

**B.Tech. (CS) (VI Sem.) / B.Tech. (MCTR)  
(VIII Sem.)**

1439

ELE 509

**B.Tech. (CS) (SIXTH SEMESTER) / B.Tech. (MCTR)  
(EIGHTH SEMESTER) EXAMINATION, 2023**

**ELE 509— Microprocessors and Microcontrollers**

**TIME ALLOWED : THREE HOURS**

**Maximum Marks— 60**

*Attempt six questions in all, selecting two questions from each Section. All questions carry equal marks.*

**SECTION A**

1. (a) Explain the memory organization of 8086 microprocessor.  
Draw the timing diagram of a typical memory write machine cycle. 7
- (b) Suppose  $[AX] = 85H$  and  $[BX] = 64H$ ,  $[SP] = 2000H$ .  
What will be the value of AX, BX and SP after the following sets of instructions executed?
  - (i) PUSH AX
  - (ii) POP BX. 3

*Turn over*

2. (a) Draw and explain the architectural diagram of 8086 microprocessor. 6
- (b) 10 numbers are stored from location 1000 onwards. Write an assembly language program to count the number of odd numbers in these. 4
3. (a) What are maskable and non-maskable interrupts? Give examples. How will you mask an interrupt in 8086?  $2\frac{1}{2}$
- (b) Suppose  $[AX] = ACH$ . What will be the value in AX in each of the following cases if the carry flag is set?
- (i) ROL AX,2
- (ii) RCL AX,2  $2\frac{1}{2}$
- (c) Explain the following addressing modes with examples :
- (i) Register indirect
- (ii) Based indexed
- (iii) Register relative
- (iv) Inter-segment direct. 5

#### SECTION B

4. Design 8086 microprocessor based system using minimum mode with the following specifications:-
- (i) 8086 microprocessor working at 10 Mhz
- (ii) 128 kb EPROM using 32 K devices
- (iii) 64 kb SRAM using 16 K devices.
- Clearly show memory ram with address range. Draw the neat schematic. 10



5. (a) With suitable diagram, explain how the Priority Interrupt Controller 8259 can be interfaced with 8086 in cascade mode. 5
- (b) Draw and explain the block diagram of 8254 software programmable timer. Explain how the GATE input controls its operation in any two modes of operation. 5
6. (a) What is DMA? Which hardware pins are used for DMA control? Draw and explain the architecture of 8257 DMA controller. 5
- (b) Write short notes on any *two* :
- (i) Programmable Communication Interface (8251)
  - (ii) RS-232
  - (iii) Operating Modes of Programmable Peripheral Interface (8255)
  - (iv) IEEE-488. 5

### SECTION C

7. (a) Explain the architecture of 8051 in detail. 5
- (b) Explain the following instructions with an example :
- (i) `MOVC A, @A+DPTR`
  - (ii) `RRC A`
  - (iii) `PUSH 02`
  - (iv) `DAA` 5
8. (a) Explain TMOD and TCON registers. 5
- (b) Write and explain an assembly language program to

toggle all the bits of port 1, with a time delay between toggling. 5

9. (a) Explain different types of interrupt in 8051 in detail. 5
- (b) Write and explain an assembly language program to read the lower nibble of data by P0 is to be displayed on LEDs are connected to upper 4-bits of P1. 5

**B.Tech. (VI Sem.)**

1450

STAT 204

**B.Tech. (SIXTH SEMESTER)  
EXAMINATION, 2023**

(CS / IT)

**STAT 204—Probability and Statistical Methods****TIME ALLOWED : THREE HOURS****Maximum Marks—60**

*Attempt six questions in all, selecting two questions from each Section. All questions carry equal marks.*

*Scientific calculator is permissible and students must be provided statistical tables.*

**SECTION A**

1. (a) Explain conditional probability with suitable example.  
(b) State and prove multiplication theorem of probability.  
(c) An urn contains 5 white and 5 black balls. 4 balls are drawn from this urn and put into another urn. From this second urn a ball is drawn and is found to be white. What is the probability of drawing white ball again at the next draw?

$$3+3+4=10$$

*Turn over*



2. (a) Prove that  $V(ax - by) = a^2V(x) + b^2V(y) - 2ab\text{Co}V(x, y)$ .  
Also deduce the result for independent variables.

