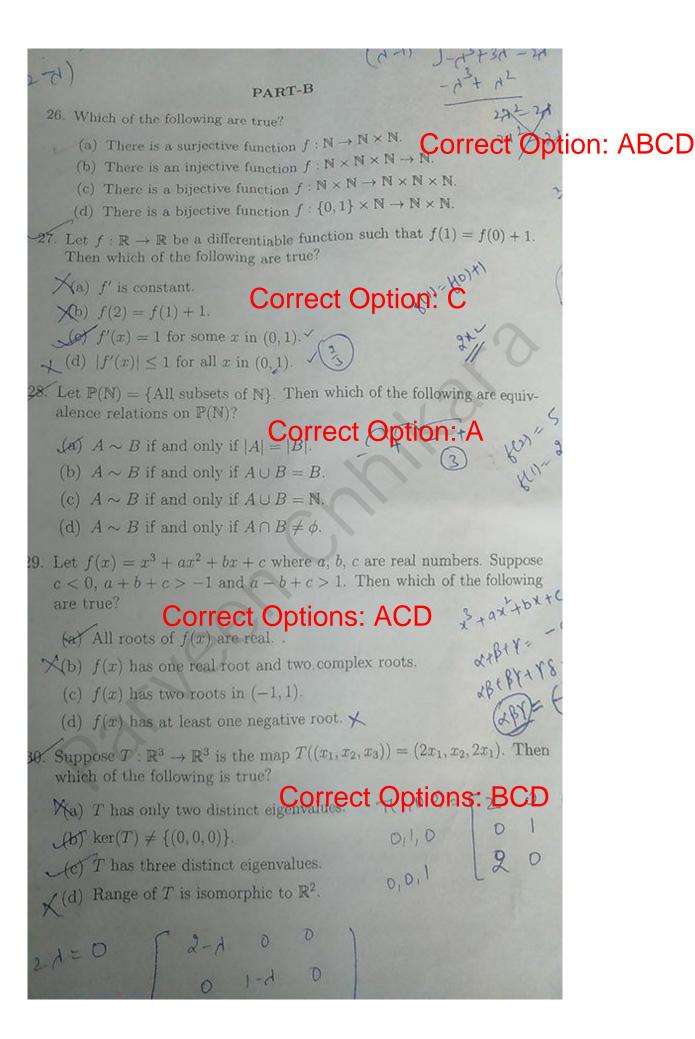
Parveen Chhikara, Mathematics Teacher



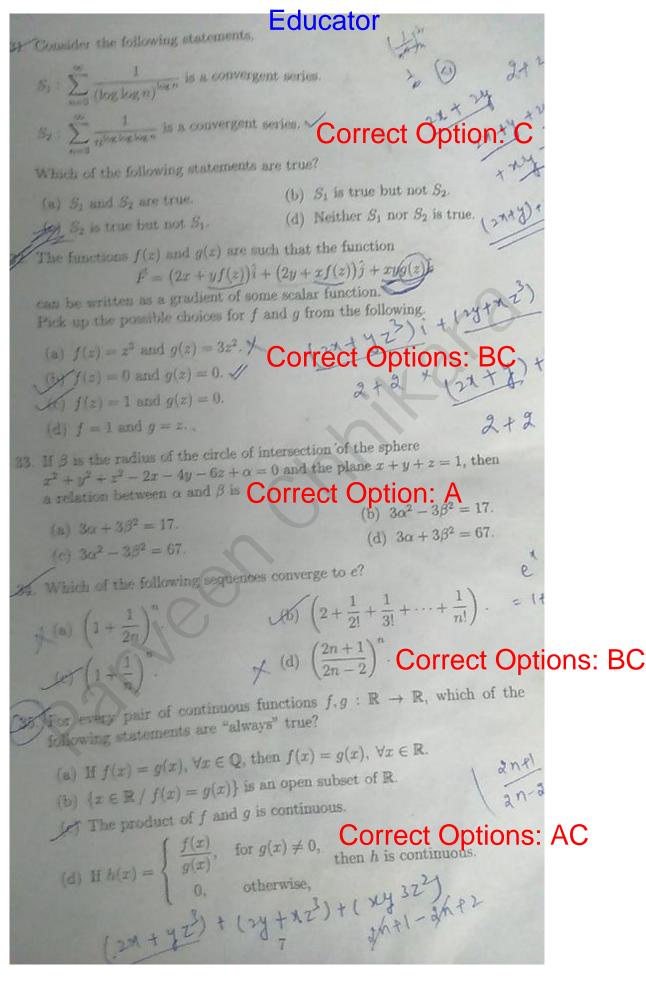


