Reg. No.									

MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL

(A constituent unit of MAHE, Manipal)

VII SEMESTER B. TECH (BIOTECHNOLOGY)
END SEMESTER EXAMINATIONS (REGULAR), NOV/DEC 2019
SUBJECT: BIOSTATISTICS & ANALYTICAL TECHNIQUES [BIO 4103]
REVISED CREDIT SYSTEM

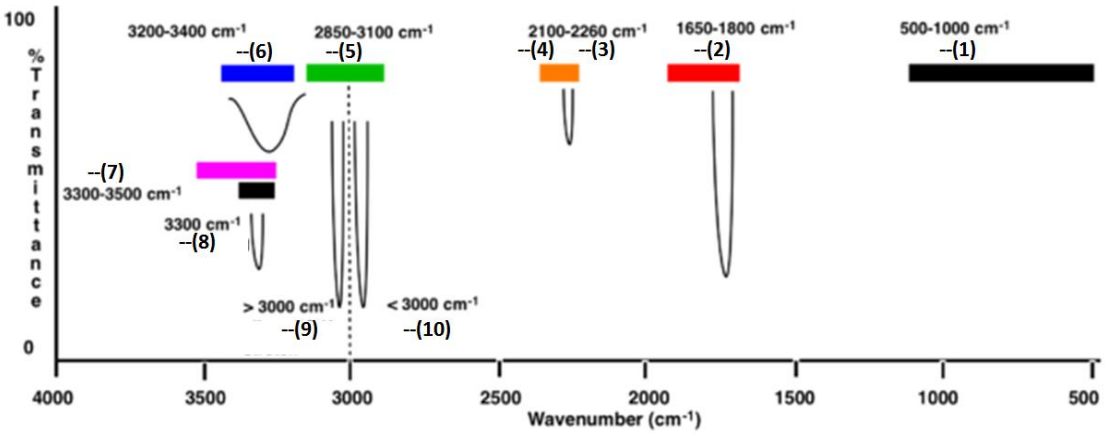
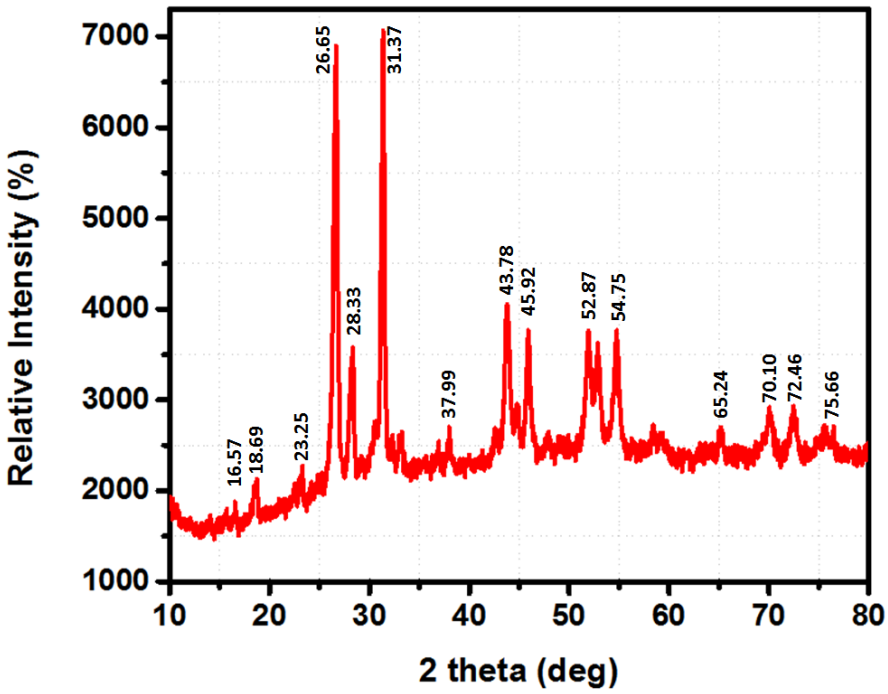
Time: 3 Hours MAX. MARKS: 50

Instructions to Candidates:

- Answer **ALL** the questions.
- Missing data may be suitable assumed.

