End Semester Examination
Course Name: Analytical Biotechnology (BT601)
Time: 9.00-12.00, Dated: 09/05/2022
Total Marks: 50

Q1.

A. Show the operation of stable memory maintenance over multiple cell generations using AND gate.
B. Show the operation of stable memory maintenance even after cell death using NOR gate.
C. Show diagrammatically that Recombinase-based logic and memory can implement digital-to-analog converters.
D. Draw polyacrylamide **Gel electrophoresis diagram** to show **autonomous cycling of the DNA motor**. [**Hint:** DNA motor (E+F) and its substrate (S) were incubated at a motor/substrate ratio for varying time periods and then resolved by gel electrophoresis].
E. Write operation of XOR Gate using DNAzymes +Truth Table

(Marks: 3x 5=15)

Q2.

A. Derive step-wise the expression of K_d for SPR and write all the terms. Show the sensogram of high and low affinity binding.
B. Evaluate the immunoassay specificity in SPR mode for **I)** specific mAbhGH-25 binds only to 22K hGH isoform and **II)** specific mAb hGH-33 only recognizes 20K isoform.
C. In Quantum dot-chitosan based heavy metal Ion sensing method, plot absorption spectra of ZnS QDs when treated with **varying concentrations** of Hg^{+2} ion.
D. How EDX spectra help in distinguishing ZnS QDs and the transformed HgS QDs during Hg+2 ion sensing?
E. Show by FRET operation of Strand exchange reactions of AND gate in mammalian cells with fluorescence output.

(Marks: 3x 5=15)

Q3.

A. Show the UV-vis reflectance spectra of different AgFON substrates for 390 nm, 510 nm, and 600 nm for SERS measurements of Anthrax using 750 nm laser excitation
B. Show long-term stability of AgFON substrates, monitored for 1-40 days using SERS spectra.
C. Write stepwise equation for *Adsorption Isotherm* and LOD for Bacillus Spores on AgFON Substrates.
D. How do you present in a single graph Cytotoxicity of different concentrations of Ag-CS NCs on cancer cells after 3 and 6 h of treatment using LDH assay.
E. How QDs can improve the efficiency of solar cells? Explain with diagram

(Marks: 3x 5=15)

Q4. Case Study: Fabrication of Glutathione-S-Transferase–ZnO Nanoconjugate Ensemble FET Device for Detection of Glutathione.

Explain briefly the following *experiments* with diagrams based on above case study:

I. How do you characterize ZnO nanoparticles?
II. Steps of Fabrication process of FET.
III. Show the graph of current measurements and real time analysis for detection of GSH.

(Marks: 1+2+2= 5)
