TED (22) –2011 **REVISION – 2022**

SECOND YEAR KGCE EXAMINATION IN CIVIL ENGINEERING

CIVIL ENGINEERING-2 (TRADE THEORY)

ANSWER KEY OF PAPER SET-2

(Time : 3 hours) (Maximum Marks: 60)

PART-A

(There should be at least 3 questions from each module)

(Maximum Marks: 20x1 Marks = 20 Marks)

SCHEME OF VALUATION

Q No	Answer
I 1	a) Setting out work
2	d) All of the above
3	d) Prismoidal Formula
4	d) All of the above
5	b) Carpet Area
6	a) 50000
7	b) m^3
8	c) 3% - 5%
9	d) Transit theodolite
10	c) Least count
11	a) 2
12	a) Eliminate parallax error
13	d) Telescope Inverted
14	c) 3 Screws
15	c) Global Positioning System
16	d) Integration of all the above
17	d) Any of the above
18	b) Micro processor
19	a) Rotation of optical axis
20	d) Surfer
II 1	When a series of cross – sectional areas calculated at equidistant points, the volume may be worked out by Trapezoidal formula or Prismoidal formula **a) <u>Trapezoidal formula:</u>** <u>Volume by Trapezoidal Method:</u> $V = \frac{D}{2}(A_0 + 2A_1 + 2A_2 + \ldots + 2A_{n-1} + A_n)$ Where, A_0, A_1, $A_2 \ldots\ldots\ldots A_n$- Area of cross sections D = Distance between the section V = Volume of cutting or banking **b) <u>Prismoidal Formula:</u>** $\frac{V = \frac{D}{3}(A_0 + A_n + 4(A_1 + A_3 + A_5 + \cdots) + 2(A_2 + A_4 + A_6 + \cdots))}{}$ ▪ In case of Prismoidal Formula, it is necessary to have an odd number of sectional area.

2

L = 200, $d1$=1m, $d_2 = 1.6$m, B=10, S:1 = 2:1

a) Mid Sectional Formula:

Quantity of Earthwork = $(Bd_m + sd_m^2)$ x L

= (10x1.3+2x1.3^2)x200 = 3276m^3

where d_m= (1+1.6)/2

b) Mean Sectional Formula:

$A_1 = Bd_1 + sd_1^2$=12m^2

$A_2 = Bd_2 + sd_2^2$=21.12m^2

Mean Sectional Area A = $\frac{A_1+A_2}{2}$= 16.56m^2

Quantity = 16.56 x 200 = 3312m^3

3

Plinth Area = 1500m^2

Plinth Area Rate = Rs.950/m^2

Building cost = Plinth Area x Plinth Area Rate = 1500 x 950

= Rs.14250000

Special Architectural treatment = (1.5/100)x 14250000 = Rs.21375/-

Water supply and Sanitary Installations @5% = Rs.71250/-

Internal Installations @ 14% = Rs. 199500/-

Services @ 6% = Rs.85500/-

Sub Total = Rs. 18,02,625/-.

Contingencies @ 3% = (3/100) x 18,02,625 = Rs.54079/-.

Supervision charges @ 8% = (8/100) x 18,02,625 = Rs.1,44,210/-.

Grand Total = Rs. 20,00,914/-.

4

Total Length of Centre line = 2 x C-C Length of Long wall + 3 x C-C Length of short walls

= 2 x 7.60 + 3 x 5.30

= 31.10 m

Sl No.	Details of work	No	L(m)	B(m)	H(m)	Qty	Remarks
1	Earthwork excavation	1	30.20	0.90	1.10	29.90	30.2=31.1-2x(0.9/2)
2	Concrete in Foundation	1	30.20	0.90	0.30	8.15	

(The qn can be answered either by Centre line method or by Long wall- Short wall method)

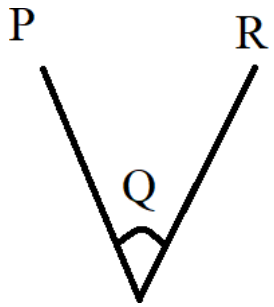
5

a) **Centre line Method:** Total centre line length of wall in a building is calculated and multiplied by the breadth and depth of respective item to get the total quantity of item.

