SEAT No._____

[43]   **( )Sardar Patel University**
M.Sc. Genetics, Second Semester
Theory examination, April 2017
Monday, 10th April, 2017; Time: 10:00 a.m. to 1:00 p.m.
Subject: PS02CGEN01 Biostatistics and Bioinformatics

Total Marks: 70

Notes: - 1) Figures to the right indicate marks.
2) Draw neat and labeled diagram, wherever necessary.

Q.1   Choose the Correct Answers of the Following.   **[08]**

1. The branch of biostatistics that deals with testing of hypothesis, making predictions using data collected is/are called as_____.
   (a) inferential biostatistics   (b) descriptive biostatistics
   (c) inferential biostatistics & descriptive biostatistics   (d) comparative biostatistics

2. A circle divided into sectors proportional to the frequency of items shown is called___.
   (a) Bar chart   (b) Pie chart   (c) Histogram   (d) Frequency polygon

3. The mean of binomial distribution is ____.
   (a) npq   (b) np   (c) pqr   (d) emr

4. Testing H0: $\mu = 25$ against H1: $\mu \neq 20$ leads to:
   (a) Two-tailed test (b) Left-tailed test (c) Right-tailed test (d) None of these

5. BLAST is available on _____.
   (a) NCBI   (b) EMBL   (c) DDBJ   (d) PDB

6. _____ is not related with protein databank.
   (a) Swiss PROT   (b) EMBL   (c) PIR   (d) CATH

7. Functional haemoglobin is _____ structure.
   (a) primary   (b) secondary   (c) tertiary   (d) quaternary

8. Evolutionary relationship is established with the help of_____.
   (a) phylogenetic tree   (b) BLAST   (c) L-Align   (d) ClustalW

Q.2   Answer the following in short. (Attempt Any Seven)   **[14]**

1. What is data? Enlist the different types of data.

2. Write the merits of arithmetic mean.

3. Calculate the mean and mode of the following data: 10, 11, 10, 11, 9, 8, 9, 10, 12, 10.

4. Define the terms: (a) Compound Events, and (b) Exhaustive Events.

5. Give examples of nucleic acid sequence databank.

6. What is a gap? Explain its significance in sequence analysis.

7. What are the BLAST and FASTA for nucleotide sequence?

8. Enlist the different types of interaction during protein folding.

9. Explain RNA structure prediction.

Q.3
(A) The following frequency distribution gives the number of chillies per plant. Calculate the mean, median and mode for the number of chilies per plant.

No. of chillies per plant	10-16	17-23	24-30	31-37	38-44	45-51
No. of plant	08	10	23	29	18	12

[06]

(B) Calculate the mean, the variance, the standard deviation, standard error and the coefficient of variation from the data recorded on respiration rate per minute of 10 persons.
Respiration/minute= 22, 22, 20, 24, 16, 17, 18, 19, 21, 21

[06]

OR

(B) From the following data recorded on the height of plants of varieties, MG – 16 and MG – 20 of groundnut; find out which variety is more consistent.

Variety MG-16	25	50	45	30	70	42	36	48	34	60
Variety MG-20	10	70	50	20	95	55	42	60	48	80

[06]

Q.4
(A) A random blood sample for the test of fasting sugar of 10 boys give the following data in mg/dl.
70, 120, 110, 101, 88, 83, 95, 107, 100, 98
Do these data support the assumption of population mean of 100 mg/dl?
[Tabulated 't' value for p=0.05 is 2.262 at 9 degrees of freedom]

[06]

(B) In an experiment on breeding of flowers of a species; a researcher obtained 107 magenta flowers with a green stigma, 42 magenta flowers with red stigma, 38 red flowers with a green stigma and 13 red flowers with a red stigma. According to Mendel's laws the theory predicts that these types should be obtained in the ration of 9:3:3:1. Draw your conclusions based on the calculated 'χ^2' value.

