Paper code :- U117-103 (RE-FS&F)

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F. Y. B. TECH. (COMMON) (SEMESTER - I) U117-103 (RE-FS&F)
COURSE NAME: **Basic Civil Engineering.** CODE: U117-103 (2017 PATTERN)

Model Answers and Scheme of Marking (Paper#3)

Q.1 (a) Importance of ITS can be understood from the following points.

1. Opportunity for interdisciplinary approach, research and development.
2. Creation of high technology employment/ jobs and entrepreneurship.
3. Real time traveler information and public transportation management.
4. Efficient traffic management; traffic signals, crossings and intersection, transit management; control and collision avoidance.
5. Avoidance of traffic delays and unnecessary longer routes.
6. Efficient management of emergency/ accidents/ incidents.
7. Quick vehicle number-plate recognition and toll collection.
8. Electronic fare collection.
9. National/ International inter-operations easily possible.
10. Deriving environmental and energy benefits through efficient operations.
11. Customer satisfaction resulting in to more productivity and health benefits.
12. Human intervention, related problems (Lengthy procedure, decision making, corruption, etc.) and delays are eliminated from traffic management since everything gets recorded in digital (soft) form.

Essential components of ITS:

- GPS (Global Positioning System) and/ or smart phone based monitoring
- GIS (Geographical Information System)
- CCTV network and monitoring system.
- Wireless communication
- High computation technologies (Computers)
- Technological advances in electronics, sensors, telecommunications and information technology; coupled with ultramodern/state-of-the-art microchip, RFID (Radio Frequency Identification), and inexpensive intelligent beacon sensing technologies.
- Vehicle- and infrastructure-based networked systems, i.e., Intelligent Vehicle Technologies.
- Infrastructure sensors are indestructible (such as in-road reflectors) devices that are installed or embedded in the road or surrounding the road (e.g., on buildings, posts, and signs), as required, and may be manually disseminated during preventive road construction maintenance or by sensor injection machinery for rapid deployment. Vehicle-sensing systems include deployment of infrastructure-to-vehicle and vehicle-to-infrastructure electronic beacons for identification communications and may also employ video automatic number plate recognition or vehicle magnetic signature detection technologies at desired intervals to increase sustained monitoring of vehicles operating in critical zones.
- Audio, Video and Bluetooth detection.
- Weather information/ forecasting system.

Explanation of importance of intelligent transportation system 2 marks, brief explanation of any 2 essential components of ITS 2 marks each. *[Total 6 marks]*

(b)

Road alignment means position or layout of the central line of road on the ground.

Four guiding principles applied for an ideal highway alignment between two terminal stations are:

1) Ease of alignment: The highway alignment should be easy in the sense that it is possible to construct and maintain the road with practically no serious problems. There should be minimum obstacles on the alignment. It will also ensure smooth and comfortable operation of vehicles on gradients and curves.
2) Economy: The alignment should be selected in such a way that the total cost including initial cost, maintenance cost and operation cost is brought down to the minimum level. The economics of each alignment should be well studied after analyzing all the relevant factors before making the final choice.
3) Safety: The aspect of safety should be viewed from two considerations, namely, before construction and after construction. The ideal alignment will ensure safety during the construction activities of highway. It will also be safe for carrying out the maintenance of highway and at the same time, it will allow the traffic movements safely and with confidence.
4) Shortest possible length (Distance): The ideal alignment would suggest the shortest route linking the two terminal stations and as per the definition, a straight line indicates the shortest distance between two points. Thus a straight alignment would grant the shortest distance between points to be linked up by the proposed highway. Such a route will be cheap in construction as length will be the shortest and also it will reduce the time of travel.

Meaning of road alignment 1 mark, brief explanation of any 2 guiding principles 2 marks each.

[Total 6 marks]

(c)

Types of bridges:

1) Beam or Girder Bridge – Simply supported or cantilever or continuous type in which the loads are transferred to the subsoil through reactions at the supports.
2) Arch Bridge – Load transfer is through the ends of arch OR arches.
3) Truss Bridge – Loads are transferred through the members of truss and the support reactions.
4) Suspension Bridge – Load transfer occurs through the cable and piers.
5) Bascule Bridge – Single OR double bascule. Can swing about horizontal axis in vertical plane.
6) Swing Bridge – Can swing in horizontal plane about vertical axis.
7) Vertical Lift Bridge – Can be bodily lifted up or down.

