Bihar Engineering University, Patna
End Semester Examination - 2022

Course: B.Tech. | *Semester: III* | *Time: 03 Hours*
Code: 101308 | *Subject: Surveying & Geomatics* | *Full Marks: 70*

Instructions:-

(i) The marks are indicated in the right-hand margin.
*(ii) There are **NINE** questions in this paper.*
*(iii) Attempt **FIVE** questions in all.*
(iv) Question No. 1 is compulsory.

Q.1 ***Choose the correct answer of the following (Any seven questions only):*** **[2 x 7 = 14]**

(a) For a well–conditioned triangle, no angle should be less than
(i) 20 degree (ii) 30 degree (iii) 45 degree (iv) 60 degree

(b) The curvature error and atmospheric refraction are eliminated by
(i) Stadia levelling (ii) Reciprocal levelling
(iii) Simple levelling (iv) Differential levelling

(c) How many satellites required for GPS to provide accurate positioning?
(i) 4 (ii) 10 (iii) 24 (iv) 50

(d) The magnetic bearing of a line AB is S45^{0}E and the declination is 5^0 West. The true bearing of the line AB is
(i) S45^{0}E (ii) S40^{0}W (iii) S50^{0}E (iv) S50^{0}W

(e) Tellurometer is an instrument used for
(i) GPS (ii) EMR (iii) GTS (iv) EDM

(f) The line normal to the plumb line is known as
(i) horizontal line (ii) level line (iii) datum line (iv) vertical line

(g) Which of the following characteristic features may be used while plotting a contour plan?
I. Two contour lines having the same elevation cannot unite and continue as one line.
II. Contour lines close together indicate a gentle slope.
III. Contour lines cross a valley line at right angles.
Select the correct answer using the codes given below:
(i) I, II and III (ii) I and II (iii) II and III (iv) I and III

(h) The "Back sight" reading on a vertically held staff at a point A on the floor along the centre line of railway tunnel is 3.465 m, and the "Fore sight" on the inverted staff held at the roof of the tunnel just vertically above A is 1.155 m. The height of the tunnel along the centre line at floor point A is
(i) 2.310 m (ii) 3.465 m (iii) 4.620 m (iv) 6.930 m.

(i) An image of a hilltop is 87.5 mm from the centre of a photograph. The elevation of the hill is 665 m and the flight altitude is 4660 m from the same datum. The image displacement due to elevation of the hill will be [Take f = 210 mm]
(i) 61.3 mm (ii) 8.5 mm (iii) 87.5 mm (iv) 12.5 mm

(j) The correct sequence of setting up a plane table at a working station is
(i) Levelling → Centering → Orienting (ii) Centering → Orienting → Levelling
(iii) Orienting → Levelling → Centering (iv) Levelling → Orienting → Centering

Q.2 (a) Discuss the errors in electronic distance measurements. **[7]**
(b) What do you understand by GPS? How is it helpful in mapping of a region? **[7]**

Q.3 (a) Write any four applications of remote sensing in Civil Engineering. **[5]**
(b) An area of 10 km x 20 km is to be surveyed using aerial photogrammetry. Average scale of photograph is 1:10000 at ground elevation of 400 m above the datum. Focal length of camera used is 20 cm and size of photographs are 23 cm x 23 cm. The speed of aircraft is 270 kmph. The forward lap in photographs is 70% and side lap is 30%. Determine the flying height, exposure interval and number of photographs required to complete the survey. **[9]**

Q.4 The following are the bearings observed while traversing with a compass, an area where local attraction was suspected: [14]

Line	FB	BB
AB	59°00′	239°00′
BC	139°30′	317°00′
CD	215°15′	36°30′
DE	208°00′	29°00′
EA	318°30′	138°45′

Find the correct bearings of the lines and also the true bearing if the magnetic declination is 10° W.

Q.5 (a) Explain how you would take field observations with a theodolite so as to eliminate the following: [6]

(i) Error due to eccentricity of verniers
(ii) Error due to nonadjustment of line of sight
(iii) Error due to slip

(b) From a running fly levels from a bench mark RL 183.215, the following readings were obtained: [8]

BS	1.215	2.035	1.980	2.625
FS	0.965	3.830	0.980	

From the last position of the instrument, five pegs at 20 m intervals are to be set out on a uniform rising gradient of 1 in 40; the first peg is to have an RL of 181.580. Work out the staff readings required for setting the tops of the pegs on the given gradient.

Q.6 The following observations of three angles A, B and C were taken at a triangulation station: [14]

Observations	Weights
A = 72°12′45.5″	3
B = 53°18′53.6″	4
C = 110°24′48.5″	2
A + B = 125°31′36.5″	2
B + C = 163°43′44.6″	2
A + B + C = 235°56′26.2″	1

Determine the most probable values of the angles.

Q.7 (a) Deduce the relationship between the degree and radius of a curve. [6]

(b) A highway curve which deflects through 80° is to be designated for a maximum speed of 100 kmph, a maximum centrifugal ratio of ¼ and a maximum rate of change of acceleration of 0.3 m/s^3. The curve consists of a circular arc with two cubic spirals at the ends. Calculate the radius of the circular arc, the length of the transition, the total length of the combined curve and the chainages of all salient points if that of the intersection is 4200 m. [8]

Q.8 (a) Discuss different types of levelling with the help of suitable diagram(s). [7]

(b) Discuss the different instruments used in plane table surveying. Also explain the method of intersection in plane table surveying. [7]

Q.9 Write short notes on any four of the following :- [3½x4=14]

(a) Digital Image Processing
(b) Total Station
(c) Autolevel
(d) Distomat
(e) Various types of field book
(f) Satellite Station