TB141310 **Reg No……………**

Name……………...

B.Sc. DEGREE (C.B.C.S.S) EXAMINATION, NOVEMBER -2014
MATHEMATICS – FIRST SEMESTER- CORE COURSE
(COMMON FOR B.Sc. MATHEMATICS AND B.Sc. COMPUTER APPLICATIONS)
MAT1FM-FOUNDATION OF MATHEMATICS

Time: 3hrs. Max.Marks:80

Part A

Short answer questions

(Answer **all** questions. Each question carries 1 mark)

1. Find A x B x C if A={x,y}, B={1,2,3} and C={0,1}
2. Find $\sum_{i=0}^{10}(i+6)$.
3. Find two sets A and B such that A $\in B$ and $A \subseteq B$
4. Define a transitive relation on a set A.
5. Represent the relation R={(1,1), (1,2), (1,3), (3,4)} on {1,2,3,4} using a directed graph.
6. Give an example of a lattice.
7. Write the converse of the statement "If the space shuttle was launched, then a cloud of smoke was seen."
8. Let p and q be propositions

   p: 2 is a prime number

   q: 4 is a perfect square

   Write the proposition 2 is a prime number or 4 is a perfect square using logical connectives.
9. Find $\Phi(1024)$, the Euler phi function.
10. State Fermat's theorem.

(10 x 1 = 10)

(P.T.O.)

Part B

Brief answer questions

(Answer any **eight** questions. Each question carries 2 marks)

11. Why $f(x)=\sqrt{x}$ is not a function from $\mathbb{R}$ *to* $\mathbb{R}$
12. Find f $\circ$ g and g $\circ$ f where f and g are two function from set of integers onto itself defined by $f(x)=x^3$ and $g(x)=2x+9$
13. State De Morgan's laws for sets.
14. If $M_R=\begin{bmatrix}1 & 0 & 0\\ 0 & 1 & 0\\ 1 & 1 & 0\end{bmatrix}$ find the matrix representing its inverse relation.
15. Give an example of a relation which is symmetric but not transitive.
16. Write down $[1]_5$ and $[2]_5$,the equivalence classes of modulo 5.
17. Let p(x) be the statement x+1>x. what is the truth value of $\forall x\ p(x)$,where the universe of discourse consists of all real numbers and justify your answer?
18. Construct a truth table for the compound proposition $(p \vee q) \oplus (p \wedge q)$
19. Translate into logic "Some integers are even and some are odd" where the universe of discourse consists of all integers.
20. Find the highest power of 7 contained in 900!
21. Show that $n^7-n=M(42)$
22. Find the remainder when 2^{1000} is divided by 17.

(8x2=16)

Part C

Descriptive (short essay questions)

(Answer any **six** questions. Each question carries 4 marks)

23. How many relations are there on a set with n elements. How many of them are reflexive?
24. Show that the function f(x) = 3x+4 is a bijection on set of integers also find the inverse.
25. Show that the relation $(a,b)\ R\ (c,d) \Leftrightarrow a+d=b+c$ is an equivalence relation on the set of real numbers.

26. Represent the relation R={(1,2), (2,3), (3,3), (3,2), (3,4), (4,2)} on {1,2,3,4} using
    i) Matrix
    ii) Directed graph
27. Show the $(p \rightarrow q) \vee (q \rightarrow p)$ is a tautology.
28. Write the converse, inverse, contra positive and biconditional statement of " If you play tennis , then you're an athlete ."
29. Prove that "n is odd, if and only if 5n+6 is odd", where n is an integer.
30. Show that $3^{2n+1} + 2^{n+2}$ is divisible by 7.
31. Show 18!+1 is divisible by 437.

(6x4=24)

Part D

Essay type questions

(Answer any **two** questions. Each question carries 15 marks)

32. i). Using membership table show $A \cup (B \cap C) = (A \cup B) \cap (A \cup C)$.
    ii). Show that set of all integers is countable.
    iii). Define floor function and ceiling functions and draw the graphs of both functions.
33. Show that following statements are equivalent
    i) n^2 is odd
    ii) 1-n is even
    iii) n^3 is odd
    iv) $n^2 + 1$ is even
34. i) Show that $p \rightarrow q$ and $\neg p \vee q$ are logically equivalent.
    ii) Prove that $\sqrt{2}$ is irrational by giving a proof by contradiction.
    iii) Which rule of inference is used in the following argument?
    "If you have a current password, then you can log onto the network"
    "You have a current password"
    Therefore: "You can log onto the network"

(P.T.O.)

35. i) Solve $5x \equiv 2 \pmod 7$

ii) Show that 27 and 48 are prime to each other using Euclidean algorithm

iii) Prove that if m is prime to n, then $\Phi(mn) = \Phi(m)\,\Phi(n)$.

(2 x15 = 30 marks)