

**GUJARAT TECHNOLOGICAL UNIVERSITY**  
**M. E. - SEMESTER – I • EXAMINATION – WINTER • 2014**

**Subject code: 2711002****Date: 09-01-2015****Subject Name: Vacuum Engineering****Time: 02:30 pm - 05:00 pm****Total Marks: 70****Instructions:**

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.

- Q.1 (a) Explain about Regions of Gas flow in pipe work of a typical vacuum pumping system. 07
- (b) Derive following expression for an elementary vacuum system with usual annotations. 07
- $$Q_i' = Q_p' = p_p S_p = p S_e$$
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- Q.2 (a) Derive the expression of pump down time for turbulent and viscous gas flow. 07
- (b) A gas filled incandescent lamp when cold at 295 K contains a gas under a pressure of 75kPa. What will be the pressure in lamp, if the filament has raised the filling gas to a mean temperature of 440 K. 07
- OR**
- (b) (i) Determine the root mean square speed of hydrogen molecules at 180 K. 03
- (ii) Calculate the volume occupied by air molecules colliding with 2.5 m<sup>2</sup> area of the confining wall per second at 293 K. 04
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- Q.3 (a) Describe working of Hot Cathode Ionization gauge with figure for vacuum measurement. 07
- (b) Explain following terms w.r.t. vacuum pumps. 07
- (i) Maximum permissible start up pressure
- (ii) Maximum tolerable discharge pressure.
- OR**
- Q.3 (a) Explain working of Cold Cathode Getter Ion Pump with neat figure. 07
- (b) Describe the linear scale of measurement for vacuum with the help of McLeod gauge with figure. 07
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- Q.4 (a) Describe construction and working of Cryosorption pump with neat figure. 07
- (b) Classify the motion seals according to the design. Draw at least one sketch of the each design of the motion seals. 07
- OR**
- Q.4 (a) Describe the Spark Coil testing method for leak detection in a vacuum system with figure. 07
- (b) Describe the limitations of Cold Cathode Ionization gauge used for vacuum measurement. 07
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- Q.5 (a) Draw the sketches for different basic types of demountable rubber gasketed joints used for vacuum system design. 07
- (b) Describe basic requirements to be met by vacuum materials. 07
- OR**
- Q.5 (a) Draw the figure of baffle type vacuum valve used as backing valve in a typical vacuum module. 07
- (b) Explain the laboratory procedure for measurement of the pump speed ( $S_p$ ) for mechanical vacuum pump with necessary figure. 07