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6E7015

Roll No. _____

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6E7015

B. Tech. VI Sem. (Main & Back) Exam., April/May-2016

Mech. Engineer

6ME5A Steam Engineering

Time: 3 Hours

Maximum Marks: 80

Min. Passing Marks (Main & Back): 26

Instructions to Candidates:-

Attempt any five questions, selecting one question from each unit. All Questions carry equal marks. Schematic diagrams must be shown wherever necessary. Any data you feel missing may suitably be assumed and stated clearly.

Units of quantities used/ calculated must be stated clearly.

Use of following supporting material is permitted during examination.

1. Steam table & molli's chart

2. Property tables

UNIT-I

- Q.1 (a) State how the boilers are classified? [6]
- (b) Give an outline sketch showing the arrangement of water tubes and furnace of a Babcock and Wilcox boiler. Indicate on it the path of the flue gases and water circulation. Show the positions of fusible plug, blow off cock and super heater. Mention the function of each. [10]

OR

- Q.2 (a) Why high pressure boiler are used? [6]
- (b) What is Fluidised Bed Combustion system? Sketch and describe a Fluidised Bed Combustion (FBC) system. State the advantages of FBC system. [10]

UNIT-II

Q.3 (a) Define Mach Number. What is its significance in design of diffusers and nozzles? [6]

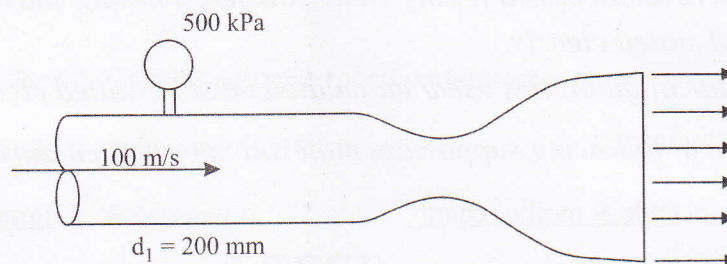
(b) Air enters a nozzle like that shown in Figure at a temperature of 195°C and a velocity of 100 m/s . If the air exits to the atmosphere where the pressure is 85 kPa . Find

(i) The exit temperature

(ii) The exit velocity

(iii) The exit diameter

[10]



OR

Q.2 (a) Derive the expression for critical pressure ratio in case of nozzles. [8]

(b) Air at 10°C and 80 kPa enters the diffuser of a jet engine steadily with a velocity of 200 m/s . The inlet area of the diffuser is 0.4 m^2 . The air leaves the diffuser with a velocity that is very small compared with the inlet velocity. Determine

(i) The mass flow rate of the air and

(ii) The temperature of the air leaving the diffuser.

[8]

UNIT-III

Q.3 (a) Explain diagram efficiency and Gross stage efficiency.

[6]

- (b) What do you understand by compounding for pressure and velocity in case of impulse turbine? Why and how it is achieved? [10]

OR

- Q.3 (a) Why governing of turbines is essential? [4]
- (b) In a simple steam impulse turbine, steam leaves the nozzle with a velocity of 1000 m/s at an angle of 20° to the plane of rotation. The mean blade velocity is 60% of velocity of maximum efficiency. If diagram is 70% and axial thrust is 39.24 N/kg of steam/sec, estimate:
- (i) Blade angles
 - (ii) Blade velocity co – efficient
 - (iii) Heat lost in kJ in friction per kg. [12]

UNIT-IV

- Q.4 (a) What do you understand by 'degree of reaction'? [4]
- (b) At a particular ring of a reaction turbine the blade speed is 67 m/s and the flow of steam is 4.54 kg/s, dry saturated, at 1.373 bar. Both fixed and moving blades have inlet and exit angles of 35° and 20° respectively. Determine:
- (i) Power developed by the pair of rings.
 - (ii) The required blade height which is to be one tenth of the mean blade ring diameter.
 - (iii) The heat drop required by the pair if the steam expands with an efficiency of 80%. [12]

OR

- Q.4 (a) What do you understand by regenerative feed heating cycle? [4]

- (b) Explain the difference between ideal and actual Regenerative cycles by showing the process on T – s and h – s Diagram. Why actual Regenerative cycle differs from ideal Regenerative cycle? [12]

UNIT-V

Q.5 (a) What are the advantages and disadvantages of reheating of steam? [4]

(b) In a condenser test the following observations were made: [12]

Vacuum = 69 cm of Hg: Barometer = 75 cm of Hg

Mean temperature of condenser = 35°C: Hot well temperature = 28°C

Amount of cooling water = 50,000 kg/hr. Inlet temperature = 17°C

Outlet temperature = 30°C: Amount of condensate per hour = 1250kg

Find

(i) The amount of air present per m³ of condenser volume.

(ii) The state of steam entering the condenser.

(iii) The vacuum efficiency.

R for air = 287 J/kgK.

OR

Q.5 (a) Explain the working of binary vapour cycle with a neat sketch. [8]

(b) What is condenser? Name the different types of condenser. Describe the operation of surface condenser. [8]
