

## IV/IV B.Tech (Regular) DEGREE EXAMINATION

November, 2022

Institutional Elective (Common to all branches)

Seventh Semester

Rural Water Supply and Environment Sanitation

Time: Three Hours

Maximum: 50 Marks

## ANSWER KEY

- Ans: a) To provide safe and potable drinking water in rural areas. --- 1 M
- b) Several health problems arise due to consumption of contaminated water -- 1 M
- c) The objective of this Programme includes the Monitoring and surveillance of all drinking water sources in the country by the community and also aims to provide safe and adequate water for drinking, cooking and other domestic needs to every rural person on a sustainable basis.--- 1M
- d) Coliforms are bacteria of intestinal origin -- 1 M
- e) Andhra Pradesh, Assam, Bihar, Chhattisgarh, Gujarat, Haryana, Jharkhand, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Orissa, Punjab, Rajasthan, Tamil Nadu, Tripura, Uttar Pradesh, West Bengal – 1 M
- f) Epidemiology is the study of the distribution and determinants of health-related states and events in specified populations. The term epidemiology is applied to cover the description and causation of not only epidemic, infectious disease, but of disease in general, including related conditions. --- 1 M
- g) Clean liners of inside and surroundings of homes. Sanitation includes interventions for the safe management and disposal/re-use of waste.----- 1M
- h) Soak pit is a dug out pit filled with stones or preferably over burnt bricks. The large number of stones or bricks increase the surface area over which biological and chemical action takes place. The water seeps into the ground and reduces danger of polluting the ground water sources. --- 1 M
- i) By proper decomposition, biodegradable waste gets converted into good quality organic manure whereby waste turned into wealth.---- 1 M
- j) Biogas plants produce good amount of clean fuel and environment friendly organic manure.--- 1 M

## UNIT-I

2. a) Surface sources includes intakes from streams and rivers, lakes and small dams; Groundwater sources including dug wells, bore wells, infiltration galleries and springs.---- 5 M

2. b) Water Quantity: Hand pumps and bore wells are the primary source of drinking water used by 42% of the population. The traditional open well serves about 27% and 5% of people still collect drinking water from exposed sources such as rivers, lakes and ponds. In many parts of the country, however, an open well is still the main source of water.---- 5 M

## (OR)

3. a) National Rural Drinking Water Programme (NRDWP) was launched in 2009. It aims to provide safe and adequate water for drinking, cooking and other domestic needs to every rural person on a sustainable basis. The Objectives In rural areas of the country, is to

- i) enable all households have access to and use safe and adequate drinking water and within reasonable distance;
- ii) enable communities to monitor and keep surveillance on their drinking water sources;
- iii) ensure potability, reliability, sustainability, convenience, equity and consumers preference to be the guiding principles while planning for a community based water supply system; iv) provide drinking water facility, especially piped water supply, to Gram Panchayats that have achieved open defecation free status on priority basis; v) ensure all government schools and anganwadis have access to safe drinking water; provide enabling support and environment for Panchayat Raj Institutions and local communities to manage their own drinking water sources and systems in their villages; vi) provide access to information through online reporting mechanism with information placed in public domain to bring in transparency and informed decision making.----- 5 M

3. b) Arsenic contamination, Fluorosis, Bacterial contamination, Contamination due to over-exploitation, effluents and industrial waste, behavioural practices and cultural practices are the problems associated with rural water supply in India.---- 5 M

## UNIT-II

4. a) To demonstrate the link between water and health and show the profound influence of water supply and quality on public health. • To describe the basic classification of water-related disease. • To describe the concept

of the faecal-oral route of disease transmission and the classic waterborne disease cycle. • To describe how improvements in water supplies will lead to improvements in health and a reduction in morbidity and mortality rates.----- 10 M

(OR)

5.a) Over 3 million people, including 1.3 million children's below six die every year from drinking infected water. According to UNICEF and the World Health Organization One in eight people worldwide lack access to safe, clean potable drinking water, and Many people has no choice but to drink water they know is contaminated with potentially life-threatening bacteria. In poor developing countries people, obtain up to 5 gallon (Appox.19-20 litter) of safe, clean water each day. In ancient ages of human civilization boiling water over a wood fire is one of commonly cheaper clean method for water solution, but it is still hazards in poor ventilation kitchen and what's more it fuels deforestation.