- (b) Let  $X$  and  $Y$  be two continuous random variables with joint PDF

$$f_{X,Y}(x, y) = \begin{cases} 6xy & 0 \leq x \leq 1, 0 \leq y \leq x \\ 0 & \text{otherwise} \end{cases}$$

- (i) Find  $f_X(x)$  and  $f_Y(y)$ .  
(ii) Are  $X$  and  $Y$  independent?  
(iii) Find the conditional PDF of  $X$  given  $Y = y$ .  $5+5=10$

3. (a) Explain classical approach of probability.  
(b) In a random arrangement of the letters of the word "ENGINEERING", find the probability that all the vowels come together.  
(c) 20 persons are seated on 20 chairs at round table in the probability that two specified persons are sitting next to each other.  $3+3+4=10$

#### SECTION B

4. Explain probability model for Poisson distribution as a limiting case of Binomial distribution. Obtain its moment generating function. Hence or otherwise prove that all its cumulants are equal.  $5+2\frac{1}{2}+2\frac{1}{2}=10$

5. (a) Explain regression lines of  $X$  on  $Y$ ,  $Y$  on  $X$  and prove that :

(i)  $b_{XY} \cdot b_{YX} = r^2$

(ii) If  $b_{XY} \geq 1$  then  $b_{YX} \leq 1$

- (b) Obtain value of Karl Pearson correlation coefficient for the following data and draw your conclusions:-

$X$  65 66 67 67 68 69 70 72

$Y$  67 68 65 68 72 72 69 71

5+5=10

6. (a) Write a note on Normal Distribution, its properties and applications.  
(b) Suppose that  $X$  is exponentially distributed over  $(0, \infty)$ , as follows:-

$$f_X(x) = Ae^{-\alpha x}$$

- (i) Determine  $A$ .

- (ii) Find its mean and variance.

5+5=10

#### SECTION C

7. (a) Explain  $t$ -test and its applications.

- (b) The following figures show the distribution of digits in a number chosen at random from a telephone directory :

Digits	0	1	2	3	4	5	6	7	8	9	Total
Frequency	1026	1107	997	966	1075	933	1107	972	964	853	10,000

Test whether the digits may be taken to occur equally frequently in the directory.

5+5=10

8. Suppose the National Transportation Safety Board (NTSB) wants to examine the safety of compact cars, midsize cars, and full-size cars. It collects a sample of three for each of the treatments (cars types). Using the hypothetical data provided below, test whether the mean pressure applied to the driver's head during a crash test is equal for each type of car. Use  $\alpha = 5\%$ .



	<i>Compact cars</i>	<i>Midsized cars</i>	<i>Full-size cars</i>
	643	469	484
<i>Observations</i>	655	427	456
	702	525	402

10

9. Write short notes on:-

(a) Simple Random Sampling.

(b) Test of Independence of Attributes.

5+5=10



## BANASTHALI VIDYAPITH

## Second Periodical Test, January- May 2023

Class: .....B.Tech VI Semester.....

Subject:..... Computer Science (A +B+C).....

Paper (with code): CS 315- Theory Of Computation.....

Max Marks: 10

No. of Students: 265

Time Allowed: 1 hrs. 30 minutes

Examination Date: 15<sup>th</sup> March 2023Note: Students are required to attempt **three** questions. Question No. 1 is **compulsory**.

