BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(MID SEMESTER EXAMINATION)

CLASS: BE **SEMESTER: III**
BRANCH: IT **SESSION : MO/2018**

SUBJECT : IT3021 DISCRETE MATHEMATICS AND GRAPH THEORY

TIME: 1.5 HOURS **FULL MARKS: 25**

INSTRUCTIONS:
1. The total marks of the questions are 30.
2. Candidates may attempt for all 30 marks.
3. In those cases where the marks obtained exceed 25 marks, the excess will be ignored.
4. Before attempting the question paper, be sure that you have got the correct question paper.
5. The missing data, if any, may be assumed suitably.

Q1 (a) Express the following statements in symbolic form: [2]
(i) If Kuntal is not in a good mood or he is not busy, then he will go to Bengaluru.
(ii) If Bidhan knows object-oriented programming and oracle, then he will get a job.

(b) Consider p : Debu is rich and q : Debu is generous. Write the new propositions using conjunction $(\wedge)$, disjunction $(\vee)$ and negation $(\sim)$. [3]

Q2 (a) Investigate the tautology of the propositional statement (symbolic), i.e., [3]
$(p \wedge \sim q) \vee (\sim p \wedge q)$

(b) Show that the statement $2 + 4 + ... + 2n = (n+2)(n-1)$, for all $n \geq 1$, satisfies the inductive step but possesses no basis. [3]

Q3 Find an explicit formula of the Fibonacci sequence $0, 1, 1, 2, 3, 5, 8, 13, ...,$ using the recurrence relation of the sequence. [5]

Q4 The solution of a recurrence relation $\alpha y_n + \beta y_{n-1} + \gamma y_{n-2} = f(n)$ is [5]
$y_n = c_1 \cdot 3^n + c_2 \cdot 4^n + 2$, where $f(n) = 6$ for all n. Determine $\alpha,\ \beta,\ \gamma$.

Q5 (a) Find the coefficient of x^6 in the following product of polynomials like [2]
$(1 + x + x^2)(x + x^2 + x^3)(x^3 + x^5)$

(b) Provide a closed formula for the generating function $\dfrac{x^3}{(1+3x)}$. [3]

Q6 Solve the recurrence relation $a_{n+2} - 5a_{n+1} + 6a_n = 2,\ n \geq 0$, using the generating function method, subjected to the initial conditions $a_0 = 1$ and $a_1 = 3$. [5]

:::: 10/09/2018 E ::::::