

ENROLLMENT NO: \_\_\_\_\_

**GANPAT UNIVERSITY**  
**B.TECH. 5<sup>th</sup> SEM. BIOMEDICAL AND INSTRUMENTATION ENGINEERING**  
**CBCS REGULAR EXAMINATION NOVEMBER 2014**  
**2BM506: ANALYTICAL INSTRUMENTATION**

**TIME: 3 Hours**

**TOTAL MARKS: 70**

**INSTRUCTIONS:**

1. Use separate answer sheets for the two sections
2. Figures on the right side indicate marks
3. Please explain with the help of diagram wherever it is necessary
4. Each sub-question carries equal marks unless it is specified

**SECTION - I**

**Que.1 Write answers of the following questions. 12**

- A Write a note on nature of the electromagnetic radiation.
- B Explain the principle of fluorescence microscopy.

**OR**

**Que.1 Write answers of the following questions. 12**

- A Explain the principle of differential interface contrast microscopy.
- B Explain the principle, applications, and advantages of transmission electron microscopy.

**Que.2 Write answers of the following questions. 11**

- A Write a note on minimization of errors in chemical analysis.
- B Derive the equation for the Beer-Lambert Law.

**OR**

**Que.2 Write answers of the following questions. 11**

- A Explain in detail the origin of absorption spectra in spectrophotometric techniques.
- B Explain the theory of infra-red spectroscopy.

**Que.3 Write answers of the following questions. 12**

- A Derive the equation explaining the dissociation of weak electrolyte in dilute aqueous solution.
- B Write a note on determinate errors.
- C Find out the pH of a solution, on addition of 75 ml of 2.5M HCl to 1L of 0.3 M boric acid/0.5 M sodium borate buffer solution. The value of dissociation constant of given buffer solution is  $6.4 \times 10^{-10}$ .

**SECTION – II**

- Que.4 Write answers of the following questions. 12**
- A Explain in detail all the methods of the auto cell counter.
  - B Write a note on pH meter.

OR

- Que.4 Write answers of the following questions. 12**
- A Explain principle, construction, and procedure of hot-air oven.
  - B Define: Zwitterion, Spectrophotometry, Retention time, Partition chromatography, Instrumental analysis, Focal point

- Que.5 Write answers of the following questions. 11**
- A Explain the principle of centrifugation. Derive and explain the equation for relative centrifugal force.
  - B Write a note on thin-layer chromatography.

OR

- Que.5 Write answers of the following questions. 11**
- A Explain the column, sample injection system and pump used in HPLC equipment.
  - B Discuss the important parameters for separation in electrophoresis.

- Que.6 Write answers of the following questions. 12**
- A What is the pH of a solution containing  $2.75 \times 10^{-6}$  M of  $[\text{OH}^-]$ ? 3
  - B Analysis of a sample gave following percentage values for active constituents; 9.6, 9.5, 12.5, 7.3, 8.4, 7.8, 8.5. Calculate the mean, standard deviation, standard error and coefficient of variation. 4
  - C
 

	New method	Standard method	
Mean	22.67	21.73	5
Standard Deviation	$\pm 0.7654$	$\pm 0.4362$	
No. of samples	7	9	

Test at 95% confidence if the new method mean is significantly different from the standard method. Tabulated value of  $f = 3.58$ ,  $t = 2.145$ .

-----END OF THE PAPER-----