



**COLLEGE OF ENGINEERING, SCIENCE & TECHNOLOGY**  
**SCHOOL OF ELECTRICAL & ELECTRONICS ENGINEERING**  
**TRADE DIPLOMA IN ELECTRICAL ENGINEERING (ELECTRICAL  
& RENEWABLE) - STAGE 4**

**EEE536 ELECTRICAL POWER GENERATION**

**SUPPLEMENTARY EXAMINATION  
SEMESTER 1, 2017**

**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. A power station has to supply load as follows:

Time (hours)	0 - 6	6 -12	12 -14	14 - 18	18 - 24
Load (MW)	45	135	90	150	75

- 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 **(9 marks)**
2. Define the following terms:
- i) Governor
  - ii) Prime-mover **(2 marks)**
3. Explain the following components of a Diesel Power Plant:
- i) Exhaust system
  - ii) Cooling system
  - iii) Fueling system **(3 marks)**
4. 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. **(5 marks)**
5. State any two advantages of interconnections of power stations. **(2 marks)**
6. Explain impulse turbines and give 1 example. **(2 marks)**
7. Differentiate between a Power Station and a Sub-station? **(2 mark)**

**SECTION B****(25 MARKS)**

1. Discuss any 3 requirements of synchronizing an alternator to the grid. **(3 marks)**
2. Tabulate the major hourly, daily/ weekly/monthly maintenance schedules for a Diesel Generator. **(4 marks)**
3. A hydroelectric plant is supplied from a catchment area of 400 km<sup>2</sup> with an annual rainfall of 1200 mm and head of 300 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)**
4. A 5MVA, 50 Hz, 3-phase star connected synchronous generator having a synchronous reactance of 25 % is running at 1500rpm and is excited to give 11000 V. Calculate the synchronizing power per two 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)**
7. State any one type of connection for a 3 phase transformer. **(1 mark)**

**SECTION C****(25 MARKS)**

1. State any three specifications/information present on a transformer number plate. **(3 marks)**
2. State 3 common electrical faults likely to be present on a transformer and mention how you overcome them. **(3 marks)**
3. Tabulate the major hourly, daily/ weekly/monthly maintenance schedules for a transformer. **(4 marks)**
4. i) Draw standards symbols for a current transformer and a voltage transformer. **(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 current transformer and a voltage transformer. **(2 marks)**
5. A 11kV/33kV power transformer is connected in star-delta. The C.Ts on the low voltage side has turns of 600/5. Find the suitable turns ratio for the C.Ts on high voltage side. **(5 marks)**
6. 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. Name any 2 types of substation. **(2 marks)**
2. Compare indoor and outdoor substations. **(2 marks)**
3. Identify any four components of a substation. **(4 marks)**
4. a) Generators are casually disturbed by high/low intensity electrical and mechanical faults. State any 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)**
5. Discuss Earthing methods utilized for a Generator/Transformer in a Substation. **(3 marks)**
6. Explain the operation of a buchhloz relay. **(4 marks)**
7. Explain any 2 types of bus-bar arrangements. **(4 marks)**

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