UNIVERSITY
OF
JOHANNESBURG

PROGRAM	:	NATIONAL DIPLOMA ENGINEERING: ELECTRICAL
SUBJECT	:	**ELECTRICAL DISTRIBUTION III**
CODE	:	**ELD 3221**
DATE	:	SUMMER EXAMINATION 2016 29 NOVEMBER 2016
DURATION	:	(SESSION 2) 12:30 - 15:30
WEIGHT	:	40: 60
TOTAL MARKS	:	100

ASSESSOR	:	MR EM MALATJI
MODERATOR	:	PROF AA YUSUF 2309
NUMBER OF PAGES	:	3 PAGES (INCLUDING THE COVER PAGE)

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.

QUESTION 1

1.1 Which energy source are applicable to South Africa, give advantages and disadvantages in a tabular form (5)

1.2 What are the important things to consider when you are determining a tariff for a specific power system. (5)

[10]

QUESTION 2

Maximum demand	20,000 kW
Load factor	40%
Boiler efficiency	85%
Turbine efficiency	90%
Coal consumption	0.09kg/kcal
Cost of 1 ton of coal	R300

Determine :

2.1 Thermal efficiency and (3)
2.2 Coal bill per annum. (6)

[9]

QUESTION 3

Water for a hydro-electric station is obtained from a reservoir with a head of 100 metres. If the energy generated per hour is 775kWh, calculate the overall efficiency of the station. Assume the flow rate is Q=1 m^3/s (10)

[10]

QUESTION 4

4.1 A 100 MW power station delivers 100 MW for 2 hours, 50 MW for 6 hours and is shut down for the rest of each day. It is also shut down for maintenance for 40 days each year. Calculate its annual load factor (5)

4.2 A generating station has a maximum demand of 25MW, a load factor of 60%, a plant capacity factor of 50% and a plant use factor of 70%. Find
4.2.1 the reserve capacity of the plant (5)
4.2.2 the daily energy produced and (2)
4.2.3 maximum energy that could be produced daily if the plant were running as per schedule, while fully loaded. (3)
4.3 A generating station has an installed capacity of 50,000 kW, maximum demand of 29.5 MW and annual load factor of 0.85. If the annual fixed charges are R160 per kW installed capacity and running charges are 4 cents per kWh, determine the cost per unit generated. (6)

[21]

QUESTION 5

A balanced 3-phase load of 50 MW is supplied at 132 kV, 50 Hz and 0·8 p.f. lagging by means of a transmission line. The series impedance of a single conductor is (30.6 + j80.4) ohms and the total phase-neutral admittance is 1.5×10^{-3} siemen. Using nominal T method, determine:

5.1 the A, B, C and D constants of the line (8)
5.2 sending end voltage (2)
5.3 regulation of the line (2)

[12]

QUESTION 6

A consumer has an average demand of 400 kW at a p.f. of 0·8 lagging and annual load factor of 50%. The tariff is R50 per kVA of maximum demand per annum plus R0,05c per kWh. If the power factor is improved to the most economical power factor by installing phase advancing equipment, calculate:

6.1 the capacity of the phase advancing equipment (8)
6.2 the annual saving effected (8)

The phase advancing equipment costs R100 per kVAR and the annual interest and depreciation together amount to 10%.

[16]

Question 7

A 3-phase transmission line is being supported by three disc insulators. The Potentials at the junction (V_3) is 18.12 kV and the ratio of capacitance between pin and earth to the self-capacitance of each unit is 0.375

Calculate :
7.1 the potentials across top unit and the middle unit (5)
7.2 the line voltage (4)
7.3 string efficiency. (3)

7.4 A 132 kV line with 1.956cm diameter and conductor spacing of 341 cm diameter conductors is built so that corona takes place if the line voltage exceeds 210 kV (r.m.s.), find the dielectric strength of air g_o.
Assume smooth conductors (i.e., irregularity factor mo = 1) and standard pressure and temperature for which air density factor = 1 (10)

[22]

TOTAL = 100