



COLLEGE OF ENGINEERING, SCIENCE & TECHNOLOGY
SCHOOL OF ELECTRICAL & ELECTRONICS ENGINEERING
**TRADE DIPLOMA IN ELECTRICAL ENGINEERING (ELECTRICAL
& RENEWABLE) - STAGE 5**

EEE572 ELECTRICAL POWER GENERATION

FINAL EXAMINATION – TRIMESTER 2, 2015

Duration: 2 hours and 10 minutes

Total Marks: 100

Total No. of Pages: 5

DATE/DAY: TBA

TIME: TBA

ROOM: AS PER TIMETABLE

INSTRUCTIONS TO STUDENTS

1. You are allowed 10 minutes extra reading time during which you are NOT to write.
2. Begin each SECTION on a fresh page and use both sides of the sheet.
3. Write your candidate number at the top of each attached sheet.
4. Insert all written foolscaps, graph paper, drawing paper, etc. in their correct sequence and secure with a string.
5. For all sheets of paper on which rough/draft work has been done, cross it through and ATTACH these to your answer scripts.
6. Write clearly the number(s) of the question(s) attempted on the top of each sheet.
7. Use of programmable calculator(s) is prohibited.
8. ANSWER ALL QUESTIONS
9. Show all working where necessary.
10. ALWAYS CHECK YOUR WORK BEFORE YOU LEAVE THE EXAM ROOM

SECTION A**(25 MARKS)**

1. Define the term “**Distributed Generation**”. **(1 mark)**
2. Discuss the functions of a “Governor” and a “Prime-mover”. **(2 marks)**
3. Explain any 4 major components of a Diesel Power Plant. **(2 marks)**
4. A power station has to supply load as follows:

Time (hours)	6-8	8-12	12-16	16-20	20-24	24-6
Load (MW)	20	40	60	20	50	20

- i. Draw the load Curve
 - ii. Draw the load duration curve
 - iii. Find the size and number of generating units together with the running hours.
 - iv. Calculate the load factor
 - v. Calculate the plant capacity factor **(8 marks)**
5. A hydro power plant is to be used as peak load plant at an annual load factor of 30%. The electrical energy obtained during the year is 750×10^5 kWh. Determine the maximum demand. If the plant capacity factor is 24% find reserve capacity of the plant. (Note Reserve capacity = Capacity – Maximum Demand) **(4 marks)**
6. A 100MW Power station delivers 100MW for 2 hours, 50MW for 6 hours and is shut-down for the rest of each day. It is also shut-down for maintenance for 65 days each year. Calculate the annual load factor. **(2 marks)**
7. State any two advantages of interconnections of power stations. **(2 marks)**
8. Explain the term *Load sharing* and also state, in a Power system, how can the load be increased on one generator if has to be optimized (output increased) and the other generator is to be relieved of its load when both are connected to the grid? **(2 marks)**
9. Comment on the following relationships:
 - a) Active power and frequency
 - b) Reactive Power and Voltage. **(2 marks)**

SECTION B**(25 MARKS)**

1. Tabulate the major hourly, daily/ weekly/monthly maintenance schedules for a Diesel Generator. **(4 marks)**

2. A hydroelectric plant is supplied from a catchment area of 400 km^2 with an annual rainfall of 800 mm and head of 250 m. consider the yield factor of 50% and load factor of 60 %. Calculate the power produced and the capacity of the power plant if the power plant has an efficiency of 85 %. **(6 marks)**

3. Discuss the 4 requirements of synchronizing an alternator to the grid. **(4 marks)**

4. A 5MVA, 50 Hz, 3-phase star connected synchronous generator having a synchronous reactance of 20 % is running at 1500rpm and is excited to give 11000 V. Calculate the synchronizing power per one mechanical degree of displacement and the corresponding synchronizing torque. **(7 marks)**

5. Name the device used to monitor synchronizing. **(2 mark)**

6. What is motoring? **(2 mark)**

SECTION C**(25 MARKS)**

1. When two generators are connected in parallel and are jointly supplying the demand in a small power system, the load is shared according to the set points of their governors. Suppose in a small power system, two generators A and B rated at 60MW and 120MW respectively supply a load of 110MW. Both generators are fitted with governors having a droop of 4% and a no-load set point of 52Hz
 - i) Using trigonometry, find out the load taken by each of the generators (A and B). **(4 marks)**
 - ii) Determine the system frequency **(3 marks)**
2. Tabulate the major hourly, daily/ weekly/monthly maintenance schedules for a transformer. **(4 marks)**
3.
 - i) Draw standards symbols for CTs and VTs. **(2 marks)**
 - ii) Elaborate on the importance of these special transformers in a substation/power station. **(1 marks)**
 - iii) Mention the safety precautions to be taken when connecting a CT and a VT. **(2 marks)**
4. A 11kV/33kV power transformer is connected in delta-star. The C.Ts on the low voltage side has turns of 500/5. Find the suitable turns ratio for the C.Ts on high voltage side. **(4 marks)**
5. A 240V single phase energy meter has a constant load of 10A passing through it for 4.9 hours at 0.85 pf. If the meter disc makes 1000 revolutions during this period, find the meter constant in revolutions per kWh. If the power factor of the load is unity, what number of revolutions would the disc make in the above time? **(5 marks)**

SECTION D**(25 MARKS)**

1. a) Generators are casually disturbed by high/low intensity electrical and mechanical faults. State 3 common electrical faults that hinder a generator's performance. **(3 marks)**

b) For the electrical faults stated in part (a) above, what protection devices are connected to overcome each of three faults mentioned above. **(3 marks)**
2. Discuss Earthing methods utilized for a Generator/Transformer in a Substation. **(3 marks)**
3. Explain the operation of a buchhloz relay. **(4 marks)**
4. Name any four types of HV circuit breakers. **(2 marks)**
5. Identify any four components of a substation. **(2 marks)**
6. What is a "Heat run" test? **(2 marks)**
7. Fiji has optimized the SCADA control into their Power Systems at their National Control Center (NCC) in Vuda. Explain the essence of such control in a sophisticated network and what equipment/devices could be controlled remotely in a Power System. **(2 marks)**
8. Explain any 2 types of bus-bar arrangements. **(4 marks)**

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