BIRLA INSTITUTE OF TECHNOLOGY
MESRA – 835215, RANCHI, INDIA

UG

Name: …………………………………………. Roll No.: …………………………………..

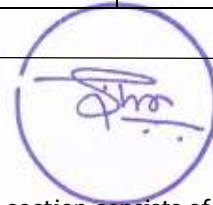Branch: …………………………………………. Signature of Invigilator: ……………………

Semester: VIth   Date: 02/05/2022 (MORNING)

Subject with Code: **BE415 SYSTEM BIOLOGY**

Marks Obtained	Section A (30)	Section B (20)	Total Marks (50)

INSTRUCTION TO CANDIDATE

CLASS: BTECH	SEMESTER : VI
BRANCH: BIOTECHNOLOGY	SESSION : SP/22

SUBJECT: BE415 SYSTEMS BIOLOGY

TIME: FULL MARKS: 50

INSTRUCTIONS:
1. The missing data, if any, may be assumed suitably.
2. Before attempting the question paper, be sure that you have got the correct question paper.
3. Tables/Data hand book/Graph paper etc. to be supplied to the candidates in the examination hall.

Q. Answer the following–   **[30 X 1 = 30]**

1. The interaction between transcription factors and genes is described by:
    a. Transcription networks
    b. Sensory networks
    c. Developmental networks
    d. None
2. Modular networks make transcription networks:
    a. Evolvable
    b. Sensitive
    c. Both
    d. None
3. Higher the value on 'n' in a Hill function the closer the response to a
    a. Step function
    b. Gradual response
    c. Both
    d. None
4. A two input function with a positive true value, only when both inputs are true can be represented by a
    a. NOT gate
    b. NOR gate
    c. AND gate
    d. XOR gate
5. Negative autoregulation promotes_____ to fluctuations in production rate:
    a. Robustness
    b. Modularity
    c. Sensitivity
    d. None
6. How many possible ways are there to connect three nodes with directed arrows?
    a. 8
    b. 13
    c. 13

d. 18
7. The overall sign of interaction in an indirect path of FFL is determined by_____ the signs:
   a. ANDing
   b. ORing
   c. NOTing
   d. NANDing
8. Which of the following statements is true?
   a. There is a delay following ON step in FFL
   b. There is no delay following OFF step in FFL
   c. Both
   d. Cant say
9. An ON pulse that is shorter than delay time Ton does not lead to gene expression:
   a. True
   b. False
10. Which of the following statements is TRUE about SIM?
    a. A master transcription factor controls a group of genes
    b. It can generate temporal gene expression programs
    c. Both
    d. None
11. The lambda repressor switch consists of:
    a. CI protein activating lysogeny
    b. Cro protein activating lysis
    c. Both
    d. None
12. The chemical systems may behave in a digital manner if_____ is high in a ligand binding
    a. Co-operativity
    b. Objectivity
    c. Repressibility
    d. None
13. Random variability arising in cellular biology is known as:
    a. Noise
    b. Chaos
    c. Both
    d. None
14. Michaelis constant is the _____ concentration at which the reaction reaches half of maximum velocity
    a. Substrate
    b. Enzyme
    c. Transcription factor
    d. Protein
15. Temporal order depends upon:
    e. Threshold concentration
    f. Cell size
    g. Synaptic transmission

h. None

16. Which of the following statements is true?
    e. Neuronal circuits have faster response time
    f. Sensory networks work on molecular and cell size level
    g. Developmental networks may span upto years
    h. All

17. Which of the following ffl has all direct and indirect signs same ?
    e. C1 FFL
    f. I1 FFL
    g. I2 FFL
    h. BOTH A AND C

18. A double positive feedback loop regulating a gene z has how many steady states?
    e. 2
    f. 3
    g. 4
    h. 1

19. Gram-negative bacteria produce _____autoinducers that can passively diffuse through their thin cell wall.
    a. acyl-homoserine lactone
    b. 4 -5 methyl acyl-homoserine lactone
    c. Acetyl Co-A
    d. None of the above

20. For Biofilm production *V. cholerae* regulates its response to autoinducers via following gene
    a. LuxO~PO4
    b. LuxO
    c. LuxI
    d. None of the above

21. For cell-cell communication in the marine bacterium *Vibrio fischeri* following gene system is responsible
    a. LuxO/LuxR system
    b. LuxI/LuxR system
    c. LuxI only
    d. None of the above

22. In the process of developmental stages of *Drosophila melanogaster*, the stage of "Body Segmentation" comes after the
    a. Fertilization
    b. Cleavage
    c. Gastrulation
    d. Midblastula Transition

23. The slowdown of nuclear division and the concomitant increase in RNA transcription happened in the developmental stage of
    a. Fertilization
    b. Blastoderm Formation
    c. Gastrulation

d. Midblastula Transition

24. A cDNA microarray consists of a collection of cDNA fragments which are _____of gene transcription products (mRNA).
   a. chemically synthesized oligo DNA
   b. forward transcripts
   c. reverse transcripts
   d. None of the above

25. In the One-color method microarray, Target samples a and b are labeled with one type of dye in the one-color method. Then each sample is hybridized on _____DNA microarray.
   a. separate
   b. same
   c. four types
   d. None of the above

26. In the website National Center for Biotechnology Information (NCBI), gene sequences are available on GEO profile. The full form of GEO is
   a. Gene Expressed Orthologous
   b. Gene Expression On-site
   c. Gene Expression Omnibus
   d. None of the above

27. In the Indirect Labelling of microarray: In the indirect procedure, a reactive group, usually a primary amine, is incorporated into the _____first, and the Cy3 or Cy5 is then coupled to the cDNA in a separate reaction.
   a. mRNA
   b. cDNA
   c. protein
   d. None of the above

28. Following which methos is not used in microarray Spotting

   a. Photolithography
   b. Ink-jet printer microarrays
   c. spotted arrays on glass
   d. Chemical etching

29. The latest release of Systems Biology Markup Language (SBML)

   a. SBML Level 3 Version 4 Core
   b. SBML Level 3 Version 2 Core
   c. SBML Level 4 Version 2 Core
   d. None of the above

30. Following which is not a purpose of SBML:

   a. enable the use of multiple software tools without having to rewrite models to conform to every tool's idiosyncratic file format

b. enable the use of single software tools without having to rewrite models to conform to every tool's idiosyncratic file format
c. ensure the survival of models beyond the lifetime of the software used to create them.
d. None of the above

Q. Answer the following–

Q.1 Compare and contrast the Lac and Tryptophan operon models of gene control. [2]

Q.2 What is Quorum Sensing? How *V.cholerae* regulates its response to autoinducers via LuxO gene? [2]

3 Explain the switch like behaviour in co-operative binding using the Hill equation and graph. [2.5]

4 "The C1-FFL is a sign sensitive delay element"- Discuss this statement. [2.5]

5 Enlist the sources and effects of intrinsic and extrinsic noise. [2]

6 Write two advantages of futile cycles. [2]

7. Write the working principle of two-color DNA microarrays, illustrate with example? [2.5]

8. What is direct and indirect labeling in microarrays? [2.5]

9. What are different components and levels of Systems Biology Markup Language (SBML)? [2]

:::::02/05/2022:::::