[Tabulated 'χ^2' value 7.81 at 5% level of probability for 3 degree of freedom]

[06]

OR

(B) (i) A bag contains 16 Blue and 8 Green balls. Two balls are drawn at random one after the other without replacement. What will be the probability that both the balls drawn are Green?
(ii) A card is drawn at random from a well shuffled pack of cards. What is the probability that the card is a King or a Queen?

[06]

Q.5 [06]
(A) Explain application of MMDB and CDD databases to study proteomics.

(B) Give details on EMBL, PHYLIP and Nexus file formats. [06]

OR

(B) Explain structural and functional genomics with applicaitns. [06]

Q.6 [06]
(A) Explain step wise method for computer aided drug designing.

(B) Explain α-helix, β-sheet and β-turn during protein folding. [06]

OR

(B) Explain post translation modifications in protein. [06]

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Sardar Patel University
M. Sc. Genetics, Second Semester Examination
Saturday, 15th April, 2017
10:00 a.m. – 01:00 p.m.
PS02CGEN03: **Recombinant DNA Technology**

Total Marks: 70

Q1.   Multiple Choice Questions (Attempt all questions).   [8X1=8]
(i)   In gel electrophoresis DNA fragments are separated on basis of
      a) Size   b) Charge
      c) Both A and B   d) None of the above

(ii) λ phage vector can carry upto
      a) 20 kb fragments   b) 30 kb fragments
      c) 40 kb fragments   d) 50 kb fragments

(iii) For cloning to occur plasmid DNA must be cut by .
      a) Restriction enzymes   b) Polymerase enzymes
      c) Helicase enzymes   d) Gyrase enzymes

(iv) Restriction enzymes are named for
      a) The person who discovered it   b) Bacterium they were derived from
      c) The viral DNA that they attack   d) None of the above

(v)   Isoschizomers recognize
      a) Same recognition sequence but   b) Same recognition sequence and
      different recognition site   recognition site
      c) Same recognition site but different   d) Different recognition site and
      recognition sequence   different recognition sequence

(vi) Which of these restriction enzymes produce blunt ends?
      a) SalI   b) EcoRV   c) XhoI   d) HindIII

(vii) What is the ideal length of PCR primers?
      a) 10-15bp   b) 16-20bp
      c) 20-30bp   d) 30-50bp

(viii) Who created the first rDNA molecule?
      a) Nathan, Arber and Smith   bWatson, Crick and Wilkins
      c) Boyer and Cohen   d) Paul Berg

Q2.   Answer any SEVEN questions from following: [7X2=14]
(i)   What is an neoschizomer?
(ii) What is the difference between RNase A and RNase H?
(iii) What is the significance of *tra* locus in a vector?
(iv) Comment: Plasmid can be considered as an independent life forms like viruses.
(v)   Give full form of HAC and MAC.
(vi) Name the scientists who created pBR322.

(vii)   What is a selectable marker?
(viii) Give function of Alkaline phosphatase
(ix)   Explain autoradiography.

Q3(A)   How many types of restriction endonucleases are there? Give their salient
        features with suitable examples   [6]

Q3(B)   Describe in detail the procedure for the preparation of total cellular DNA from a
        bacterial cell. How does the process differ from that of isolation of total plant   [6]
        DNA?

                                        OR

Q3(B)   Explain genomic DNA isolation from fungal cells with help of schematic
        diagram.   [6]

Q4(A)   Discuss the properties of an ideal cloning vector. Why should an ideal cloning
        vector be small in size? Also give three examples of cloning vectors.   [6]

Q4(B)   What is transformation efficiency? Discuss the factors affecting transformation
        efficiency.   [6]

                                        OR

Q4(B)   Explain Maxam and Gilbert's method of DNA sequencing.   [6]

Q5(A)   Describe the steps involved in RFLP study. Justify the statement: Each RFLP
        data is unique to a specific enzyme –probe combination.   [6]