Q1a. Show whether the following grammar is ambiguous or not

$$S \rightarrow A \mid B, A \rightarrow aAb \mid ab, B \rightarrow abB \mid \epsilon$$

Q1b. Define CFG for the following Languages

$$i) L = \{x \in \{0, 1\}^* \mid n_1(x) = n_0(x)\}$$

$$ii) L = \{a^{n+2}b^n \mid n \geq 1\}$$

Q1c Simplify the following grammar

$$S \rightarrow aX \mid aYY, X \rightarrow aaX \mid \epsilon, Y \rightarrow bY \mid bbZ, Z \rightarrow Y$$

[1+1+2]

Q2. For any string  $w = w_1w_2 \dots w_n$ , the reverse of  $w$ , written  $w^R$ , is the string  $w$  in reverse order,  $w_n \dots w_2w_1$ . For any language  $A$ , let  $A^R = \{w^R \mid w \in A\}$ . Show that if  $A$  is regular, so is  $A^R$ .

OR

Q3 Construct an PDA corresponding to the following CFG

$$S \rightarrow 0ABB \mid 0AA, A \rightarrow 0BB \mid 0, B \rightarrow 1BB \mid A$$

[3]

Q4. . Convert the given CFG in Greibach Normal Form (GNF)

$$S \rightarrow AB$$

$$A \rightarrow BS \mid b$$

$$B \rightarrow Sa \mid a$$

OR

Q5. . Design a PDA whose language is  $\{w \in \{a, b\}^* \mid n_a(w) = n_b(w)\}$ 

[3]

Paper Setter

Dr. Neelam Sharma

## BANASTHALI VIDYAPITH

## First Periodical Test, January-May, 2023

Class: B.Tech. (CS) VI Semester

Subject: Computer Science

Paper (with code): CS 317 Artificial Intelligence &amp; Machine Learning

Max Marks: 10

No. of Students: 270

Time Allowed: **1 hrs. 30 minutes**

Examination Date: 30/01/23

**Note:** Students are required to attempt **three** questions. Question No. **1** is **compulsory**.**Q 1.** (a) Write state space representation of the given problem:

In the missionaries and cannibals problem, three missionaries and three cannibals must cross a river using a boat that can carry at most two people, under the constraint that, for both banks, if there are missionaries present on the bank, they cannot be outnumbered by cannibals (if they were, the cannibals would eat the missionaries). The boat cannot cross the river by itself with no people on board.

(b) Explain the purpose and procedure of the Turing Test.

2+2 = 4 Marks

**Q 2.** Explain with reasons which search algorithms will be used by you for the following problem:

- (a) A robot finding its way in a maze.  
(b) Finding a winning move in a chessboard.

3 Marks

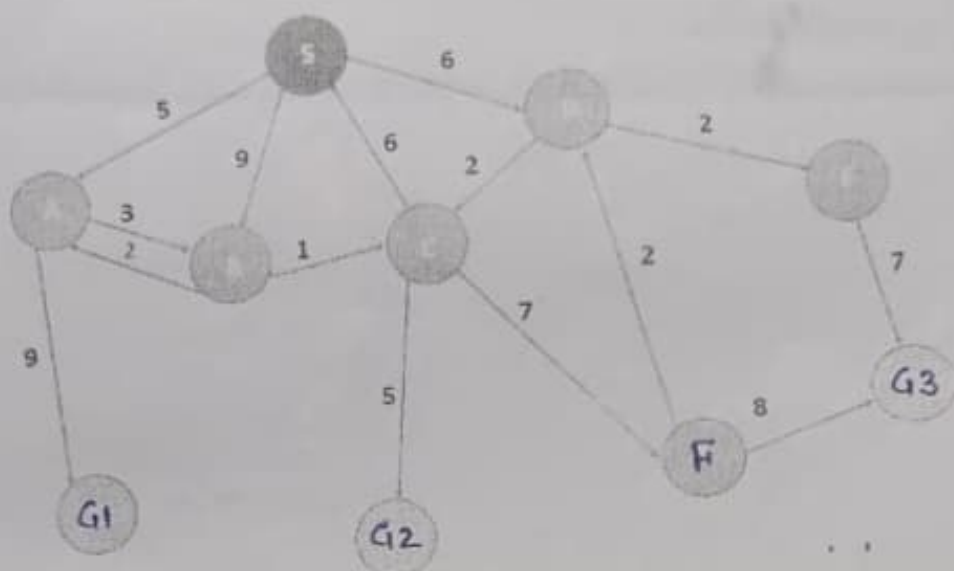
**OR****Q 3.** Consider trying to solve the 8-puzzle using hill climbing. Can you find a heuristic function that makes this work? Make sure it works on the following example:

