

KATHMANDU UNIVERSITY
End Semester Examination
January/February 2024

Level : B.E.
Year : III
Time : 2 hrs. 30mins.

26 JAN 2024

Course : GEOM 303
Semester : I
F. M. : 40

SECTION "B"

[6 Q. × 4 = 24 marks]

Attempt *ANY SIX* questions.

1. What are the major considerations for selection of best routes? Mention the major guidelines for detail survey of the route. [2+2]
2. You are assigned to carry out the survey for hydropower project. How do you accomplish the task? Elaborate in detail.
3. Two straight lines of a proposed highway consists of two straight lines joined by a curve of 700m radius. The angle of deflection between two straights is 25° and chainage is increasing from left to right and point of intersection is 4300m. Calculate the chainage of point of curvature and point of tangency. Also calculate the deflection angles for a chord of length 30m.
4. Design a vertical curve for the following data:
g₁ = -1.5%; g₂ = +2.0%, RL of the point of intersection 153.45m, Chainage of the point of intersection 455.0m, Length of curve 200m. Calculate the elevation at the interval of 20m by the method of tangent correction.
5. The following offsets were taken from a chain line to a hedge. Compute the area included between the chain line, the hedge and the offsets by the method of Simpson's rule.

Dist. (m)	0	20	40	60	80	120	160	220	280
Offsets (m)	9.4	10.8	13.6	11.2	9.6	8.4	7.5	6.3	4.6

6. The area enclosed by the various contour line is given. Determine the capacity of the reservoir if the full water level is 125.00m. Also calculate the elevation surface of water when the reservoir is 4/5th of its full capacity.

Contour	100	105	110	115	120	125
Area (ha)	3	8	10	15	20	25

7. A tachometer was set up at station A and the following observations were obtained on a vertically held staff:

Station	Staff station	Vertical angle	Staff reading	Remarks
A	B.M.	-2°18'	3.225, 3.550, 3.875	RL of B.M.
	B	+8°36'	1.65, 2.515, 3.338	437.655m

Calculate the horizontal distance from A to B and the R.L. of B if the constants of the instruments were 100 and 0.4

SECTION "C"
[2 Q. × 8=16 marks]

Attempt *ANY TWO* questions.

8. Derive the relationship for horizontal distance and elevation for horizontal line of sight in tachometry. How do you establish/transfer the horizontal and vertical control points for underground survey? [4+4]
9. What are the significance of transition curve? Mention the design criteria for transition curve. Describe the field procedure for setting out of simple circular curve by Rankine method with necessary derivation. [2+2+4]
10. Write Short notes on: [4 × 2=8]
 - a. Mass haul diagram
 - b. Gyro theodolite
 - c. L-Section and X-section
 - d. Setting out of building

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Marks Scored:

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Exam Roll No. :

Time: 30 mins.

F. M. : 10

Registration No.:

Date :

SECTION "A"

[20Q. × 0.5 = 10 marks]

Choose and encircle the most appropriate option from each set of choices

- At which of the stage of engineering survey, the projects are analyzed and reported together with the estimate of project cost, time period, internal rate of return?
 - Project Identification
 - Prefeasibility Study
 - Feasibility Study
 - Detailed Design Survey
- The length of tangent equals the length of long chord when the angle of deflection is
 - 30°
 - 45°
 - 60°
 - 120°
- Which of the statement is the **CORRECT** for the transition curve?
 - $l+r=\text{constant}$
 - $l/r=\text{constant}$
 - $lr=\text{constant}$
 - $r/l=\text{constant}$
- For a particular transition curve of radius 600m, the centrifugal ratio is $\frac{1}{4}$ then what should be the maximum velocity of the vehicle to pass safely in that road?
 - 34m/s
 - 36m/s
 - 38m/s
 - 40m/s
- If two grades of -1.2% and +0.9% meet, what will be the length of vertical curve required for a rate of change of grade of 0.1% per 30m?
 - 630m
 - 620m
 - 615m
 - 610m
- The vertical curve is
 - Circular
 - Parabolic
 - Elliptic
 - Hyperbolic
- Which of the statement is **FALSE** regarding mass haul diagram?
 - Upward sloping curves indicate (rising left to right) indicate a cut
 - Downward sloping (falling left to right) curves occur in a fill section
 - The baseline is the zero balance line.
 - A line that is drawn perpendicular to the baseline so as to cut a loop is called a 'balancing line'
- For L-Section profile, if horizontal scale is 1:1000, then the vertical scale is
 - 1:1000
 - 1:100
 - 1:10000
 - 1:500

9. If the length of crest is 10m, head of the stream is 4m, then the discharge of that stream will be?
 a. $145.2 \text{ m}^3/\text{s}$ b. $146.2 \text{ m}^3/\text{s}$ c. $147.2 \text{ m}^3/\text{s}$ d. $148.2 \text{ m}^3/\text{s}$
10. A structure made to control the pressure variations due to rapid changes in the pipeline flow, in order to eliminate water hammer possibilities is called
 a. Surge tank b. Anchor points c. Forebay d. Penstock
11. Optimum gradient for penstock alignment is:
 a. 1:2 b. 1:1 c. 1:1.5 d. 2:1
12. While carrying out sounding, if "h" is the slope distance and "d" is the separation between transmitter and receiver, the actual depth is given by:
 a. $\sqrt{h^2 - \left(\frac{d}{2}\right)^2}$ b. $\sqrt{\left(\frac{d}{2}\right)^2 - h^2}$ c. $\sqrt{\left(\frac{d}{2}\right)^2 + h^2}$ d. $\sqrt{h^2 + \left(\frac{d}{2}\right)^2}$
13. A horizontal or nearly horizontal passage to the tunnel or mine is called the
 a. Shaft b. Portal c. Vein d. Adit
14. What would be the value of β (Parallactic angle), so that the Multiplying constant is 100?
 a. $34'22''$ b. $34'24''$ c. $34'34''$ d. $34'44''$
15. A special type of theodolite used in the mine survey is
 a. Universal theodolite b. Digital theodolite
 c. Transit theodolite d. Gyro theodolite
16. In tacheometric survey, staff intercept is:
 a. maximum when staff is held truly normal to line of sight
 b. minimum when staff is held truly normal to line of sight
 c. decreases if staff is tilted away from normal
 d. increases if staff is tilted towards normal
17. Which of the statements is **TRUE** regarding area computation?
 a. The area obtained by Simpson's rule is greater than trapezoid if the surface is concave towards the base
 b. The area obtained by Simpson's rule is smaller than trapezoid if the surface is concave towards the base
 c. The area obtained by trapezoid rule is greater than Simpson's if the surface is concave towards the base
 d. The area obtained by both methods is always equal
18. Calculate the area from the following readings recorded by the planimeter with anchor point inside the figure: initial reading=9.918, final reading=4.254, $M=100 \text{ sq.cm}$, $C=23.52$ with one complete revolution on disc in anticlockwise direction
 a. 2785.7 cm^2 b. 785.7 cm^2 c. 1785.7 cm^2 d. 3785.7 cm^2

19. Setting out is done
- a. Prior to preparation of plans
 - b. Along with the preparation of plans
 - c. After the preparation of the plans
 - d. If obstructions are present
20. Which of the following is associated with setting out of sewers and pipe lines?
- a. Batter board
 - b. Cross staff
 - c. Cross head
 - d. Optical square