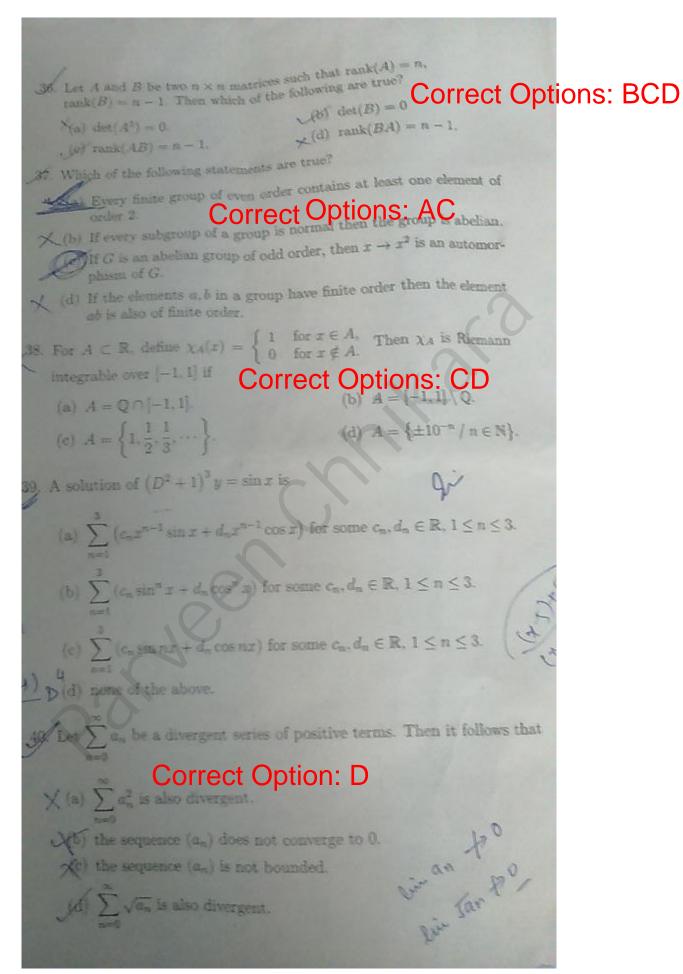
Parveen Chhikara, Mathematics Teacher & Educator

