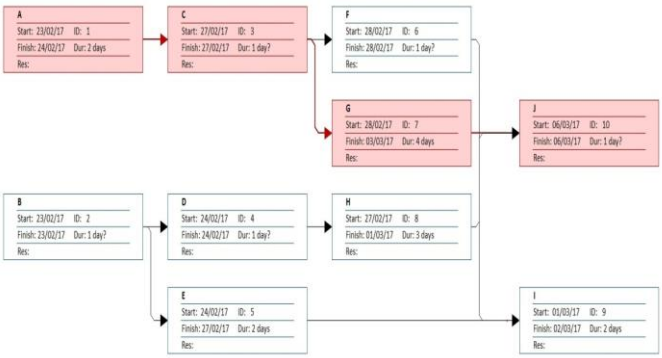
**Step 3:** Draw network diagram of CPM.
Network diagram of CPM using Microsoft Project 2010 presented in Fig.1.

**Fig. 1.** Network of activities with critical path




**Step 4:** Determine critical path, which is the longest path in the network.
From Fig.1, we find that the critical path is A-C-G-J and is denoted by red line.
**Step 5:** Calculate project completion time.
The expected project completion time = $t_A + t_C + t_G + t_J$ = 8 days.

## B. NUMERICAL EXAMPLE 2

Let us consider neutrosophic CPM and try to obtain crisp model from it. Since you are given the following data for a project.

**TABLE 3.** INPUT DATA FOR NEUTROSOPHIC CPM.

| Activity | Neutrosophic Activity Time(days) | Immediate predecessors |
|---|---|---|
| A | $\tilde{2}$ | - |
| B | $\tilde{4}$ | A |
| C | $\tilde{5}$ | A |
| D | $\tilde{8}$ | B |
| E | $\tilde{6}$ | C |
| F | $\widetilde{10}$ | D,E |

Time in the previous table considered as a triangular neutrosophic numbers.
Let,
$\tilde{2} = \langle(0,2,4); 0.8,0.6,0.4\rangle, \tilde{8} = \langle(4,8,15);\ 0.2,0.3,0.5\rangle,$
$\tilde{4} = \langle(1,4,12); 0.2,0.5,0.6\rangle, \tilde{6} = \langle(2,6,18); 0.5,0.4,0.9\rangle,$
$\tilde{5} = \langle(1,5,10); 0.8,0.2,0.4\rangle, \widetilde{10} = \langle(2,10,22); 0.7,0.2,0.5\rangle.$

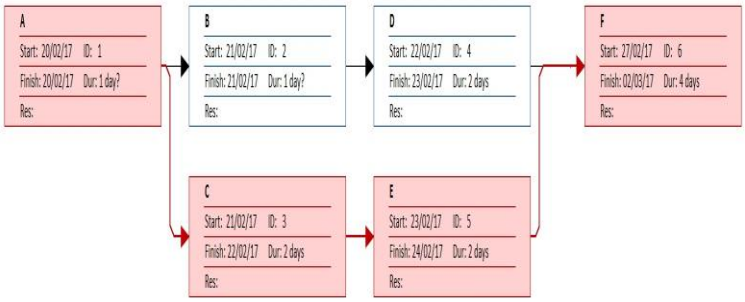
To obtain crisp values of each triangular neutrosophic number, we should calculate score function of each neutrosophic number using equation (4).
The expected time of each activity are presented in table 4.

**TABLE4.** INPUT DATA FOR CRISP CPM.

| Activity | Immediate Predecessors | Activity Time(days) |
|---|---|---|
| A | - | 1 |
| B | A | 1 |
| C | A | 2 |
| D | B | 2 |
| E | C | 2 |
| F | D,E | 4 |

After obtaining crisp values of activity time we can solve the critical path method easily, and determine critical path efficiently.
To draw network of activities with critical path we used Microsoft project program.

**Fig. 2.** Network of activities with critical path




From Fig.2, we find that the critical path is A-C-E-F and is denoted by red line.
The expected project completion time = $t_A + t_C + t_E + t_F$ = 9 days.

## V. CONCLUSION

Neutrosophic set is a generalization of classical set, fuzzy set and intuitionistic fuzzy set because it not only considers the truth-membership and falsity- membership but also an indeterminacy function which is very obvious in real life situations. In this paper, we have considered activity time of CPM as triangular neutrosophic numbers and we used score function to obtain crisp values of activity time. In future, the research will be extended to deal with different project management techniques.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## REFERENCES


[1] J. Lewis," *Project Planning, Scheduling & Control" 4E*: McGraw-Hill Pub. Co., 2005.

[2] H., Maciej, J., Andrzej, & S., Roman."Fuzzy project scheduling system for software development." *Fuzzy sets and systems, 67*(1), 101-117,1994.

[3] F. Smarandache,. “A geometric interpretation of the neutrosophic set-“,A generalization of the intuitionistic fuzzy set. *ArXiv preprint math/0404520,* 2004.

[4] D., Irfan, & S., Yusuf..” Single valued neutrosophic numbers and their applications to multicriteria decision making problem”,2014.

[5] I. M. Hezam, M. Abdel-Baset, F. Smarandache”Taylor Series Approximation to Solve Neutrosophic Multiobjective Programming Problem”,Neutrosophic Sets and Systems An International Journal in Information Science and Engineering Vol.10 pp.39-45,2015.

[6] N . El-Hefenawy, M. Metwally, Z. Ahmed,&,I . El-Henawy.“A Review on the Applications of Neutrosophic Sets”. Journal of Computational and Theoretical Nanoscience, 13(1), 936-944, 2016.

[7] M Abdel-Baset, I.Hezam, & F. Smarandache, “ Neutrosophic Goal Programming”. Neutrosophic Sets & Systems, 11,2016.

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