2 marks for any 4 correct types of bridges. 1 mark for explanation of any one type, 1 mark for sketch.

[Total 4 marks]

OR

Q.2(a)

About 8 sectors or categories of physical infrastructure projects can be listed for convenience as: **(i)**new township/ town, **(ii)**transportation, **(iii)**public health/ sanitation, **(iv)**power (energy), **(v)**water management, **(vi)**telecommunication, **(vii)**environmental management, and **(viii)**disaster management.

Transportation sector: Development of efficient transportation routes/ means and systems such as different types of roadways, railways, waterways, airways is very essential for modern day commuting as well as transportation of goods and commodities. Design, construction of allied structures (such as sidewalks or footpath, tunnels, bridges, platforms, etc.), traffic management and their maintenance is carefully done by Civil Engineer. Civil Engineers will have key role in the 21st century due to more use of traditional as well as mass rapid transit systems such as metro and mono railways; modern (Smart) traffic management and airways. Rapid balanced development of rural/ under-developed regions can be

implemented effectively through thoughtfully developed transportation network. This is the most important and key sector for rapid development of developing countries like India.

3 marks for stating six major sectors in infrastructure engineering. 3 marks for discussing the importance of transportation sector for overall development of India. *[Total 6 marks]*

(b)

Tabular comparison of airways, waterways and railways with respect to Flexibility for users, and Initial, operational and Maintenance Cost: 3 marks for each correct comparison. *[Total 6 marks]*

(c)

2 marks for proportionate sketch of a bridge, 2 marks for labeling all components/parts. *[Total 4 marks]*

Q.3(a)

2 marks for neat schematic diagram of water supply system, 1 mark each for brief explanation of its four components (i.e. Works or Units in it). *[Total 6 marks]*

(b)

1 mark for the meaning of *Green House Effect*. 2 marks for proper explanation, 1 mark for neat sketch. *[Total 4 marks]*

(c)

Proper classification of air pollutants, their sources & ill-effects in a tabular form. *[Total 4 marks]*

OR

Q4(a)

(1)Physical characteristics: Useful to characterize the water appearance.

a. **Turbidity** gives water clarity (NTU, nephelometric unit) & 5NTU is upper limit given by WHO.

b. **Color** is measured by apparent color (unfiltered) or true color (filtered by a 40 μm screen so that the color is mainly from dissolved constituents).

c. **Particles** are measured by quantity and quantity and sizes (1 to 60 μm). They are generally not visible to the human eye and may adsorb toxic metals or synthetic organic chemicals. Particles are called suspended solids if their sizes are >1 μm, colloidal particles if sizes are in 0.001-1 μm and dissolved particles if sizes are < 0.001μm.

d. **Taste** and **odor** come from dissolved organic/ inorganic constituents and biological sources (e.g., decayed algae). Water **temperature** is very important and changes with seasons, which affects water's physical, chemical and biological properties.

(2) Chemical characteristics: Used to describe various chemical constituents in water.

a. **Calcium** is abundant in water and is a major constituent of water hardness (with magnesium).

b. **Chloride** concentration can be high if water source is contaminated by brine water.

c. **Fluoride** may exist in natural water or may be added artificially in some areas.

d. **Iron** is frequently found in water and can create a brownish color to bathroom fixtures.

e. **Nitrate** (and other forms of nitrogen) may be found in surface and groundwater from urban and agricultural runoff (e.g. from ammonia fertilizers).

f. **Sulphur** may occur as sulphates/ reduced sulphides (in groundwater with low dissolved O_2).

g. **Arsenic** is widespread in the world, & is serious in Bangladesh, India in hand-pumped wells.

h. For organic constituents, **natural organic matter** (NOM) is derived from degraded vegetation and measured as **total organic carbon** (TOC). **Synthetic organic chemicals** (SOCs) are due to industrial activities, urban runoff, etc.