Approximately 80% of all illnesses in developing countries are caused by poor water and sanitation condition. It is normal for women and young girls to need to walk a few kilometers consistently to bring water for their families. When filled, water containers can weigh as much as 20 kg (44 lbs). In the last century, water use has greatly outpaced the rate of population growth: people are using more water than ever before. By 2025, up to 1.8 billion individuals could face water scarcity. By 052- EVH-17 2025, up to 1.8 billion people could face water scarcity Water scarcity can take two forms: physical water scarcity, or low quantity of water, and economic water scarcity, or low quality of water. Physical water scarcity term typically applies to dry, arid regions where fresh water naturally occurs in low quantities. This is in effect incredibly exacerbated by anthropogenic exercises that take surface and ground water quicker than the earth can recharge it. Locales most influenced by this kind of water lack are Mexico, Northern and Southern Africa, the Middle East, India, and Northern China. Economic water scarcity applies to ranges or societies that fail to offer the monetary assets and/or human ability to put resources into water sources and take care of the local demand. Water is often only available to those who can pay for it or those in political power; leaving millions of the world's poorest without access. The regions most affected by this type of scarcity are portions of Central and South America, Central Africa, India, and South East Asia. India's water crisis is established in three reasons. The primary is insufficient water per person as a consequence of population growth. The second cause is poor water quality coming about because of inadequate and postponed investment in urban water-treatment offices. The third issue is waning groundwater supplies because of over-extraction by agriculturists. This is on account of groundwater is an open-access asset and anybody can pump water from under his or her own particular area. India has 16 per cent of the world's population and four per cent of its fresh water resources. Around 37.7 million Indians are affected by waterborne diseases annually, 1.5 million children are estimated to die of diarrhea alone and 73 million working days are lost due to waterborne disease each year. The resulting economic burden is estimated at \$600 million a year. Providing safe drinking water to all in rural India is a challenging task. The user should be made aware of the importance of preventing contamination of water and user's accountability should also 052- EVH-17 realize their individual responsibility in maintaining the quality of water. Researcher point out the various low cost water treatment method suitable in rural area as Bamboo charcoal (Activated carbon) Solar sterilization, distillation, Chlorine filters, Bone ,Everything-but-the-sink portable filter ,Slow sand filtration ,and Emergency homemade filter.

-Household purification of water by Boiling; Chemical disinfection using chlorine, Iodine, Potassium permanganate; Filtration using Sand Filter, Ceramic filters, etc.----- 10 M

### UNIT-III

6.a) Water supply and sanitation were added to the national agenda during the country's first five year plan. It was only in early eighties, with the thrust of the International Water and Sanitation Decade, that India's first nation wide programme for rural sanitation, the central rural sanitation programme was launched in 1986 in the Ministry of Rural Development with the objective of improving the quality of life of rural people an to provide privacy and dignity of women. The programme provided large subsidy for construction of sanitary latrines for BPL households. It was supply driven, highly subsidized, and gave emphasis on a single construction model. Based on recommendations of the National Seminar on Rural Sanitation in September 1992, the programme was again revised to make it an integrated approach for rural sanitation

-- The 54<sup>th</sup> round of National Sample Survey (July 1999) on drinking water, sanitation and hygiene in India provides data relating to source, quality etc. Of drinking water, and conditions of sanitation and hygiene of

households. This data was collected in the first half of 1998. Around 50 per cent of rural households were served by a tubewell/handpump, 26 per cent by a well, and 19 per cent by tap. Only about 31 per cent of rural households reported having their source of water within their premises, the rest had to go out to fetch their drinking water. About 60 per cent did not have to go beyond 0.2 km for this. Seasonal disruption of supply was common, especially in the summer months. Households still depended on supplementary sources, especially where tubewell or hand pump was the main source. Practices of filtering or boiling water before drinking were almost non-existent.

--- States have reported that more than 95 per cent coverage has been achieved. However, reliable data on the ground reality of rural water supply is lacking. A re-assessment survey of rural habitations has become necessary and the data should be updated periodically through a 'Return Filing' system where by each Panchayatiraj institution (PRI) will report on the status of these services in its area. Random sampling will need to be done to validate this. In view of the importance of basic data, however, Central assistance for PRI and urban local bodies (ULBs) could be made conditional on a 'Return Filing' system being established.

The most important elements of the rural sanitation package are: - Safe handling of drinking water.

- Disposal of wastewater.
- Safe disposal of human excreta.
- Human excreta is associated with more than 50 per cent of diseases.
- Safe solid waste disposal.
- Home sanitation and food hygiene.
- Personal hygiene, particularly, washing one's hand with soap.
- Sanitation in community.-----5 M

b) Stabilization ponds, Imhoff tanks, Soak pit etc.-----5 M

(OR)

7.a)

septic tanks provide an excreta treatment in locations where a sewerage system is not available. For rural areas, the septic tanks offer a limited use, especially for locations with high water table. However, institutions like schools, dispensaries or families who can afford the cost and manage the quantity of water required, a septic tank system for excreta disposal could be considered. The system consists of a water tight settling tank with one or two chambers/compartments, to which waste is carried by water flushing down a pipe connected to the toilet which usually has a U-trap. However, this system does not dispose of wastes, it only helps to separate the solid matter from the liquid. Some of the solids float on the surface, where they are known as scum, while others sink to the bottom where they are broken down by the bacteria to form a deposit called sludge. The liquid effluent flowing out of the tank is, from a health point of view, as dangerous as raw sewage and remains to be disposed off, normally by soaking into the ground through a soak-pit or with a connection to small bore sewers.-----5 M

7. b) Soakage Pits and Trenches etc.-----5 M

#### UNIT-IV

8. a) Sanitation is the basic need, as basic as drinking water or food. A Sanitary toilet within or near home, provides privacy and dignity to women. Mahatma Gandhi emphasized the link between sanitation and health. Performance Review of Rural Sanitation Sector TSC in Tenth Plan: The TSC is being implemented in 578 districts of 30 states/UTs with support from central government and the respective state/UT government. Major issues in rural sanitation coverage emphasis on construction of household toilets though laudable, needs to reorient itself to a vigorous information and education campaign mode to bring about a change in mind set. The issue of convergence of the programme with health awareness received a boost only after the launch of National Rural Health mission.

