Universiti Tun Hussein Onn Malaysia

UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER II
SESSION 2018/2019

COURSE NAME	:	PLANT & MACHINERY
COURSE CODE	:	BNC 31903
PROGRAMME CODE	:	BNC
EXAMINATION DATE	:	JUNE/JULY 2019
DURATION	:	3 HOURS
INSTRUCTION	:	ANSWER **ALL** QUESTIONS

THIS QUESTION PAPER CONSISTS OF **SIX (6)** PAGES

Q1 (a) List and briefly describe **TWO (2)** types of material hoists.

(4 marks)

(b) Discover **FIVE (5)** factors to be considered when selecting a tower crane.

(15 marks)

(c) Differentiate the advantages between the horizontal jib and a luffing jib with the aid of sketches.

(6 marks)

Q2 (a) A 2 ½ cy short-boom dragline is to be used to excavate good common earth. The depth of cut will be 12.6 ft, optimum depth is 10.5 ft and the swing angle will be 90 degree.

(i) Determine the probable production of the dragline.

(6 marks)

(ii) There are 60,000 bcy of material to be excavated. Evaluate how long the project requires.

(2 marks)

(b) Distinguish Grader and Scraper with suitable sketch ups.

(14 marks)

(c) During hauling, the apron is lowered to capture the material. Explain the purpose of sprinklers on the haul.

(3 marks)

Q3 (a) Develop the differences between Horizontal Directional Drilling (HDD) and horizontal boring/pipe jacking in terms of accuracy, labour usage, cost difference and launching mode (surface/subsurface).

(8 marks)

(b) With appropriate diagram, construct the major procedures in implementing the underground utilities installation.

(11 marks)

(c) Justify **TWO (2)** needs for HDD technology in underground utilities installation.

(6 marks)

Q4 (a) In case of major construction projects, the speed of work and the timely completion of work is very important. The proper use of the appropriate equipment contributes to the following impacts. Briefly explain on the impacts given.

(i) Economy

(2 marks)

(ii) Quality

(2 marks)

(iii) Safety

(2 marks)

(iv) Speed

(2 marks)

(b) The function of compaction equipment is to produce higher density in soil mechanically. The desired level of compaction is best achieved by matching the soil type with its proper compaction method. Other factors must be considered as well, such as compaction specification and job site conditions. Discuss and justify on the appropriate compactors for cohesive and granular soil compaction.

(8 marks)

(c) Referring to **Figure Q4 (c),** the auditorium is 2 storey high. Recommend the suitable machineries to be deployed, given that the office tower and TV and Music studio are 10 storey high. Justify your answer.

(9 marks)

