UNIVERSITY
OF
JOHANNESBURG

PROGRAM	:	NATIONAL DIPLOMA ENGINEERING: ELECTRICAL
SUBJECT	:	**ELECTRICAL DISTRIBUTION III**
CODE	:	**ELD 3221**
DATE	:	SUMMER SSA EXAMINATION 2017 9 JANUARY 2017
DURATION	:	(SESSION 1) 08:00 - 11:00
WEIGHT	:	40: 60
TOTAL MARKS	:	100

ASSESSOR	:	MR EM MALATJI
MODERATOR	:	PROF AA. YUSUF 2309
NUMBER OF PAGES	:	3 PAGES

INSTRUCTIONS TO STUDENTS

WORK IN PENCIL WILL NOT BE MARKED.
ALL WORK WITH THE EXCEPTION OF DIAGRAMS MUST BE IN BLUE OR BLACK INK.
NO UNITS NO MARKS.
QUESTIONS MAY BE ANSWERED IN ANY ORDER.
DO NOT SPLIT QUESTIONS.
PLEASE ANSWER ALL QUESTIONS.
USE THREE DECIMAL PLACES.
ONLY ONE POCKET CALCULATOR PER CANDIDATE MAY BE USED.

ELECTRICAL DISTRIBUTION III ELD 3221 (SUPPLEMENTARY EXAM)

QUESTION 1

Compare the following power generation

	Steam generation	Diesel generation	Hydro generation	Nuclear Generation
Initial Cost				
Running cost				
Reliability				

(12)

[12]

QUESTION 2

A 100 MW steam station coal calorific value is 6400kcal/kg. Thermal efficiency of the station is 30% and electrical efficiency is 92%. Calculate the coal consumption per hour when the station is delivering at 70% of full rated output. (8)

[8]

QUESTION 3

Due to load shedding, a peaking diesel power station was built to help with the peak demand. The following parameters are applied to the station:

Parameters	
Fuel Consumption/day	5000kg
Energy generated	5000kWh
Calorific value of fuel	15 000kcal/kg
Alternator efficiency	94%
Engine mechanical efficiency	93%

Calculate

3.1 the overall efficiency, and (4)
3.2 thermal efficiency of engine. (4)

[8]

QUESTION 4

A diesel station supplies the following loads to various consumers

Industrial consumer	1500 kW
Domestic power	100 kW
Commercial establishment	750 kW
Domestic light	450 kW

If the maximum demand on the station is 2500 kW and the number of kWh generated per year is 45×10^5 kWh, determine

4.1 The demand factor (4)
4.2 daily load factor. (6)

4.3 A generating station has an energy output of 17.52×10^7 kWh at a certain load factor.

The data of the generating is given as follows:

Capital cost = R95 x 10^6 kWh; Annual cost of fuel and oil = R 9 x 10^6
Taxes, wages and salaries etc. = R 7.5 x 10^6
Interest and depreciation = 12%
Calculate the cost per unit when the load factor is halved. (8)

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[18]

QUESTION 5

A balanced 3-phase load of 30 MW is supplied at 132 kV, 50 Hz and 0·85 p.f. lagging by means of a transmission line. The series impedance of a single conductor is (20 + j52) ohms and the total phase-neutral admittance is 315×10^{-6} Siemens. Use nominal π method to determine:

5.1 the A, B, C and D constants of the transmission line (9)
5.2 sending end voltage, and (5)
5.3 regulation of the line (3)

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[17]

QUESTION 6

A factory has a maximum demand of 200 kW at a lagging power factor of 0.8 lagging and an annual load factor of 0.8. The tariff is R100 per kVA of maximum demand per annum plus R0,05c per kWh. The phase advancing plant costs R500 per kVAR and the annual interest and depreciation together amount to 10%. Calculate:

6.1 The value to which the power factor be improved so that the annual expenditure is minimum (5)
6.2 The capacity of the phase advancing plant (6)
6.3 The new bill for energy, assuming that the factory works for 6250 hours per annum. (6)

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[17]

Question 7

7.1 Discuss the factors that affect corona (4)

7.2 Discuss ways to reduces corona effect (4)

7.3 Each line of a 3-phase system is suspended by a string of 3 similar insulators. If the voltage across the line unit is V_3, calculate the line to neutral voltage. (12)

Assume that the shunt capacitance between each insulator and earth is 1/8th of the capacitance of the insulator itself. String efficiency is 84.28%.

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[20]

Total [100]