ROLL NO.	

PRESIDENCY UNIVERSITY, BENGALURU
SCHOOL OF ENGINEERING

Max Marks: 80 | Max Time: 120 Min | Weightage: 40 %

END TERM FINAL EXAMINATION

I Semester AY 2017-18 | Course: **MEC 301 Power Plant Engineering** | 22 December 2017

Instructions:

(i) Assume missing data appropriately, if any
(ii) Answers to all numerical problems must accompany the units.
(iii) Question paper consists of 3 parts. Part A, B and C are closed book type

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Part A

(5 Q x 4 M= 20 Marks)

1. Draw flow diagram of engine fuel supply system of Diesel power plant and briefly explain.
2. Define stoichiometric combustion? Write the relation for minimum quantity of air required for complete combustion of one kg of fuel.
3. Briefly explain a fission chain reaction with an example.
4. Briefly explain the classification of hydroelectric power plant based on head over turbine.
5. Define renewable energy sources and list out at least six renewable energy power plants.

Part B

(4 Q x 9 M= 36 Marks)

6. Explain the working principle of Boiling Water Reactor (BWR) with a neat sketch.
7. Draw the line diagram of Nuclear reactor and briefly explain the function of the following:
   (a) Moderator (b) Control rods (c) Reflector
8. Draw the flow diagram of hydroelectric power plant and explain the essential elements of the following:
   (a) Catchment area (b) Penstock (c) spillways
9. A Single jet impulse turbine has to be designed for the following specifications:
   - Power developed by the turbine : 8000 kW
   - Turbine speed :237 rpm
   - Net head available :600 m
   - Coefficient of velocity of the jet :0.98

Assume the speed of the bucket wheel as 0.46 of the velocity of jet. Find (a) specific speed of the turbine (b) velocity of the jet (c) speed and diameter of the bucket wheel

Part C

(2 Q x 12 M= 24 Marks)

10. For a test on a four stroke petrol engine, the following data is available:

    - Speed of engine : 1000 rpm
    - Net brake torque : 70 N-m
    - Indicative mean effective pressure: 10 bar
    - Stroke : 150 mm
    - Bore : 100 mm
    - Rate of fuel consumption : 2.57 kg / h
    - CV of petrol : 41000 kJ/kg
    - Clearance volume :140 cm^3

    Calculate: (a) Compression ratio (b) Air standard efficiency (c) Indicated power (d) Brake power (e) Mechanical efficiency (f) Indicated thermal efficiency (g) Brake thermal efficiency.

11. The percentage sample of liquid fuel by weight is C = 84.8 % and H_2 = 15.2%. Calculate minimum weight of air requirement for the combustion per kg of fuel for complete combustion. If the actual supply of air is 15 % in excess of this, estimate total air supplied for the combustion. Also find out Percentage analysis of the dry combustion products by volume basis

PRESIDENCY UNIVERSITY, BENGALURU
SCHOOL OF ENGINEERING

Max Marks: 80 | Max Time: 120 Min | Weightage: 40 % | SET A

COMPREHENSIVE EXAMINATION

I Semester AY 2017-18 | Course: **MEC 301 Power Plant Engineering** | JAN 2018

Instruction:

(i) Assume missing data appropriately, if any
(ii) Answers to all numerical must accompany the units.
(iii) Question paper consists of 3 parts. Part A, B and C are closed book type

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Part A

(5 Q x 4 M= 20 Marks)

1. Draw flow diagram of engine fuel supply system of Diesel power plant and briefly explain.
2. Define stoichiometric combustion? Write the relation for minimum quantity of air required for complete combustion of one kg of fuel.
3. Briefly explain a fission chain reaction with an example.
4. Briefly explain the classification of hydroelectric power plant according to the availability of Head.
5. Define renewable energy source and list out at least 6 renewable energy power plants.

Part B

(4 Q x 9 M= 36 Marks)

6. Explain the working principle of Boiling Water Reactor (BWR) with a neat sketch.
7. Draw the line diagram of Nuclear reactor and briefly explain the function of the following:
   (a) Moderator (b) Control rods (c) Reflector
8. Draw the flow diagram of hydroelectric power plant and explain the essential elements of the following:
   (a) Catchment area (b) Penstock (c) spillways
9. A Single jet impulse turbine has to be designed for the following specifications:
   - Power developed by the turbine : 8000 kW
   - Turbine speed :237 rpm
   - Net head available :600 m
   - Coefficient of velocity of the jet :0.98

Assume the speed of the bucket wheel as 0.46 of the velocity of jet. Find (a) specific speed of the turbine (b) velocity of the jet (c) speed and diameter of the bucket wheel

Part C

(2 Q x 12 M= 24 Marks)

10. For a test on a four stroke petrol engine, the following data is available:
    - Speed of engine : 1000 rpm
    - Net brake torque : 70 N-m
    - Indicative mean effective pressure: 10 bar
    - Stroke : 150 mm
    - Bore : 100 mm
    - Rate of fuel consumption : 2.57 kg / h
    - CV of petrol : 41000 kJ/kg
    - Clearance volume :140 cm^3

    Calculate: (a) compression ratio (b) air standard efficiency (c) Indicated power (d) Brake power (e) Mechanical efficiency (f) Indicated thermal efficiency (g) Brake thermal efficiency.

