Let X and Y be melde equees. Prove that I : X -> Y is a continuous function if inverse image of every open set in Y is agon in X.

Fit and A. Bland A. denote subsets of a space X. Prove that

e event text X to economica to consumate at the train travers

St. Prove or diagnova. All metric snace are T<sub>d</sub>.

so the xint annual countries set any point.

33. Prove that a impological aprice is 1, it every singleton set is closed in 10.

en Let X, n. (Y. C) be two topological apaces and f. X -- Y a function. Then show

The Continuous G.e. t = Continuous L.

in There exist a sub-base Siter Cauch that I (V) = a tor an V = S

W. For any ninsed subset A of Y. P. (A) is closed in X.
V. For all A = X, 1(A) = 1(A).

5. Defind Lebesgue number. Prove that in a compact metric space every open cover twee a Excessor number. Using this most show that every continuous

K21U 0219

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Name : .....

VI Semester B.Sc. Hon's (Mathematics) Degree (Supple.)

Examination, April 2021

(2014 – 2015 Admissions)

BHM 603 : TOPOLOGY

Time: 3 Hours Max. Marks: 80

Answer all the 10 questions.

(10×1=10)

- Let X be an infinite set and d be the discrete metric on X. Is the metric space (X, d) is compact? Justify.
- 2. If in a metric space we have B(x, r) = B(x, s) does it mean that r = s?
- 3. What is the closure of  $\mathbb Z$  in  $\mathbb R$  with respect to discrete topology on  $\mathbb R$  ?
- 4. Define metrizable topology.
- 5. Define semi open interval topology on  $\mathbb{R}$ .
- 6. Does there exist a countable dense subset of  $\mathbb R$  with cofinite topology ?
- 7. Define normal space. The season mobile the property factor work as
- 8. Give an example of path connected topological space.
- "Continuous image of a Hausdorff space need not be Hausdorff" Give an example.
- 10. Let  $X = \{a, b\}$  and  $\tau = \{\phi, X, \{a\}\}$ . Check whether  $(X, \tau)$  is a  $T_2$ -space.

Answer any 10 short answer questions out of 14.

 $(10 \times 3 = 30)$ 

- 11. Show that discrete metric space (X, d) is Hausdorff.
- 12. Let A and B are two subsets of a topological space (X, d).
  - i) Is  $int(A) \cup int(B) = int(A \cup B)$ ?
- ii) Is int(A) ∩ int(B) = int(A ∩ B) ?Justify your answer.

P.T.O.

- 11. What is meant by diffusion current?
- 12. What is an inversion center?
- 13. What is micro emulsion method?
- 14. What do you mean by meta stable ion?
- 15. Write two advantages of Raman spectra over IR spectra.
- 16. Identify the mirror planes present in BF<sub>a</sub>.
- 17. Give the point group of NH<sub>3</sub> and N<sub>2</sub>O<sub>4</sub>.
- 18. Explain the effect of hybridization on the frequency of vibra.

 $(2 \times 7 = 14)$ 

## SECTION - C

(Answer any 4 questions. Each question carries 3 marks.)

- 19. Using Woodward Feiser rule calculate  $\lambda_{\text{max}}$  for :
  - a) 3,4-dimethylpent-3-ene-2-one.
  - b) p-chloroacetophenone.
- 20. Discuss two chemical methods for nano particle synthesis.
- 21. What are the advantages of amperometric titration?
- 22. What are the factors affecting chemical shift?
- 23. Give three applications of carbon nanotubes.
- 24. Explain the terms proper and improper rotation with suitable example.
- 25. Explain the Mc Lafferty rearrangement.
- 26. Discuss the significance of group frequency concept in IR spectroscopy.

 $(3 \times 4 = 12)$ 

## SECTION - D

(Answer any 2 questions. Each question carries 5 marks.)

- 27. a) Explain the selection rules for Raman spectroscopy.
  - b) Discuss the quantum theory of Raman scattering.
- 28. Explain the different kinds of symmetry elements and symmetry operations.
- 29. Describe the theory and instrumentation of spectrophotometry.
- 30. Explain the construction and working of dropping mercury electrode. What are the advantages of it?
- 31. Discuss any two methods for the characterisation of nanoparticles.
- 32. a) Explain the term force constant on the basis of simple harmonic oscillator model of a diatomic molecule.
  - b) The force constant of HI IS 283.4 N m<sup>-1</sup> .Calculate the fundamental frequency in cm<sup>1</sup>. [H=1.008; I=126.9]. (5×2=10)