THE 38TH ISET ANNUAL LECTURE

ISET organized the 38th ISET Annual Lecture. Dr. I.D. Gupta, Former Director, Central Water and Power Research Station, Pune has delivered the 38th ISET Annual Lecture on **'Some Crucial Issues in Earthquake Response Analysis of Gravity Dams'** on March 24, 2018 in Saint Dnyaneshwar Hall, Library Building, Dr. Vishwanath Karad MIT World Peace University, S.No. 124, Paud Road, Kothrud, Pune. Prof. M.L. Sharma, President, ISET presided over the function. Prof. A. Boominathan, E.C. Member, ISET introduced the eminent speaker. The abstract of the Lecture is given below:

Dr. I.D. Gupta delivering the 38th ISET Annual Lecture

Out of nearly 57,000 large dams (15 m or higher) the world over, only about 7.8% dams are located in India as against a population of about 17%.India thus needs to construct a large number of dams in near future to meet the ever increasing requirement of water for irrigation, human consumption, industrial use, and generation of electricity. Water reservoirs created behind large dams also help in flood moderation. Two broad categories of dams are the earth and rock-fill type of embankment dams and the concrete or stone masonry type of gravity dams. A gravity dam resists the water pressure and other overturning forces by its own weight only and thus termed as gravity dam. The gravity dams are the maximum in number due to a number of advantages associated with them. However, many crucial issues specific to the earthquake response analysis of such dams are often not treated appropriately.

Most of the favourable sites having been already utilized, many of the future dams in India will be sited in areas of high seismicity and complex geology, posing great engineering challenges for their safe and economical design. Many of the old dams have been designed using simplified methods of analysis with nominal seismic forces due limited availability of computers and necessary software and due to lack of detailed understanding of the seismotectonics and ground motion characteristics at that time. It is thus necessary to develop physically realistic and mathematically accurate methods of analysis for design of new dams as well as for safety evaluation of important existing dams. In addition, the input ground motion and the material properties of the dam and the foundation also play very important role in the dam design, because even most sophisticated method of analysis will be of no use if these inputs are not realistic.

Earthquake response analysis of gravity dams is a much more complex problem than that of most other structures on land. A gravity dam is a massive structure resting directly on the foundation rock and in contact with the huge reservoir of water upstream. This requires analyzing the dam, a large part of the foundation, and the reservoir of water as a complete single system under simultaneous action of horizontal (transverse) and vertical components of ground acceleration. During intense earthquake shaking, significant additional forces are at play due to interaction between the base of the dam and foundation rock and between upstream face of the dam and the reservoir water. The hydrodynamic interaction forces are also affected significantly by the thickness of the sediments deposited at the reservoir bottom. To get reliable estimate of the earthquake response of a gravity dam, all these effects need to be modeled in realistic and accurate manner.

It is proposed to discuss in some detail how the following complex issues associated with earthquake response analysis of gravity dams can be treated in practically simple ways:

- *(i) Dam – Foundation rock interaction effects*
- *(ii) Hydrodynamic forces*
- *(iii) Reservoir bottom absorption effects*
- *(iv) Stochastic nature of the response*
- *(v) Material properties and performance criteria*

Dr. Ravi S. Jakka, Secretary, ISET proposed vote of thanks. The Annual Lecture was attended by large number of Engineers, Academicians and Students. The 38th ISET Annual Lecture was followed by 47th Annual General Meeting at the same venue.