ELIZADE UNIVERSITY, ILARA-MOKIN, ONDO STATE

FACULTY OF ENGINEERING

DEPARTMENT OF ELECTRICAL AND COMPUTER ENGINEERING

FIRST SEMESTER EXAMINATION, 2016/2017 ACADEMIC SESSION

COURSE TITLE: ELECTRICAL POWER PRINCIPLES

COURSE CODE: EEE 415

EXAMINATION DATE: 6TH APRIL, 2017

COURSE LECTURER: DR P.K OLULOPE

HOD's SIGNATURE

TIME ALLOWED: 3 HOURS

INSTRUCTIONS:

1. ANSWER **QUESTION 1** AND ANY OTHER **THREE QUESTIONS**.
2. SEVERE PENALTIES APPLY FOR MISCONDUCT, CHEATING, POSSESSION OF UNAUTHORISED MATERIALS DURING EXAMINATION
3. YOU ARE **NOT** ALLOWED TO BORROW CALCULATORS AND ANY OTHER WRITING MATERIALS DURING THE EXAMINATION

Question #1

(a) Differentiate between short, medium and long transmission lines in term of voltage level and length.

(b) If $P_1 = \sqrt{3}\, V_L I COS\theta$, and $P_2 = 3V_P I COS\theta$ prove that $P_1 = P_2$ and state two ways of improving reactive power in power system.

(c) State two ways you think Nigeria power system can be improved

(d) List three conventional power generators

(e) List two reasons why AC system is preferred in Nigeria compared to DC system.

(f) What is the function Ring Main Unit (RMU) in substation?

(g) List three equipment that can be found in distribution substation

(h) How do you differentiate 33kV from 11kV?

(i) List three ways of classifying distribution system

(j) Differentiate between a feeder and a distributor.

(k) What is the length of 11kV cross arm, height of 11kV pole, a span length for 11kV pole, depth from the ground of 11kV pole, diameter of 11kV wire?

(l) A 3-phase, 50Hz, 100 km line has a resistance, inductive reactance and capacitive shunt admittance of 0·1 Ω, 0·5 Ω and 3x 10^6 S per km per phase. If the line delivers 100 MW at 66 kV and 0·85 p.f. lagging, determine the sending end voltage and current. Assume a nominal π circuit for the line.

(40 Marks)

Question #2

(a) List the renewable energies and state two advantages over the non-renewable energy.

(b) Explain with schematic diagram the operation of hydro power station. Compare (with two factors) the power station with that of nuclear power station.

(c) A hydro-electric generating station is supplied from a reservoir of capacity 5 × 106 cubic metres at a head of 200 metres. Find the total energy available in kWh if the overall efficiency is 75%.

(20 marks)

Question #3

(a) Mention 4 major components of an overhead line.

(b) There is hardly any doubt that copper is an ideal material for transmission and distribution of electric power. Justify this statement.

(c) List four types each of poles and insulators.

(d) Why are suspension insulators preferred for high voltage power transmission?

(20 marks)

Question #4

(a) A 100-km long, 3-phase, 50-Hz transmission line has following line constants:

Resistance/phase/km = 0·1 Ω

Reactance/phase/km = 0·5 Ω

Susceptance/phase/km = 10×10^{-6}S

If the line supplies load of 20 MW at 0·9 p.f. lagging at 66 kV at the receiving end, calculate by nominal π method:

(i) Sending end power factor (ii) regulation (iii) Transmission efficiency

(b) State two reasons why high voltage DC is preferable to high voltage AC

(20 marks)

Question #5

(a) Draw a typical Nigeria grid system.

(b) A 2-wire d.c. distributor AB is fed from both ends. At feeding point A, the voltage is maintained as at 230 V and at B 235 V. The total length of the distributor is 200 metres and loads are tapped off as under:

25 A at 50 metres from A ; 50 A at 75 metres from A

30 A at 100 metres from A ; 40 A at 150 metres from A

The resistance per kilometer of one conductor is 0·3 Ω. Calculate:

(i) Currents in various sections of the distributor

(ii) Minimum voltage and the point at which it occurs

(20 marks)

Question #6

(a) Define the following terms

(i) Demand factor

(ii) Load factor

(iii) Diversity factor

(iv) Plant capacity factor

(b) List two differences between load curve and load duration curve

(c) The daily demands of three consumers are given below

Time	Consumer 1	Consumer 2	Consumer 3
12 midnight to 8 A.M.	No load	200 W	No load
8 A.M. to 2 P.M.	600 W	No load	200 W
2 P.M. to 4 P.M.	00 W	1000 W	1200 W
4 P.M. to 10 P.M.	800 W	No load	No load
10 P.M. to midnight	No load	200 W	200 W

Plot the load curve and find (i) maximum demand of individual consumer (ii) load factor of Individual consumer (iii) diversity factor and (iv) load factor of the station.

(20 marks)