(3) Biological characteristics: These are used to identify/ describe pathogens and microorganisms.

a. **Pathogens** include many classes of microorganisms such as bacteria, viruses, protozoa and helminths, which cause sickness or disease in their hosts. Since there are many different pathogens, it is not practical to monitor all of them. In reality, indicator organisms are identified and used in checking biological water quality. The commonly used ones are total coliforms, fecal coliform and E-coli. Clearly, although indicator organisms can usually provide a good indication of water biological quality, they cannot prove the water is safe and other methods must be used to confirm the absence of various pathogens if in doubts.

1 mark each for brief expl. of two characteristics from 3 categories of characteristics of water. *[Total 6 marks]*

(b)

Urbanization has encouraged the migration of people from villages to the urban areas. This has given rise to a number of environmental problems such as, water supply with desirable quality and quantity, wastewater generation and its collection, treatment and disposal.

Out of this total water supplied, generally 60 to 80% contributes as a wastewater. In most of the cities, wastewater is let out partially treated or untreated and it either percolates into the ground and in turn contaminates the ground water or it is discharged into the natural drainage system causing pollution in downstream water bodies.

Strength of pollution of waste water is measured in terms of BOD (Biological or Biochemical Oxygen Demand) and COD (Chemical Oxygen Demand).

BOD is the amount of Oxygen needed for digesting the organic matter in the waste water sample. (Generally it is BOD_5 i.e. BOD measured at the end of 5 days of digestion of the matter). COD is the amount of Oxygen consumed by chemical reactions in the waste water sample/ solution. Strong Oxidizing agents/ chemicals such as potassium dichromate or potassium permanganate is used to oxidize the matter in the sample.

The objective of wastewater (sewage) collection and disposal is to ensure that sewage discharged from communities is properly collected, transported, treated to the required degree so as not to cause danger to human health or unacceptable damage to the natural environment and finally disposed off without causing any health or environmental problems.

4 marks for brief explanation of importance of wastewater management. *[Total 4 marks]*

(c)

1 mark for stating 2 types of dams. 2 marks for correct explanation of one type of dam, 1 mark for appropriate sketch. *[Total 4 marks]*

Q.5 Rewrite sentences 'a' to 't' & the most appropriate option as Answer.

a) In general, infrastructure means ..... [1]
(iii)Overall facilities, amenities and services.

b) Object of 'Surveying and Planning' is to ..... **(i)draw maps** [1]

c) Design of a building foundation is an application of ..... [1]
(iv)Geotechnical Engineering

d) Determination of the cross sectional dimensions of beams of a building is an application of ..... (i)Structural Engineering [1]

e) Out of the following; ..... does not fall in scope of Civil Engineer. [1]
(iii)Design of transformers

f) Construction engineering mainly involves construction of ..... [1]
(ii)Both I & ii

g) Bearing capacity of soil can be determined by ..... [1]
(iv)plate load test

h) Full form of the term RMC is ..... **(iii)Ready Mix Concrete** [1]

i) Identify the 'Odd' material not fitting in the group of construction materials. **(i)HYSD** [1]

j) In ..... type of structure, more floor area is available due to provision of thinner walls. **(i)Framed** [1]

k) Main difference between plans and maps is ..... [1]
(iv)The scale adopted for them

l) Identify correct application of GPS from following. **(iv)Both i and ii** [1]

m) Total Station **cannot** be used for ..... [1]
(ii)Measuring area of irregular figure

n) Least count of standard 4 m telescopic leveling staff is **(ii)0.005 m** [1]

o) If staff readings on successive points A and B in a leveling work are exactly the same (identical); ..... [1]
(iii)Ground is plane and horizontal between A and B

p) Positions of doors and windows on external walls to get desirable views and conceal undesirable views are considered in the planning principle ..... **(iii)Prospect** [1]

q) For a building with total 50 m^2 built up area constructed on a plot of 200 m^2 area, the floor area ratio (FAR) will be .....**(ii)0.25** [1]

r) Set-back distance is essential for ..... **(iii)Road widening** [1]

s) Height of room plays an important role in ..... **(i)Roominess** [1]

t) Identify which is **NOT** a green building rating system. [1]
(iii)ENERGY BUILD

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NOTE: Apart from the solution given above; other relevant, correct matter shall be treated as correct answers and proportionate marks shall be given.