Universiti Tun Hussein Onn Malaysia

UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER II
SESSION 2016/2017

COURSE NAME	:	PLANT AND MACHINERY
COURSE CODE	:	BNC 31903
PROGRAMME	:	BNC
EXAMINATION DATE	:	JUNE 2017
DURATION	:	3 HOURS
INSTRUCTION	:	ANSWER **ALL** QUESTIONS

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

Q1 (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) Distinguish Grader and Scraper with suitable sketch ups.

(12 marks)

Q2 At one location, an excavation work is done by an excavator with bucket load factor of 0.8, job efficiency of 75% with the production of 175 BCM/h, load factor 0.77 and truck transit time of 0.5 hour. The type of soil is tough clay.

(a) Calculate the number of trucks required for this excavation work.

(4 marks)

(b) If a dipper cycle time of this excator is 25 second with the amount of 2.5 LCM, estimate the number of trucks required.

(6 marks)

(c) If there is only an availability of 10 trucks, estimate the production of this team.

(2 marks)

(d) Evaluate the situations and answers from Q2 (a), (b) and (c).

(8 marks)

Q3 (a) 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 an appropriate compactor for cohesive and granular soil compaction.

(8 marks)

(b) Hauler is construction equipment mainly used to move materials and some of the machine can carry more than 300 tonnes of materials. However, the material weight that a hauler could attain was limited by practical considerations such as efficiency, maneuverability and safety. Dump trucks, lorry, low loader, and dumper are examples of hauler. However, contractors occasionally used the wrong type of hauler to transport materials in a construction project. Analyse the reasons for the wrong usage of hauler amongst contractors. Give an example for each reason given.

(12 marks)

Q4 (a) Discuss briefly on the difference between Horizontal Directional Drilling (HDD) and horizontal boring/pipe jacking in terms of accuracy, labour usage, cost difference and launching mode (surface/subsurface).

(6 marks)

(b) State the major procedures in implementing the underground utilities installation with the demonstrating of a diagram.

(8 marks)

(c) Justify the needs for HDD technology in underground utilities installation.

(6 marks)

Q5 (a) List **FOUR (4)** types of tower crane.

(4 marks)

(b) The construction of tall buildings often requires the tower crane for lifting of construction materials. Evaluate the difference between self-supporting static tower cranes and supported static tower cranes.

(6 marks)

(c) Determine the probable production in cubic yard bank measure (BCY) for a 2cy dragline when excavating and casting tough clay. The average depth of the excavation is 9ft and maximum depth of cut is 11.8ft. The average angle of swing will be 140°. The efficiency factor will be a 45-min hour.

(10 marks)

- END OF QUESTIONS –

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Production = CSVBE

1.0 m^3 BMC = 1.25 LCM = 0.9 CCM

Table 1 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 2 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 3 Swing-depth factor for hydraulic excavators

Depth of Cut (% of Maximum)	*Angle of Swing* 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 4 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