B.E. (Mech) (Sem-VII) (CBCGS)

Pumps, Compressors & fans (CR-2016)

University of Mumbai

Examinations Summer 2022

Time: 2 hour 30 minutes | Max. Marks: 80

Q1.	**Choose the correct option for following questions. All the Questions are compulsory and carry equal marks**
1.	Negative slip occurs in reciprocating pumps, when delivery pipe is
Option A:	Long and suction pipe is short and pump is running at low speed
Option B:	Long and suction pipe is short and pump is running at high speed
Option C:	Short and suction pipe is long and pump is running at low speed
Option D:	Short and suction pipe is long and pump is running at high speed
2.	_____ is a circular disk attached to the motor and used to transfer the rotary motion of the motor to the piston.
Option A:	Plunger
Option B:	Crank
Option C:	Suction pipe
Option D:	Delivery pipe
3.	Which of the following axial fan type is most efficient?
Option A:	Propeller
Option B:	Tube Axial
Option C:	Vane Axial
Option D:	Radial
4.	Reciprocating air compressor is best suited for.....
Option A:	Large quantity of air at high pressure
Option B:	Small quantity of air at high pressure
Option C:	Small quantity of air at low pressure
Option D:	Large quantity of air at low pressure
5.	The parameter used by ASME to define fans, blowers and compressors is
Option A:	Fan ration
Option B:	Specific ratio
Option C:	Blade ratio
Option D:	Twist factor
6.	If the flow of air through the compressor is perpendicular to its axis, then it is a.....
Option A:	Conversion of dynamic pressure into static pressure takes place in the volute casing due to its convergent shape
Option B:	Multistaging in centrifugal compressors is commonly used for high refrigerant capacity applications
Option C:	In multistage centrifugal compressor, width of blades increases progressively in the direction of flow
Option D:	In multistage centrifugal compressor, width of blades reduces progressively in the direction of flow

7.	The fluid gains .....while passing through the impeller
Option A:	Velocity
Option B:	Pressure
Option C:	Temperature
Option D:	Velocity and Pressure
8.	What is the shape of the diffuser in the centrifugal pump?
Option A:	Round
Option B:	Dough nut
Option C:	Rectangle
Option D:	Cylindrical
9.	The optimum value of vane exit angle for a centrifugal pump impeller is
Option A:	10-15°
Option B:	20-25°
Option C:	30-40°
Option D:	50-60°
10.	Indicator diagram of a reciprocating pump is a graph between
Option A:	flow vs swept volume
Option B:	pressure in cylinder vs swept volume
Option C:	flow vs speed
Option D:	pressure vs speed

Q2.	**Solve any Two Questions out of Three** **10 marks each**
A	A centrifugal pump impeller has internal and external diameter 480 mm and 240 mm respectively. It is running at 1000 rpm. The rate of flow through the pump is 0.0576 m^3/s and velocity of flow is constant and is equal to 2.4 m/s. The diameter of suction and delivery pipes are 180 mm and 120 mm respectively and suction and delivery heads are 6.2 m (abs) and 30.2 m of water respectively. If the power required to drive the pump is 23.3 KW and outlet vane angle is 45°. Find: i) Inlet vane angle ii) Overall efficiency iii) Manometric efficiency
B	What is Ideal Indicator Diagram for a reciprocating pump and what is the effect of friction in suction and delivery pipes on indicator diagram.
C	A centrifugal blower takes in 180m^3/min of air at suction pressure of 1.013 bar and temperature of 43°C and delivers at 750 mm of W.G. taking the efficiencies of the blower and drive as 80 % and 82 % respectively. Determine the power required to drive the blower and the state of air at exit.

Q3.	Solve any Two Questions out of Three 10 marks each
A	Explain surging and choking in case of a centrifugal compressor.
B	A single acting reciprocating pump having a cylinder diameter of 150 mm and stroke of 300 mm is used to raise the water through a height of 20 m. Its crank rotates at 60 rpm. Find the theoretical power required to run the pump and the theoretical discharge. If actual discharge is 5 lit/s find the percentage of slip. If delivery pipe is 100 mm in diameter and is 15 m long, find the acceleration head at the beginning of the stroke.
C	What are the main causes of noise generation? What are the methods of reducing fan noise?

Q4.	Solve any Two Questions out of Three 10 marks each
A	Explain construction and working of double acting reciprocating pump with neat labeled diagram.
B	A single stage single acting compressor delivers 0.6 kg of air per minute at 6 bar. The temperature and pressure at the end of suction stroke are 30°C and 1 bar. The bore and stroke of compressor are 90 mm and 140 mm respectively. The clearance is 3% of the swept volume. Assuming the index of compression and expansion to be 1.3, find i) Volumetric efficiency of the compressor ii) Power required if the mechanical efficiency is 86 % iii) Speed of the compressor in rpm
C	Explain the performance of axial fan with the help of graph.