5. Prove that I : A - B is loverible if and Doly if I's bijective.

18. If I is a one-to-one and onto function defined on real numbers by I(x) = 2x - 3, that a formula that defines the inverse function I^{-1} .

17. 1/9 = (2, 3, 4, 5, 8, 6, 9, 10) is ordered by 's is a multiple pty'. Find

a) will manufacture to the contract of 15.

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18. If Lis exponglemented inflow with unique complaments, then show that this join obtained in the store and the atoms.

18 If α , β , γ and the request the equation x^2 - αx — b = 0, find the value of

The way off

20. Transform one equation 25x² = 5x² = 7x² + 1 = 0 into another with integral and the funding on efficient unity. (Weightings 7x2e14)

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28. Prove than 5 threat at 2

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23. 300 Hart 23.4 -16.6 0.3.8

24. Solve the equation $dx^2 - 2dx^2 + 13x + 18 = 0$ whose roots one of 2.2

In Solve by true equation of - 9x + 48 = 0 by Carden is method. (Worghtage: 3x3=8



M 6574

Reg. No.:....

Name:.....

II Semester B.Sc. Degree (CCSS - Reg./Supple./Improv.)

Examination, May 2014

CORE COURSE IN MATHEMATICS

2B02 MAT: Foundations of Higher Mathematics

Time: 3 Hours

Max. Weightage: 30

- 1. Fill in the blanks:
 - a) The number of terms in the expansion of $(1-x)^{-1}$ is _____

b)
$$1 + \frac{1}{1!} + \frac{1}{2!} + \frac{1}{3!} + \dots =$$

c) The nth term of the series $\frac{2.3}{3!} + \frac{3.5}{4!} + \frac{4.7}{5!} + ...$ is _____

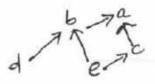
d)
$$\lim_{n\to\infty} \left(1-\frac{1}{n}\right)^n =$$
 (Weightage: 1)

- 2. Fill in the blanks:
 - a) The dual of $(A \cap U) \cap (\phi \cup A') = \phi$ is _____
 - b) Consider the relation defined by $x^2 + y^2 = 16$, then graph of the equation is a
 - c) If $A = \{1, 2\}$, $B = \{a, b, c\}$ and $c = \{c, d\}$, then $(A \times B) \cap (A \times C)$ is _____
 - d) If $R = \{(x, y) | x \in \mathbb{R}, y \in \mathbb{R}, 4x^2 + 9y^2 = 36\}$, then $R^{-1} =$ _____ (Weightage: 1)

Answer any five from the following (Weightage 1 each):

- 3. Sum the series $1 + \frac{1}{4} + \frac{1.4}{4.8} + \frac{1.4.7}{4.8.12} + \dots$
- 4. Prove that $\log 2 \frac{(\log 2)^2}{2!} + \frac{(\log 3)^3}{3!} = \dots = \frac{1}{2}$

- 5. Prove that $(B \cap C) \cup A = (B \cup A) \cap (C \cup A)$
- 6. Find all partitions of S= {1, 2, 3}.
- 7. If ~ is a relation on the set of natural numbers defined by (a, b) ~ (c, d) if and only ad = bc, then prove that '~' is an equivalence relation.
- 8. If R = {(1, 2), (2, 3), (3, 3)} is a relation defined on a set A, find R² and R³.
- 9. If V= (a, b, c, d) is ordered by the following diagram, insert the correct symbol <, > or II between each pair of elements.



- i) a e
- ii) b e
- iii) d....a
- iv) c d
- 10. If R is a relation defined on the set of natural numbers given by $R = \{(x, y)/x \in N, y \in N, 2x + y = 10\}$, find
 - i) the domain of R
 - ii) the range of R
 - iii) R-1.

(Weightage 5×1=5)

Answer any seven from the following (Weightage 2 each):

- 11. If a relation R is transitive prove that its inverse is also transitive.
- 12. If f and g are function defined on the real numbers given by

$$f(x) = x^2 + 2x - 3$$
 and $g(x) = 3x - 4$, find $f \circ g$ and $g \circ f$.

- 13. If f: A → B is one-to-one and g: B → C is also one-to-one, prove that g∘f: A → C is one-to-one.
- 14. If f: A → B and g: B → C have inverse functions f⁻¹: B → A and g⁻¹: C → B, show that gof has an inverse function which is f⁻¹og⁻¹: C → A.

- Prove that f: A → B is invertible if and only if f is bijective.
- 16. If f is a one-to-one and onto function defined on real numbers by f(x) = 2x 3, find a formula that defines the inverse function f^{-1} .
- 17. If B = {2, 3, 4, 5, 6, 8, 9, 10} is ordered by "x is a multiple of y". Find
 - a) all maximal elements of B,
 - b) all minimal elements of B and
 - c) does B have a first or last element?
- If L is a complemented lattice with unique complements, then show that the join
 of irreducible elements of L other than zero are its atoms.
- 19. If α , β , γ are the roots of the equation $x^2 + ax b = 0$, find the value of $\frac{\alpha}{\beta\gamma} + \frac{\beta}{\gamma\alpha} + \frac{\gamma}{\alpha\beta}$.
- 20. Transform the equation $25x^4 + 5x^3 7x^2 + 1 = 0$ into another with integral co-efficients and the leading co-efficient unity. (Weightage $7 \times 2 = 14$)

Answer any three questions from the following (Weightage 3 each):

- 21. If α , β , γ are the roots of $x^3 + px^2 + qx + r = 0$, find the equation whose roots are $\alpha + \frac{1}{\beta \gamma}$, $\beta + \frac{1}{\gamma \alpha}$, $\gamma + \frac{1}{\alpha \beta}$.
- 22. Prove that $\sum_{n=0}^{\infty} \frac{5n+1}{(2n+1)!} = \frac{e}{2} + \frac{2}{e}$.
- 23. Show that $\frac{1}{2.3.4} + \frac{1}{4.5.6} + \frac{1}{6.7.8} + \dots = \frac{3}{4} \log 2$.
- 24. Solve the equation $4x^3 24x^2 + 23x + 18 = 0$ whose roots are in A.P.
- 25. Solve by the equation $x^3 9x + 28 = 0$ by Cardan's method. (Weightage: $3 \times 3 = 9$)