- Simplest method for rectangular, hexagonal and octagonal type buildings having no cross walls.
- Where there are number of junctions in a building, for every junction special consideration have to be made to find the correct quantity (For each junction half breadth of the respective item is to be deducted)
- C/C length of long wall and short wall will remain the same for excavation in foundation, for concrete in foundation, brick masonry in foundation, plinth and superstructure.
- Quick method but requires special attention and considerations at the junctions.

a) Long wall - Short wall method:

- In this method, longer walls in a building are considered as long walls and measured from out to out

	- Shorter walls are considered as short walls and are measured from in to in - Long wall length, out to out = Centre to centre length + one breadth - Short wall length, in to in = centre to centre length – one breadth - Method is simple and accurate and there is no chance of any mistake
6	Temporary adjustments in a theodolite are: a) Setting up over the station: Centring of the instrument over the station by a plumb bob or by optical plummet and approximate leveling with the help of tripod legs. b) Levelling Up: After having centred and approximately leveled the instrument, accurate leveling is done with the help of foot screws and with reference to the plate levels. c) Elimination of parallax: Parallax is a condition arising when the image formed by the objective is not in the plane of the cross hairs. It is done by i) Focusing the eye piece for distinct vision of the cross hairs and ii) focusing the objective to bring the image of the object in the plane of cross hairs.
7	 To measure the horizontal angle PQR : 1) Set up the instrument at Q and level it accurately. 2) Release all clamps. Turn the upper and lower plates in opposite directions till the zero of one of the vernier is against the zero of the scale and the vertical circle is to the left. Take both vernier readings. 3) Loose the lower clamp and turn the instrument towards the signal at P. 4) Unclamp the upper clamp and rotate the instrument clockwise about the inner axis to bisect the point R 5) Read both verniers. Reading of vernier A gives the angle PQR directly while the vernier B gives by deducting 180^0. 6) Change the face by transiting the telescope and repeat the whole process. The mean of the two vernier readings gives the angle with other face. The average horizontal angle is then obtained by taking the mean of the two readings with different faces.

8	Global Positioning System Global Positioning System is a satellite-based navigation system which was created by U.S. Department of Defence. It gives geolocation and time information to a GPS receiver in all climate conditions, anywhere on or close to the Earth where there is an unobstructed line of sight to four or more GPS satellites. GPS has three segments: 1. Space segment: The space segment is made up of at least 24 satellites which are placed on six circular orbital planes 2. Control segment: ontrol segment handles synchronizing satellite's atomic clocks and adjusts the ephemeris of each and every satellite's inner orbital model. 3. User segment: User segment is for typical users (like civil, commercial, scientific, military users, etc.) that want to make use of GPS receivers to estimate their position. At present, GPS is a multi-use, space-based radio navigation system belonging to the united states government and controlled by the US Air Force to meet national defense, homeland security, civil, commercial, and scientific requirements. GPS satellites circle the Earth 2 times a day in a precise orbit. GPS position is determined using data coming from satellites. GPS receiver computes distance to satellites and using theirs position calculate its own. GPS satellites circle the Earth 2 times a day in a precise orbit. GPS position is determined using data coming from satellites. GPS receiver computes distance to satellites and using theirs position calculate its own.
9	EDM is a general term embracing the measurement of distance using electronic methods. In electro magnetic method, distances are measured with instruments that rely on propogation, reflection and subsequent reception of either radio, visible light or infra red waves. Types of EDM Instruments: a) Microwave Instruments: These instruments come under the category of long range instruments where in the carrier frequencies of the range of 3 to 30GHz enable distance measurements upto 100km range. Tellurometer come under this category. b) Visible Light Instruments: These instruments use visible light as carrier wave, with a higher frequency, of the order of 5×10^{14} Hz. Geodimeter comes under this category. c) Infrared Instruments: They use near infrared radiation band of wavelength about 0.9µm as carrier wave which is easily obtained from Gallium Arsenide infrared emitting diode.Wild Distomats fall under this category of EDM instruments.
10	i) Field work is carried out very fast. ii) Accuracy of measurement is high. iii) Manual errors involved in reading and recording are eliminated. iv) Calculation of coordinates is very fast and accurate. Even corrections for temperature and pressure are automatically made. v) Computers can be employed for map making and plotting contour and cross-sections. Contour intervals and scales can be changed in no time. **(Any Five Points)**
11	**a) Angle Measurement:** To measure horizontal and vertical angles, the electronic theodolite of device is used with an accuracy of 2-6 seconds. For horizontal measurement of angles, any direction can be taken as reference. In case of vertical measurement of angles,

	upward direction is taken as reference. b) **Distance Measurement in Total Station**: To measure the distance, Electronic Distance Measuring (EDM) instrument of total station is used with an accuracy of 5-10 mm per km. The range of EDM varies from 2.8-4.2 km. **c) Data Processing:** Computation of horizontal distances along with X, Y, Z coordinates is done by the instrument called Microprocessor. Hence, if atmospheric temperature and pressure is applied, the microprocessor applies suitable correction to the measurements.
12	a) Centring: The process of setting the Theodolite exactly over the station mark is known as Centring. b) Transiting: Process of turning the Telescope in vertical plane through 180^0 about the trunnion axis. c) Swinging the Telescope: Process of turning the telescope in horizontal plane. d) Changing Face: Operation of bringing the face of the telescope from left to right and vice versa. e) Face left observation: If the face of the vertical circle is to the left of the observer, the observation of the angle is known as Face left observation.