Start		
1	2	3
8	5	6
4	7	

Goal		
1	2	3
4	5	6
7	8	

3 Marks

Q 4. (a) Apply the Uniform-Cost search algorithm on the following graph and show the resultant:



(b) Is the uniform-cost search algorithm complete and optimal?

2+1=3 Marks

OR

Q 5. (a) In cost-based searching, what happened if negative costs are allowed? Explain with a suitable example.

(b) Which of the following is more amenable to parallelization? DFS, BFS, or DFID? Justify your answer.

1.5+1.5 = 3 Marks

Dipanwita Thakur  
Sneha Asopa  
Paper Setter



## BANASTHALI VIDYAPITH

### Second Periodical Test, Jan-May' 23

Class – B.Tech (CS, IT, EE) – VI Sem

Subject – Commerce & Management

Paper (with code) – ECO307 – Fundamentals of Economics

Max Marks: 10

No. of students: 525+

Time – 1 hour & 30 mins

Examination Date: 17-Mar-23

**Note 1:** Students are required to attempt **Three** questions. **Question No.1** is compulsory.

**Note 2:** Students are allowed to use Calculators.

**Q1.** Given below is the Land & Labour schedule of Priya Cements Ltd. You need to calculate the blank spaces with the available information & show it to Priya Cements Ltd. company so that they can plan & adjust their future needs accordingly.

Land (in acres)	No. of Labourers	Total Productivity	Average Productivity	Marginal Productivity
1	0	0	-	-
1	1	-	2	-
1	2	-	-	4
1	3	-	4	-
1	4	16	-	-
1	5	-	3.6	-
1	6	-	-	0
1	7	-	2	-
1	8	8	-	-

**Questions –**

1. Priya Cements Ltd is a new company in the cements business. You, being an economics expert, are requested to fill in the blank spaces in the table from the data available to assist the management in making some key decisions. (2 Marks)
2. Marginal Productivity will be 0 when Total productivity is maximum – True / False – Justify your answer. (1 Mark)
3. From which stage in the above table, does Marginal Productivity imply that it is harming the firm – Discuss it's implications for Priya Cements Ltd ? (1 Mark)

**Q2.** Guns and mangoes are substitute goods, complementary goods or independent goods – Explain in detail. (3 Marks)

**OR**

**Q3.** Vinita Toys Ltd has a choice of producing from 0 to 4 units. Please assist them to calculate the missing values so that it can make appropriate decisions accordingly. (3 Marks)

QTY	TC	TFC	TVC	ATC	AFC	AVC	MC
0	80	-	0	0	0	0	-
1	-	80	-	-	-	-	80
2	-	-	140	-	-	70	-
3	-	-	-	96.7	26.7	-	-
4	380	-	-	-	-	-	90

Q4. Rekha, a 8 year old girl, is crazy about Dolls & Comic books & the Covid pandemic has only fuelled her desire for enjoying them in higher quantities. Consider the below 5 combinations she may choose & draw it's indifference curve with 1 combination not falling on the Indifference curve. Please point it out & also explain to her the relevance of the Indifference curve with a graph, having Comic books on the y-axis. (3 Marks)

