

**SUBJECT CODE NO:- P-143**  
**FACULTY OF ENGINEERING AND TECHNOLOGY**  
**B.E.(Mech) Examination MAY/JUNE-2016**  
**Turbo Machines**  
**(Revised)**

[Time:Three Hours]

[Max Marks:80]

“Please check whether you have got the right question paper.”

- N.B i) Solve any three questions from each section.  
 ii) Figures to right indicate full marks
- Section A
- Q.1 a) Define a turbo machine and give the classification in brief 06  
 b) Explain how the principle of dimensional analysis is applied to the turbo machines and explain their significance 07
- Q.2 a) Show that a curve radial vane work done per second is given by  $\rho a V [V_{w1} u_1 \pm V_{w2} u_2]$  the notation carry usual meaning. 07  
 b) A jet water of diameter 48mm strikes a fixed plate in such a way that the angle between the plate and jet is  $30^\circ$ . The force exerted in the direction of the jet is 1480N. determine the rate of flow of water 06
- Q.3 a) Define and explain hydraulics efficiency, mechanical efficiency and overall efficiency of a turbine 06  
 b) What do you mean by the characteristics curve of turbine? Name the important types of characteristics curves 07
- Q.4 A Pelton wheel is to be designed for a head of 65 m when running at 205 rpm. The Pelton wheel develops 100 KW shaft power. The velocity of buckets = 0.47 times the velocity of the jet, overall efficiency = 0.85 and co-efficient of the velocity is equal to 0.98. Find i) Diameter of jet ii) diameter of wheel iii) width and depth of buckets iv) number of buckets on the wheel. 13
- Q.5 Write short notes on any three of the following 14  
 a) Types of draft tubes and its significance  
 b) Kaplan turbine  
 c) Pelton wheel turbine  
 d) Selection of turbine for particular case
- Section B
- Q.6 a) What are the effects of cavitations? Give the necessary precaution to avoid cavitation. 06  
 b) A centrifugal pump is to discharge  $0.12\text{m}^3/\text{s}$  at a speed of 1440 rpm against a head of 27 m. the impeller is 260 mm, its width at outlet is 55 mm and manometric efficiency is 77%. Determine the vane angle at the outer periphery of the impeller 07
- Q.7 a) The diameter of an impeller of a centrifugal pump at inlet and outlet are 35cm and 65cm respectively. The velocity of flow at outlet is 2.5m/s and the vanes are set back at angle of an  $45^\circ$  at the outlet. Determine the minimum starting speed of the pump, if the manometric efficiency is 75% 07  
 b) List the main component parts of centrifugal pump and explain them briefly 06
- Q.8 a) Classify the steam turbine based on the energy available at inlet of the machine and briefly explain them. 06  
 b) An adiabatic steam nozzle is to be designed for a discharge rate of 12kg/s of steam from 12 bar and  $405^\circ$  to a back pressure of 1.1 bar. The nozzle efficiency is 0.92 and the frictional loss is assumed to take place in the diverging portion of the nozzle only. Assume a critical pressure ratio of 0.5457. Determine the throat and exit areas 07

- Q.9            a) Discuss the influence of reheating, regeneration and inter-cooling on the performance of the gas turbine cycle.            07
- b) Why is compounding of steam necessary? Describe with neat sketch the pressure compounding of steam turbine            06
- Q.10          Write short notes on any three of following            14
- a) Priming in centrifugal pump
- b) Stirling cycle
- c) Nozzles and diffusers
- d) Application of gas turbines