11. The percentage of sample of liquid fuel by weight is C = 84.8 % and H_2 = 15.2%. Calculate minimum weight of air requirement for the combustion per kg of fuel for complete combustion. If the actual supply of air is 15 % in excess of this, estimate total air supplied for the combustion. Also find out Percentage analysis of the dry combustion products by volume basis

PRESIDENCY UNIVERSITY, BENGALURU
SCHOOL OF ENGINEERING

Max Marks: 40 | Max Time: 60 Mins | Weightage: 20 %

TEST 2

I Semester AY 2017-2018 | Course: **MEC 301 Power Plant Engineering** | 28 OCT 2017

Instructions:

i. Write legibly
ii. Scientific and non-programmable calculators are permitted

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Part A

(3Q x 3 M= 09 Marks)

1. Distinguish between Ideal Regenerative Rankine cycle of open and closed feed water heater.
2. List out at least 3 essential components of Diesel power plant.
3. List out the four processes in Ideal Brayton cycle in proper sequence.

Part B

(2 Q x 8 M= 16 Marks)

4. Draw the ideal regenerative Rankine cycle-T s diagram and briefly explain about all the processes in proper sequence.

5. With help of pressure and velocity profile sketch briefly explain simple Impulse and Reaction turbine

Part C

(1 Q x 15 M= 15 Marks)

6. In a gas turbine plant working on Brayton cycle, in which air enters the compressor at 100KPa and 300 K. The pressure ratio is 6.25 and the maximum cycle temperature is 1073 K. Find (a) compressor work (b) turbine work, (c) heat supplied to air (d) cycle efficiency and (e) draw T-s diagram. Mass of air may be considered as 1 kg. Take c_p = 1.005kJ/kg and γ = 1.4.

PRESIDENCY UNIVERSITY, BENGALURU
SCHOOL OF ENGINEERING

Max Marks: 40 | Max Time: 60 Mins | Weightage: 20 %

TEST 1

I Semester 2017-2018 | Course: **MEC 301 Power Plant Engineering** | 22 SEPT 2017

Instructions:

i. Write legibly
ii. Scientific and non programmable calculators are permitted
iii. Steam tables are permitted

Part A

(4Q x 2 M= 08 Marks)

1. Define Load factor and Use factor.
2. Distinguish between natural circulation and forced circulation.
3. What are once through boilers? How do they differ from drum boilers ?
4. List out atleast 2 methods to increase the efficiency of the Rankine cycle

Part B

(2 Q x 8 M= 16 Marks)

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

Time (hours)	0 -6	6 – 12	12 – 14	14 – 18	18 - 24
Load (MW)	30	90	60	100	50

(a) Draw the load curve pattern for power station (b) Calculate average load and Load factor

6. Explain the working principle of La Mont boiler with help of neat line diagram.

Part C

(1 Q x 16 M= 16 Marks)

7. A steam power plant incorporates an ideal reheat cycle to improve the existing efficiency. Steam at 30 bar and 250^0C is supplied at the HP turbine inlet and expands till it is dry saturated at 3 bar as shown in Fig 1. Now the steam is taken to a reheater and its temperature is again increased to 250^0C at constant pressure. The reheated super-heated steam expands in the LP turbine to a condenser pressure of 0.04bar with dryness fraction of 0.88. Assume pump work is 3 kJ/kg.

   Determine (a) Power developed by the Turbines (b) Total heat supplied (c) Ideal reheat Rankine cycle efficiency.

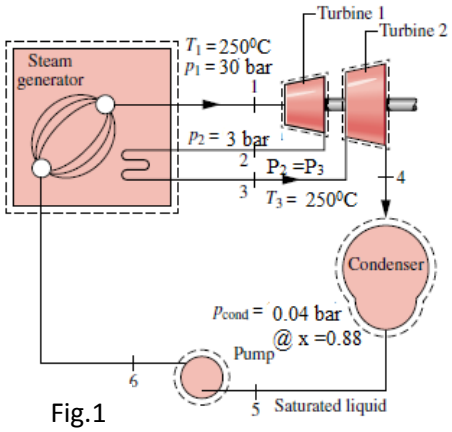

Fig.1