MURANG'A UNIVERSITY COLLEGE

SCHOOL OF ENGINEERING AND TECHNOLOGY

ELECTRICAL ENGINEERING DEPARTMENT

UNIT : ELECTRICAL POWER SYSTEMSCLASS: KNEC/EEP/15DJ3

EXAM: MAIN (END TERM) EXAM. COURSE CODE:EE1309

DATE: 21ST APRIL 2015 TIME :2HRS

INSTRUCTION

1. This exam consists of SEVEN Questions.
2. Attempt any five questions.
3. You should have a scientific calculator, writing materials and this exam paper.
4. No mobile phones allowed in the exam room.

1 (a). Explain the following as applied to transmission and distribution of electrical energy.

(i)Regulation (3marks)

(ii)Transmission Efficiency (3mks)

(b. A two conductor single-phase ,short line has a total resistance of 0.4Ω and a total Inductive reactance of 0.15Ω.The line supplies a load of 100A at 400V at a power factor of 0.8 lagging. Calculate,

(i)Sending end voltage (6mks)

(ii)Percentage regulation (4mks)

(iii)Transmission efficiency (4mks)

Q2.(a) With the aid of a diagram, describe the operation of ;

(i) Balanced beam relay (5mks)

(ii) Merz price protection of alternators (5mks)

(b) An 11KV, 10MVA, 3-ϕ, star connected alternator is earthed through a non inductive resistor of 5Ω. An earth leakage relay connected to a current transformer in the earthing connection is set to operate when the fault reaches 30% of full load. Determine the percentage of alternator winding remaining unprotected against zero impedance earth fault. (10marks)

Q3 (a) Define the following terms with reference to protection. (6marks)

(i)Sensitivity

(ii) Selectivity

(iii) Reliability

(b) With the aid of diagrams explain the protection of transmissionlines by

(i) combined overcurrent and earth leakage (4marks)

(ii) Over-current with separate earth leakage protection stating the reason for requirement of separate earth leakage relay. (4marks)

(iii) Principle of differential protection of alternators (3marks)

(iv) Operation of an impedance relay (3marks)

Q4(a) State ***four*** main characteristics of protective relays. (4marks)

(b)(i) With the aid of diagrams and in particular reference to alternators, explain

(I) The effect of earthing resistor with regard to earth fault. (3marks)

(II) The protection of short circuit faults using biased Percentage relay. (10marks)

(III) State the advantages of earthing the alternator neutral point. (3marks)

Q5(a)State with reasons, the suitability of the following conductor Materials

for use as overhead lines.

(i)Steel core aluminum

(ii)Copper clad steel (4marks)

(b). Explain the following with regard to overhead conductor vibrations.

(i) Dancing

(ii) Swinging. (4marks)

(c)An overhead line with a span of 308m is suspended between two towers at levels of 28m and 48m above the ground level. Each conductor has a diameter of 32 mm and weighs 2kg/m. If the conductor is subjected to a wind pressure of $396N/m^2$ of total projected area and has an ultimate Strength of 160KN with a safety factor of 5, determine the sag. (12marks)

Q6 (a)State any three properties of electrical conductors (3mks)

(b) Explain the following with respect to overhead transmission Lines

(i) Induced vibration and derive an expression for wind effect (5marks)

(ii) Vibration control (4marks)

(c) The weight of a conductor whose diameter is 1.28cm is 980kg per kgm and its maximum tensile strength is 6800kg. If the conductor span is 320m and a wind travelling at 82 km/hr exerts a pressure of $0.0058V^2$ kg/m^2 on the conductor ,calculate the sag of the conductor.

(8marks

Q7 (a) Explain the following terms

(i)Ferranti effect

(ii) corona power loss (6marks)

(b) A 132KV, 50Hz three phase transmission line delivers 30MW at 0.82 power factor lagging. Each conductor has a resistance of 14Ω, an inductance of 0.18H and a capacitance to neutral of 1.6μf.Using nominal π – method , calculate the sending end;

(i) Voltage
(ii) Current
(iii)Power factor (14mks)