--- Eleventh plan Priorities: The Nirmal gram puraskar has brought a sea change in the attitudes of the community and it is promoting a healthy competition among the panchayats for achieving total sanitation. The existing Total Sanitation Programme should include safe disposal of night-soil, rainwater, domestic liquid and solid waste. It should not be restricted to construction of latrines only. Awareness of sanitation standards and health impact of unsanitary conditions continues to be low. Rural sanitation is promoted as a total package consisting of safe handling of drinking water, scientific disposal of waste water, safe disposal of human excreta including child excreta, solid waste management, domestic sanitation and food hygiene, personal hygiene and village sanitation. However, there has hardly been any significant change in the sanitary conditions in the villages in India. The 54<sup>th</sup> round of National Sample Survey indicates that only 17.5 per cent of rural population were using latrines. There is a need to implement a vitalised programme for rural sanitation which

must have the following elements:

- Preference has to be given to the twin pit model of water-sealed latrines. However, the cost of such a unit may be an inhibiting factor. The successful model of Midnapur In West Bengal, where asinglepit is provided initially, may also be considered for adoption in their districts with appropriate changes to suit local conditions.
- School sanitation (providing toilets) should be given highest priority to inculcate safe hygienic habits among school children.
- Village Panchayats should adopt building bye-laws where dry latrines are not permissible. Any latrine to be constructed should be of the water-sealed type with a leach-pit. This will prevent the emergence of the problem of manual scavenging.
- For the success of the scheme, and to overcome the huge problem of insanitary practices in the country, a large programme of education, propagation, training, designing and development, production, and installation, needs to be taken. NGOs should be mobilised to support to the programme, especially for supervision, monitoring, training and development work. A suitable provision for the participation of the non-governmental organizations in the sanitation programme should be made in the project costs.----- 10 M

(OR)

9.a) A landfill is a properly designated area and used for the disposal of non-biodegradable and non-recyclable inorganic solid waste. Landfill is considered to be a viable option.

Advantage: Takes care of the problem of disposal of non recyclable solid waste

Applicability: Community level with the cooperation of individual household.

Action: Gram Panchayat to organize themselves to construct and maintain landfill. Gram Panchayat may make use of Youth Club members/ Women Self Help Groups.

- Description: Selection of Landfill Site: Gram Panchayat in construction with Zilla Parishad/Block Panchayat should select the landfill site which should be:
  - Located at the outskirts of the village
  - Accessible
  - On Vacant/Uncultivated land
  - Located in the natural depressions with slight slopes
  - Waste from landfills leaches into the aquifer below site should be such as to avoid surface water and ground water pollution
  - Before establishing any landfill site, baseline data of ground water quality in the area shall be collected and kept as a record for future references
  - Procedures to be followed for landfill construction
  - Wastes should be compacted to achieve high density
  - Wastes should be immediately covered with a minimum 10cm of soil/debris
  - Before the monsoon season, an intermediate cover of soil approximately 40-65 cm thick should be placed on the landfill to prevent infiltration
  - Proper drainage system should be constructed to divert run-off water
  - After the completion of landfill a final cover should be provided to prevent infiltration and erosion.
  - Landfill site should be properly fenced with a provision of a gate with locking arrangement by the gram panchayat/community
  - Plantation at landfill site should be encouraged to combat pollution. It should be in sufficient density to minimize soil erosion
  - The plants should be locally adapted, non-edible, drought and extreme temperature resistant, short rooted and of low nutrient demanding variety

Operation and Maintenance:

- Gram Panchayat/ Community should prevent entry of stray animals and unauthorized persons through protective measures.
- Regular Monitoring of ground water is required for maintaining groundwater quality

Materials required: The system is labor intensive and primarily requires earthwork job for disposal of non recyclable solid waste. The size of the landfill will depend upon the quantity of non recyclable solid waste to be disposed off into the pit daily.

Limitations: Entry of cattle and grazing on the landfill site in an unfenced landfill would be hazardous ----- 10 M

*CSK*  
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**Dr. Ch. NAGASATISH KUMAR**  
M.Tech., Ph.D., (NITW)  
Professor & Head  
Civil Engineering Department  
Bapatla Engineering College  
BAPATLA - 522 102.

*JPM* 05/11/22  
Submitted by  
Dr.T.Phani Madhavi  
Professor of Civil Engineering  
Subject Coordinator