Reg. No………………………………………….. Name…………………………………………… **15U126**

B.Sc. DEGREE END SEMESTER EXAMINATION OCTROBER 2016

SEMESTER – **1: MATHEMATICS FOR BSC MATHEMATICS, COMPUTER APPLICATIONS AND BCA**

COURSE **- 15U1CRMAT1–15U1CRCMT1-16U1CPCMT1: FOUNDATION OF MATHEMATICS**

Common for Regular (2016 Admission) & Supplementary / Improvement (2015 Admission)

Time: Three Hours Max Marks: 75

Part A

Short Answer Questions. Answer **all** questions.
Each Question carries 1 mark

1. Define "ceiling of x " where X is a real number.
2. *Given* $f : \mathbb{Z} \to \mathbb{N}$ is defined by $f(x) = \begin{cases} 2x-1, & \text{if } x > 0 \\ -2x, & \text{if } x \le 0 \end{cases}$

   Find $f^{-1}(x)$
3. Prove or disprove that [x + y] = [x] + [y] for all real numbers x and y.
4. Evaluate $\sum_{i=1}^{3} \quad \sum_{j=1}^{2} ij$
5. Define factorial function.
6. Negate the statement $\forall x \exists y$ [p(x) V q(y)]
7. Define "Inverse of the conditional statement": p → q.
8. State Fundamental theorem of Arithmetic.
9. Prove that 284 and 220 are amicable numbers.
10. If n = $P_1^{m1} P_2^{m2} P_3^{m3}$…… then obtain ϕ(n)
    Where P_1 , P_2, P_3 are distinct primes. (1 x 10 = 10)

Part B

Brief Answer Questions. Answer **any *eight*** questions.
Each Question carries 2 marks

11. Suppose A={ x, y, z }. Obtain the power set of A.
12. Let ***f*** **: R → R** be defined by **f(x) = x² + 2x.**
    Find **(fof)2** and **(fof)3.**
13. *Given* $f : \mathbb{Z} \to \mathbb{N}$ is defined by $f(x) = \begin{cases} 2x-1, & \text{if } x > 0 \\ -2x, & \text{if } x \le 0 \end{cases}$

    Prove that f is one- to –one
14. Define "Partition of a set S ".
    Write down two possible partitions of the set S = {a,b,c,d,e,f,g,h}.
15. Show that **(p → q) ∧ (q → p**) and (p ↔ q) are logically equivalent.
16. Find the smallest number with 10 divisors.
17. If n=ab where (a,b)=1, Show that ϕ(a,b) = ϕ(a) ϕ(b).

18. If N be any integer, **n** the number of its divisors and P the product of them all. Prove that $N^n = P^2$
19. Find the g.c.d of 58 and 86 and express it as a linear combination of the above two integers
20. Negate the following Statements

    (1)$(\forall\, x \,\varepsilon\, A)(x + 2 = 7)$

    (2)$(\exists\, x \,\varepsilon\, A)(x + 2 \geq 7)$ (2 x 8 =16)

Part C

Short Essay type Questions. Answer **any *five*** questions.
Each Question carries 5 marks

21. Compute the value of $\sum_{k=50}^{100} k^2$
22. Let **A** be a set of non zero integers and let * be the relation on A x A defined by (a,b) * (c,d) whenever ad = bc. Prove that * is an equivalence relation.
23. Find the join and meet of the zero-one matrix

$$A = \begin{bmatrix} 1 & 0 & 1 \\ 0 & 1 & 0 \end{bmatrix} \quad \text{and} \quad B = \begin{bmatrix} 0 & 1 & 0 \\ 1 & 1 & 0 \end{bmatrix}$$

24. Show that $p \rightarrow (q \wedge r) \equiv (p \rightarrow q) \wedge (p \rightarrow r)$.
25. If $p \rightarrow q$ and $q \rightarrow r$ then show that $(p \rightarrow r)$ is a tautology.
26. Show that $3^{2n+1} + 2^{n+2} = M(7)$
27. Prove that cube of any number is of the form 7m or 7m ± 1 (5 x 5 =25)

Part D

(Essay). Answer **any *two*** questions. Each Question carries 12 marks

28. Prove that that

    $(A - C) \cap (C - B) = \phi$ analytically where A, B & C are sets. Also verify graphically.
29. Let R_5 be the relation on the set Z of integers defined by $x\ R_5\ y$ if $x \equiv y \pmod 5$. Show that R_5 is an equivalence relation on Z.
30. Give a proof by contradiction of the theorem " if $\mathbf{n^2}$ is even then, n is even ".
31. (a) State and prove Wilson's theorem.

    (b **S**how that

    $18! + 1 \equiv 0 \pmod{23}$ (12 x 2 =24)

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