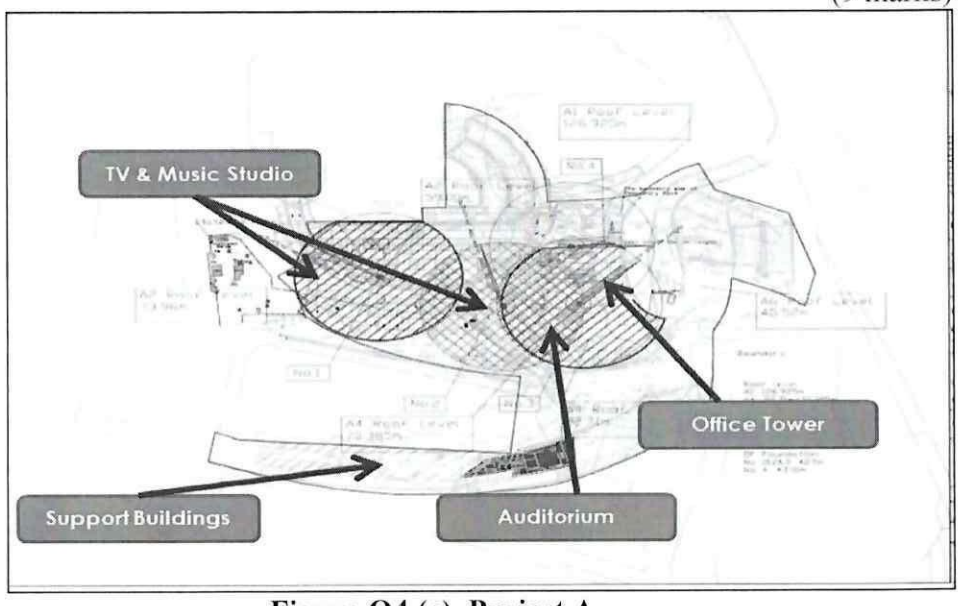

Figure Q4 (c) Project A

- END OF QUESTIONS –

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APPENDIX

Production = CSVBE

1.0 m^3 BMC = 1.25 LCM = 0.9 CCM

Table 1 Ideal production of draglines

	Bucket Size [cu yd (m^3)]										
Type of Material	$\frac{3}{4}$ (0.57)	1 (0.75)	$1\frac{1}{4}$ (0.94)	$1\frac{1}{2}$ (1.13)	$1\frac{3}{4}$ (1.32)	2 (1.53)	$2\frac{1}{2}$ (1.87)	3 (2.29)	$3\frac{1}{2}$ (2.62)	4 (3.06)	5 (3.82)
Light moist clay	130	160	195	220	245	265	305	350	390	465	540
or loam	(99)	(122)	(149)	(168)	(187)	(203)	(233)	(268)	(298)	(356)	(413)
Sand and gravel	125	155	185	210	235	255	295	340	380	455	530
	(96)	(119)	(141)	(161)	(180)	(195)	(226)	(260)	(291)	(348)	(405)
Common earth	105	135	165	190	210	230	265	305	340	375	445
	(80)	(103)	(126)	(145)	(161)	(176)	(203)	(233)	(260)	(287)	(340)
Tough clay	90	110	135	160	180	195	230	270	305	340	410
	(69)	(84)	(103)	(122)	(138)	(149)	(176)	(206)	(233)	(260)	(313)
Wet, sticky clay	55	75	95	110	130	145	175	210	240	270	330
	(42)	(57)	(73)	(84)	(99)	(111)	(134)	(161)	(183)	(206)	(252)

*Based on 100% efficiency, 90° swing, optimum depth of cut, material loaded into haul units at grade level.

Table 2 Swing-depth factor for draglines

Depth of Cut (% of Optimum)	Angle of Swing (deg)							
	30	45	60	75	90	120	150	180
20	1.06	0.99	0.94	0.90	0.87	0.81	0.75	0.70
40	1.17	1.08	1.02	0.97	0.93	0.85	0.78	0.72
60	1.25	1.13	1.06	1.01	0.97	0.88	0.80	0.74
80	1.29	1.17	1.09	1.04	0.99	0.90	0.82	0.76
100	1.32	1.19	1.11	1.05	1.00	0.91	0.83	0.77
120	1.29	1.17	1.09	1.03	0.98	0.90	0.82	0.76
140	1.25	1.14	1.06	1.00	0.96	0.88	0.81	0.75
160	1.20	1.10	1.02	0.97	0.93	0.85	0.79	0.73
180	1.15	1.05	0.98	0.94	0.90	0.82	0.76	0.71
200	1.10	1.00	0.94	0.90	0.87	0.79	0.73	0.69

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Table 3 Bucket fill factors for excavators and loaders

Material	Bucket Fill Factor
Common earth, loam	0.80-1.10
Sand and gravel	0.90-1.00
Hard clay	0.65-0.95
Wet clay	0.50-0.90
Rock, well blasted	0.70-0.90
Rock, poorly blasted	0.40-0.70

Table 4 Standard cycles per hour for hydraulic excavators

	Machine Size			
Type of Material	**Wheel Tractor**	**Small Excavator: 1 yd (0.76 m^3) or Less**	**Medium Excavator: 1¼-2¼ yd (0.94 - 1.72m^3)**	**Large Excavator: Over 2¼ yd (1.72m^3)**
Soft (sand, gravel, loam)	170	250	200	150
Average (common earth, soft clay)	135	200	160	120
Hard (tough clay, rock)	110	160	130	100

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Table 5 Swing-depth factor for hydraulic excavators

	Angle of Swing					
Depth of Cut (% of Maximum)	**45**	**60**	**75**	**90**	**120**	**180**
30	1.33	1.26	1.21	1.15	1.08	0.95
50	1.28	1.21	1.16	1.10	1.03	0.91
70	1.16	1.10	1.05	1.00	0.94	0.83
90	1.04	1.00	0.95	0.90	0.85	0.75

Table 6 Adjustment factor for trench production

Material	Factor
Loose (sand, gravel, loam)	0.60 - 0.70
Average (common earth)	0.90 - 0.95
Firm (firm plastic soils)	0.95 - 1.00