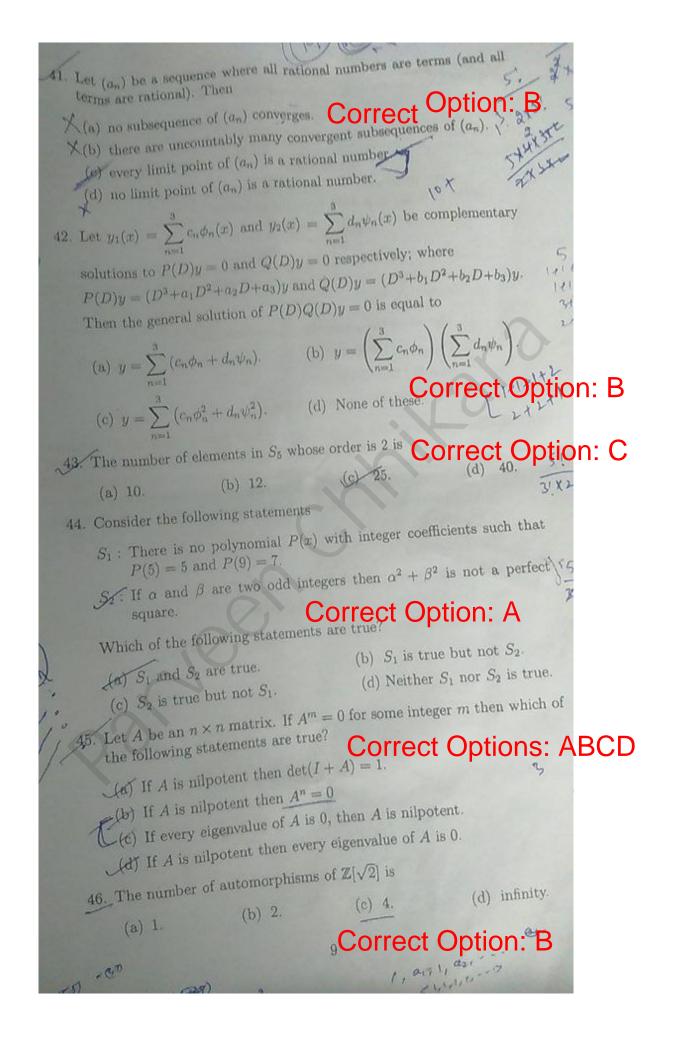
(9) Which of the following subsets are subspaces of R ³ ?
(b) $\{(x, y, z) \in \mathbb{R}^3 / 5x - y + z = 0\}$ (c) $\{(x, y, z) \in \mathbb{R}^3 / 5x - y + z = -1\}$ Correct Option: A
(b) $\{(x,y,z) \in \mathbb{R}^3 / 5x - y + z = -1\}$ Correct Option: A (c) $\{(x,y,z) \in \mathbb{R}^3 / x, y, z \text{ are rationals}\}$
(d) $\{(x, y, z) \in \mathbb{R}^3 / x^2 + y^2 + z^2 = 1\}$
20. A palindrome is a word which reads the same backward or forward (eg. MADAM, ANNA). The number of palindromes of length 11 (eleven) can be formed from an alphabet of K letters is equal to
can be formed from an alphabet of K letters is equal to (a) K^5 . (b) K^5 . (c) $\binom{K}{6}$. (d) $\binom{K}{5}$.
The center of the ring of 2 × 2 matrices over R is
$ \left\{ \begin{pmatrix} a & 0 \\ 0 & b \end{pmatrix} \middle/ a, b \in \mathbb{R} \right\}. $ $ \left\{ \begin{pmatrix} a & 0 \\ 0 & a \end{pmatrix} \middle/ b \in \mathbb{R} \right\}. $ Correct Option:
(c) $\{(a,b) \in \mathbb{R}\}$, (d) $\{(a,b) \in \mathbb{R}\}$
22. The set of units of the Gaussian ring $\{a+ib/a,b\in\mathbb{Z}\}$ is
(a) $\{\pm 1, \pm i\}$. (b) $\mathbb{Z} \cup i\mathbb{Z}$. Correct Option:
(c) $\{a+ib/a,b\in\{\pm 1,0\}\}$. (d) Z. Correct Option:
23. Group of automorphisms of $(\mathbb{Z} / 10\mathbb{Z}, +)$ is isomorphic to
(a) $(\mathbb{Z}/2\mathbb{Z}) \times (\mathbb{Z}/2\mathbb{Z})$. (b) $\mathbb{Z}/2\mathbb{Z}$. Correct Option: (d) $\mathbb{Z}/10\mathbb{Z}$.
24. The system of equations $6x_1 + 2x_2 + 2\alpha x_3 = 1$ and $3x_1 - x_2 + x_3 = 5$
has no solution if a is equal to Correct Option: C
(a) -0.
25. Suppose every collection of three distinct numbers from 1, 2,,9 is
equally likely to be selected, then Correct Option: A
(a) the probability that the sum of the selected numbers is even is more than the probability that the sum of the selected numbers
is odd. (b) the probability that the sum of the selected numbers is even is
(b) the probability that the sum of the selected numbers is equal to the probability that the sum of the selected numbers is
odd. (c) the probability that the product of the selected numbers is even
is less than 1/2.
(d) the probability that the product of the selected humbers
equal to $2/3$.
2 x 1 1 5 20 0 =



Parveen Chhikara, Mathematics Teacher &







447. The kernel of a ring homomorphism from 2(X) to Correct by f(X) → f(X + 9) is **Correct Option: A** (b) (X2+6X+5) (8) (0). (a) $(X^2 - 6X + 13)$. (c) R[X]. 48. Pick up prime elements of the ring of Gaussian integra Correct Options: BC $G = \{x + iy \mid x, y \in \mathbb{Z}\}$ from the following (d) 13. (8) 2. 49. A subset S of N is said to be thick if among any 2016 consecutive positive integers, at least one should belong to S. Which of these (a) The set of the geometric progression {2,2,2,...} subsets are thick? 48) The set of the arithmetic progression {1000, 2000, 3000}. 40 {n ∈ N / n > 2016}. -(d) The set of all composite numbers. 50. Three students are selected at random from a class of 10 students among which 4 students know C programming of whom 2 students are experts. If every such selection is equally likely, then the probability of selecting three students such that at least two of them know C programming with at least one out of the two selected being an expert in C programming is **Correct Option: B** (a) less than 1/4. (b) greater than 1/4 but less than 1/2. (c) greater than 1/2 but less than 3/4. (d) greater than 3/4. .