2nd Semester Back Examination 2016-17
GAS TURBINE AND JET PROPULSION
BRANCH : HEAT POWER & THEMAL ENGINEERING
Time: 3 Hour
Max Marks: 70
Q. CODE: Z816
Answer Question No.1 which is compulsory and any five from the rest.
The figures in the right hand margin indicate marks.

Q1   **Answer the following questions:**   (2x10)
- **a)** Define dynamic temperature.
- **b)** Write two methods to improve the thermal efficiency of simple cycle gas turbine plant.
- **c)** Write steady flow energy equation for the turbine of a gas turbine plant.
- **d)** Define compressor work.
- **e)** What is combustion intensity of combustion chamber?
- **f)** Define degree of reaction of a compressor.
- **g)** Define effectiveness of a heat exchanger.
- **h)** Differentiate between radial flow and axial flow turbine.
- **i)** What is the stress on the blade of a rotor and how many types?
- **j)** What is the aspect ratio of a blade?

Q2 **(a)** An open cycle gas turbine plant has a single stage compressor and a single stage expander incorporating a heat exchanger. The air suction temperature is 17^0C and the pressure 1 bar. For an overall pressure ratio of 4.5 and shaft output of 4000KW, the mass flow is 40kg/sec. If the thermal ratio of the heat exchanger is 0.6 and the isentropic efficiency of compressor is 0.85, calculate the isentropic efficiency of the gas turbine for a plant thermal efficiency of 0.30. Take for air, $\gamma = 1.4$, $C_{pa} = 1.005$ KJ/kg^{0}K, for gas $\gamma = 1.365$, $C_{pg} = 1.07$ KJ/kg^{0}k.   (5)

(b) Write the assumptions for open cycle gas turbine plant and derive the efficiency for it.   (5)

Q3 **(a)** Write different components of a centrifugal compressor and explain the working principle of each component. Calculate the work done by the compressor from velocity triangles.   (6)

(b) Draw the h-s diagram of a radial flow turbine.   (4)

Q4 **(a)** Calculate the degree of reaction of a axial flow compressor. (5)

(b) Write the factors affecting the combustor design. (5)

Q5 **(a)** Write different components of a radial flow turbine and explain its working principle. Calculate the specific work output from the velocity triangles. (6)

(b) Explain the methods of improving the part-load performance of gas turbine. (4)

Q6 **(a)** Describe matching procedures of turbofan engine. (5)

(b) Describe the control systems of a gas turbine. (5)

Q7 **(a)** Explain turbofan engine and turbojet engine. (5)

(b) Write a comparison between open cycle and closed cycle gas turbine. (5)

Q8 **Write short note on: (any two)** (5x2)

(a) Turbo shaft engine.

(b) Compressibility effect on gas flows.

(c) Transient behavior of gas turbine.