Reg.No. \_\_\_\_\_\_\_\_\_\_\_\_

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**End Semester Examination – Nov/Dec – 2018**

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| **Code :** | **17ME3035** | **Duration :** | **3hrs** |
| **Sub. Name :** | **ADVANCED TURBOMACHINERY** | **Max. marks :** | **100** |

**ANSWER ALL QUESTIONS (5 x 20 = 100 Marks)**

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| **Q. No.** | **Sub Div.** | **Questions** | **Course**  **Outcome** | **Marks** |
| 1. | a. | Compare reaction and impulse turbine. | CO1 | 5 |
| b. | Develop the Euler energy equation for turbomachinery from conservative equation. | CO1 | 15 |
| (OR) | | | | |
| 2. | a. | Discuss about the various energy transfer which are taking place in a turbo machine. | CO2 | 10 |
| b. | Define and classify turbo machines. | CO1 | 10 |
|  |  |  |  |  |
| 3. | a. | Explain in detail how optimum suction head is calculated for a pump. | CO2 | 5 |
| b. | Discuss what will happen, if NPSH is kept negative while operating the pump. | CO2 | 5 |
| c. | Discuss the role of Degree of reaction on the selection turbines. | CO3 | 10 |
| (OR) | | | | |
| 4. | a. | A pipe of diameter 1.5m is required to transport an oil of specific gravity 0.9 and viscosity 3 \* 10-2 poise at the rate of 3000litres/sec. Tests were conducted on a 15cm diameter pipe using water at 20oC. Find the velocity and rate of flow in the model. Viscosity of water at 20oC = 0.01 poise. | CO2 | 10 |
| b | Explain what do you mean by specific speed.  Comment on how specific speeds can be used to select a turbine or pump during installation. | CO3 | 10 |
|  |  |  |  |  |
| 5. |  | Show that stage efficiency in a compressor is given by  η st = | CO4 | 20 |
| (OR) | | | | |
| 6. | a. | The nozzle expand air from p1 = 8.0bar, T1 = 540K to a pressure of 5.8bar with a efficiency of 95%. The air is then passed through a diffuser of area ratio 4. The total pressure loss across the diffuser is 367mm Hg. Determine the efficiency of the diffuser and the velocities of air at its entry and exit. What is the pressure at diffuser exit? | CO4 | 10 |
| b. | Describe about creep phenomenon occurring in gas turbine. How does it affect the operation of gas turbine stages at elevated temperature? | CO4 | 10 |
|  |  |  |  |  |
| 7. |  | In an impulse turbine designed for free- vortex flow at the rotor inlet, the blade root radius is 0.25m and the blade height is 63mm. The absolute velocity of steam at the rotor inlet is 450 m-s-1 , the fluid being directed to make an angle of 15oC with the wheel tangent at the blade root. If the speed- ratio is 0.45 at the tip, the blade velocity co-efficient is 0.97 and the difference between the rotor and outlet angle is 3O all over the root, find the degree of reaction at tip. | CO5 | 20 |
| (OR) | | | | |
| 8. | a. | Explain the following terms with respect to blade:   1. Span length 2. Chord 3. Angle of incidence 4. Camber-line 5. angle of attack | CO5 | 8 |
| b. | Discuss about the following in turbomachinery explaining following terms:   1. internal loss 2. external loss 3. return flow loss 4. disk friction low | CO5 | 12 |
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|  | | **Compulsory**: |  |  |
| 9. |  | A Pelton wheel is to be designed for the following specifications:  Shaft Power = 11,772Kw, Head = 380 meters, speed = 750 r.p.m.; overall efficiency = 86%; Jet diameter is not to exceed one – sixth of the wheel diameter. Determine:   1. The wheel diameter 2. The number of jets required 3. Diameter of the jet   Kv1 = 0.985 and Ku1 = 0.45 | CO6 | 20 |