Q5(B)   What are RAPDs and how is this data obtained ? Give an account of principle,
        procedure and applications of RAPD. Also write its advantages and limitations.   [6]

                                        OR

Q5(B)   Define a molecular marker. Give a brief account on desirable properties of an
        ideal molecular marker.   [6]

Q6(A)   Explain codon bias and codon degeneracy? Explain their significance in vector
        designing.   [6]

Q6(B)   Why the earliest, best studied and general purpose plasmid cloning vector is
        pBR322? Describe the genealogy and properties of this plasmid vector.   [6]

                                        OR

Q6(B)   Write a short note on 'Recombinant vaccines'.   [6]

                        ******** BEST OF LUCK ********

Sardar Patel University
M. Sc. Genetics - Second Semester Examination
Tuesday, 18th April, 2017
PS02EGEN01: Population and Evolutionary Genetics (CBCS)
Time: 10:00 am to 01:00 pm

Total Marks: 70

Note: *Figures to the right indicate marks.*
Draw diagrams wherever necessary.

Q. 1   Multiple choice questions (All are compulsory)   [08]

Phenotype of organisms depends on _____.
1. (a) Genotype-G   (b) Genotype and environmental interactions – GE
    (c) Environment-E   (d) All of these

Diploid organisms' mutation rate is measured indirectly by ....
2. (a) Probability   (b) Large scale screening
    (c) Statistics   (d) All of these

Theory of Natural selection was proposed by_____.
3. (a) Lamarck   (b) Darwin   (c) Weismann   (d) Hugo de Vries

Intraspecific diversity is _____.
4. (a) Diversity within a species   (b) Diversity between species
    (b) Both 'a' and 'b'   (d) None of these.

Ex Situ Conservation means _____.
5. (a) On-site Conservation   (b) Off-site Conservation
    (c) Both 'a' and 'b'   (d) None of these.

Gene banks are one of the methods of _____ conservation?
6. (a) In Situ Conservation   (b) In Situ Conservation
    (c) Captive – breeding   (d) All of these.

The science that deals with origin, physical & cultural development biological
7. characteristics and social customs is known as _____.
    (a) Ethology   (b) Ornithology   (c) Anthropology   (d) Ecology

The term altruism is first given by...............
8. (a) Watson   (b) Hardy and Weinberg   (c) August Comte   (d) Mendel

Q. 2   Answer in short. (Attempt any seven)   [14]
1. Define the terms migration and panmictic population.
2. Enlist different types of selection.
3. What is inter specific and intra specific genetic diversity?
4. Give a note on molecular clocks.
5. Write the effects of Genetic drift on population?
6. What is Genetic drift? What is its effect on population?
7. Define the terms inbreeding depression and genetic load.
8. Write about the various materials used to isolate DNA for fingerprints.
9. What is inclusive fitness?

Q. 3 **(A)** Define Hardy - Weinberg law. Write its applications in population genetics. [06]
(B) Justify "natural selection is a major force driving allele frequency change". [06]
OR
(B) Write shorts notes on the following:
(1) Inbreeding   (2) Mutation [3+3]

Q. 4 **(A)** Write a note on evolutionary history and the evolution of eukaryotes from prokaryotes. [06]
(B) Write an essay on theories of evolution. [06]
OR
(B) Define speciation? Give a note on instantaneous speciation. [06]

Q. 5 **(A)** 'Genetic diversity is the heart of conservation genetics' explain. Add a note on how to identify genetic diversity. [06]
(B) Write a note on types of conservation of species. [06]
OR
(B) Justify 'Population size has a major impact on species survival'. Add a note on Genetic drift [06]

Q. 6 **(A)** Write short notes on the following:
(i) Imprinting phenomena in human.
(ii) Discuss Protein comparisons in forensic sciences. [3+3]
(B) What are unique correlations? Write an explanatory note on haplodiploidy. [06]
OR
(B) Write a detail note on DNA comparisons in forensic sciences. [06]

***********_Best wishes_***********