UNIVERSITY OF JOHANNESBURG

PROGRAM	:	**BACHELOR OF ENGINEERING TECHNOLOGY**
SUBJECT	:	**SURVEYING B1**
CODE	:	**SURCIB1**
DATE	:	SEMESTER-MAIN EXAMINATION 22 November 2017 (SECOND SESSION)
DURATION	:	(Y-PAPER) 12:30-15:30
WEGHT	:	40:60
FULL MARKS	:	100
TOTAL MARKS	:	100

EXAMINER	:	MR. A. VESSAL	SAPSE NO
MODERATOR	:	MR. D. WILSON	FILE NO
NUMBER OF PAGES	:	5 PAGES PLUS ANNEXURE	
INSTRUCTIONS	:	CALCULATORS ARE PERMITTED (ONLY ONE PER STUDENT)	

REQUIREMENTS : GRAPH PAPERS, RULER

Surname and Initial ..... Student # .....

INSTRUCTIONS TO STUDENTS:

1. ANSWER ALL QUESTIONS IN PEN NOT IN PENCIL
2. Show all your calculations to get a full mark
3. Return your test sheet with your answer sheet to the examiner

QUESTION 1

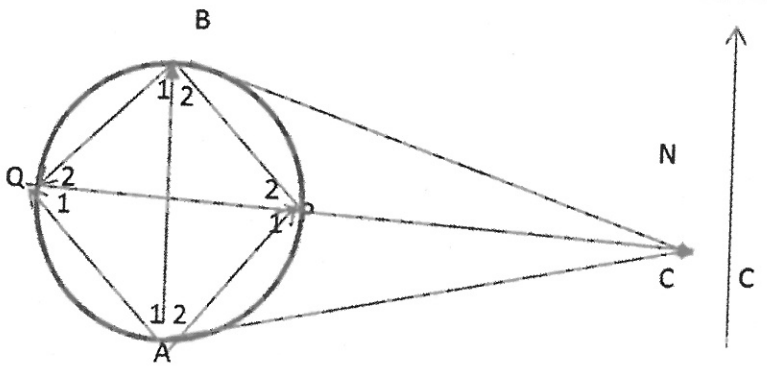
A falling gradient of 1/30 is to be connected to a rising gradient by means of a vertical parabolic curve. The stationing of PVI is 1+460.000 at the elevation 550 m A.M.S.L. The station of PVC (BVC) is at 1+335.00.The design speed for SSD is 100 Km/hr. Determine the reduced level and chainage (station) of PVT(6), and Lowest point on the curve(10). The table for Ks is in Annexure 1.

[16]

QUESTION 2

A group of students has done the resection survey on campus to establish a control point, P for future reference. The information are given in the following table and diagram. Determine the Coordinates of P .(Hint : You need to check if the Bearing QC and QP are the same to get a full mark).

	Eastings	Northings		
A	2400	7900	APC=	130°
B	2400	7710	BPC=	140°
C	2200	7805		



[32]

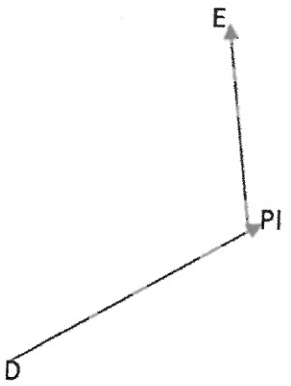
QUESTION 3

A Horizontal curve is designed for a small highway for the following information .Determine the followings:

1) Coordinates of BC and EC (12).

2) Design this curve using the table to calculate all deflection angles, offset angles and chords for the 150 m change interval. (16)

Distance Peg D to BC chainage=		42.6794279578m	PI chainage=	988.5000
D	4515	8770		
PI	4295	8770		
E	4150	8610	Join Bearing PI-E	222.11.04



Chord #	Chainage	Curve Length	Chord Length	Offset angle ($\alpha = (90/\pi/R) \times \ell$)	Tangential angle	Tangential Chord=2Rsin(tangential angle)
BC(PC)						
1						
2						
EC(PT)						

[28]

QUESTION 4

1. Plot the pegs for grid interval of 40 m using scale of 1:1000 (see the annexure for the data). (12)
2. Draw the contours with contour interval of 2 m (12)

[24]

[TOTAL : 100]

Equations

L (curve length)= R× π× Δ /180

T = R tan (Δ/2)

External Distance = R (Sec Δ/2—1)

LC (Long Chord) or C = 2R sin (Δ/2)

M= R-R× cos Δ/2= R (1-cosΔ/2) Dc= (180×100)/ π/R=5729.578/R

α = (90/ π/R) ×ℓ for each (ℓ) Chord = 2R sin α for each (ℓ)

a= $(g_2-g_1)/2L$
b=g_1
c=elevation of PVC (BVC)
Ks (rate of Sag vertical curve) =L/A A= ABS(G2-G1)
L= curve length
X_L= -b/2a or X_L= Ks×ABS(G1)

Metric				US Customary			
Design speed (km/h)	Stopping sight distance (m)	Rate of vertical curvature, K[a]		Design speed (mph)	Stopping sight distance (ft)	Rate of vertical curvature, K[a]	
		Calculated	Design			Calculated	Design
20	20	2.1	3	15	80	9.4	10
30	35	5.1	6	20	115	16.5	17
40	50	8.5	9	25	155	25.5	26
50	65	12.2	13	30	200	36.4	37
60	85	17.3	18	35	250	49.0	49
70	105	22.6	23	40	305	63.4	64
80	130	29.4	30	45	360	78.1	79
90	160	37.6	38	50	425	95.7	96
100	185	44.6	45	55	495	114.9	115
110	220	54.4	55	60	570	135.7	136
120	250	62.8	63	65	645	156.5	157
130	285	72.7	73	70	730	180.3	181
				75	820	205.6	206
				80	910	231.0	231

[a] Rate of vertical curvature, K, is the length of curve (m) per percent algebraic difference intersecting grades (A). $K = L/A$

Exhibit 3-75. Design Controls for Sag Vertical Curves

ANNEXURE (Tacheometry)

Surname and Initial: Student .No.:

Adjustment = Join Bearing- RO Observation TH = 1.7m IH = 1.60m Set up @ Peg D

Join Bearing Peg D to R.O. = 60.90488^0

PT	Obs. HA	Obs.VA	RD BR	HD	dY	dX	Y	X	Δ elev.	Elevation	Pts
Station							92219	2896360		1534.9	D
D to RO	150.56666	92.6	60.90488	47.25	41.288	22.976	92260.288	2896382.976	-2.246	1532.6544	E
1	259.1667	92.267	169.50492	85.063	15.494	-83.64033	92234.4944	2896276.36	-3.467	1531.4331	1
2	42.45	89.75	312.78822	48.09	-35.29	32.66677	92183.7085	2896392.67	0.1098	1535.0098	2
3	72.45	91.283	342.78822	38.18	-11.3	36.47061	92207.7022	2896396.47	-0.955	1533.9447	3
4	210.2	86.9	120.53822	48.838	42.064	-24.81544	92261.0641	2896335.18			4

Surname _____ Initial _____ Student # _____