1A.	For the set of scores (y values) 2, 0, 2, 4, and 2, calculate, i). sum of y, ii). sum of y+1, iii). sum of (y+1), iv). sum of $(y+1)^2$, i). (sum of y)^2.	**2.5**
1B.	The DAFOR scale is an ordinal-level measuring system, which ranges from 5 (dominant) to 1 (rare). It is used to record the occurrence of plant species in quadrats. The following is a sample of grass cover measured using this system: 4, 3, 4, 5, 2, 1, and 3. (i). select the most appropriate measures of central tendency (MCT) and measure of variability (MV) for these data. Justify the choice. (ii). Calculate the MCT and MV that you have selected in (i).	**4**
1C.	The bone density of 100 adults, all over 50-year-old, were recorded, along with information on the sex of the person, how much exercise they took (none, low, moderate, or high level), and how tall they were centimeters. i). state which analysis you think the researchers had in mind for their data when designing their project (include a summary of the path you look through the choosing chart to get to the choice). (ii). Suggest which type of graph the researchers could use to help communicate their finding.	**3.5**
2A	The following scores represent a nurse's assessment (X) and a physician's assessment (Y) of the condition of 10 patients at a time of admission to a trauma center. Construct a regression equation using least square method, determine R^2 to	**6**

	check the adequacy of the model, and predict the ARD for the model. If the standard error coefficient of model is 2.873 and for x is 0.2092, check the significance using t_{sat}. **X** 18 13 18 15 10 12 8 4 7 3 **Y** 23 20 18 16 14 11 10 7 6 4	
2B.	Cranor and Christensen conducted a study to assess short-term clinical, economic, and humanistic outcomes of pharmaceutical care services for patients with diabetes in community pharmacies. For 47 of the subjects in the study, cholesterol levels are summarized in Table. **Class interval** | **<100** | **100-124.9** | **125-149.9** | **150-174.9** | **175-199.9** | **200-224.9** | **225-249.9** | **250-274.9** | **275-299.99** | **300-<300** **No of subjects** | **0** | **1** | **3** | **8** | **18** | **6** | **4** | **4** | **3** | **0** **Expected relative frequency** | **0.0084** | **0.0291** | **0.0815** | **0.1653** | **0.227** | **0.2269** | **0.1536** | **0.0753** | **0.0251** | **0.0071** **Expected frequency** | **0.4** | **1.4** | **3.8** | **7.8** | **10.7** | **10.7** | **7.2** | **3.5** | **1.2** | **0.3** The tabulated χ^2 value is 10.566. Calculate the χ^2 at 5% significance level	**4**
3A	A 2^4-factorial design (Yates run order) was used for a process development study. The factors are A-amount of catalyst charge, B-temperature, C-pressure and D-concentration of one of the reactants. The responses are 70, 60, 89, 81, 69, 62, 88, 81, 60, 49, 88, 82, 60, 52, 86 and 79. Estimate the four main effects, six two-factor interactions, four three-factor interactions, one four-factor interaction and fit into the model equation with its co-efficient.	**5**
3B	For question number. **3A**, construct the four main effect plots**,** six two-factor interaction plots, two cube plots for the response and display a dot plot of the estimated effects.	**5**
4A	What is a 4^2x3^3x2 factorial design? How many runs are there in this design? How many variables does it accommodate?	**2**
4B	The absorbance is a dimensionless quantity. What will be the units of $\in$, the specific absorptivity?	**2**

4C	The absorbance of an iron thiocyanate solution containing 0.00500 mg Fe/mL was reported as 0.4900 at 540 nm. (i). calculate the specific absorptivity, including units, of iron thiocyanate on the assumption that a 1.00 cm cuvette was used. (ii). What will be the absorbance if the solution is diluted to twice its original volume and the solution is placed in a 5.00 cm cuvette? (iii). What percent of light is transmitted by the original iron thiocyanate solution? (iv). What concentration of iron thiocyanate will absorb 50% of the entering light?	**4**
4D	Illustrate the instrumentation for XRF and write the application of XRF.	**2**
5A	The generalized FTIR spectra region is shown in Fig. Identify and list the corresponding functional group in the figure. 	**5**
5B	The XRD spectrum of the unknown sample is shown in Fig. Extract the data from the graph and the FWHM (deg) for the peaks were, 0.15, 0.15, 0.13, 0.26, 0.13, 0.18, 0.15, 0.41, 0.31, 0.36, 0.21, 0.31, 0.41 and 0.31. Estimate the d-spacing, crystallite size and average crystallite size. 	**5**