Combination	Dolls	Comic books
A	12	4
B	8	6
C	6	3
D	4	10
E	2	12

OR

Q5. Sneha is doing an economics class assignment & is confused between the different market structures. She has made the below table after analyzing the perfect & imperfect markets. Please check the below table & re-do it if you think, there are any errors in it. (3 Marks)

Perfect Competition	Monopolistic Competition	Oligopoly	Monopoly
Homogeneous good	Differentiated/Similar good	Differentiated/Similar good	Highly Differentiated good
Numerous Firms	Many small firms	Few large firms	One firm
$P = MC$	$P > MC$	$P > MC$	$P > MC$
Free entry	Low entry barriers	High entry barriers	Impossible to enter
Currency markets	Hotels	Microsoft	Oil Markets

Shri. Karan Khanna



## B.Tech. (CS / IT) (SIXTH SEMESTER) EXAMINATION, 2023

## CS 315— Theory of Computation

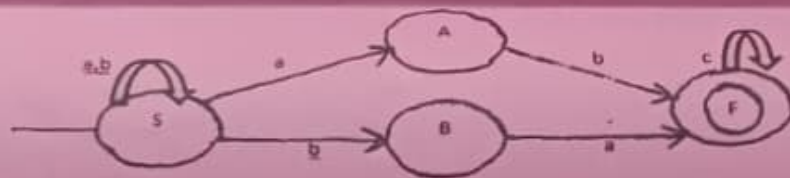
TIME ALLOWED : THREE HOURS

Maximum Marks— 60

Attempt six questions in all, selecting two questions from each Section. All questions carry equal marks.  
Section- A

Q1 a). What do you understand by "Finite Automata with output" and "Acceptance of a string by DFA".  
State the differences between Moore and Mealy machine. 2½+2½

Q1.b) State Arden's theorem. Find the regular expression for the following automata using Arden's theorem: 1½+3½



2 (a) Write the regular expression for the following regular sets:

$4 \times 1\frac{1}{2} = 6$

- i)  $\{a^x / x \text{ is divisible by } 3 \text{ or } 5\}$
- ii)  $L = \{W \in (a,b)^* / |W| \bmod 4 = 0\}$
- iii) The set of all strings consisting of odd number of 0's and 1's over  $(0,1)$ .
- iv) The set of all strings over  $\{a,b\}$  which does not contain  $ab$  as substring.

2(b) Construct DFA for all binary words whose corresponding integer value is divisible by 6. [4]

3(a) Prove that class of regular languages are closed under intersection, set difference and complement operation. 5

(b) Construct transition diagram of a Finite Automata corresponding to the RE  $(ab + c)^* b^*$  2½

(c) When do you say that two strings  $x$  and  $y$  are indistinguishable with respect to a language  $L$ . Give an example. 2½

## Section- B

4 × 1½ = 6

Q 4 a) Write CFGs for the following:-

- i)  $L = \{ a^i b^j c^k \mid j = i + k, i, j, k \geq 1 \}$
- ii)  $L = \{ 0^m 1^n \mid m + n \geq 1 \}$
- iii)  $L = \{ \text{set of all strings having equal number of a's and b's over } (a, b) \}$
- iv)  $L = \{ a^n b^m c^m d^m \mid n, m \geq 0 \}$

Q4 b) Let B be the language of all palindromes over  $\{0, 1\}$  containing an equal number of 0's and 1's. Show that B is not context free. [4]

Q5 a). Convert the following CFG into GNF:

5

$A \rightarrow BAB / B / E$

$B \rightarrow 00 / E$

Q5 b) What do you understand by acceptance in "PDA by empty stack". Construct PDA M to accept the language  $L = \{ a^{2n} b^n \mid n \geq 1 \}$

5

Q6 a) Given a CFG  $G = (\{S, X, Y, Z\}, \{0, 1\}, P, S)$  with the production set P as follows: | 6

$S \rightarrow XSX / Y$

$X \rightarrow 0 / 1$

$Y \rightarrow 0Z1 / 1Z0$

$Z \rightarrow XZX / X$

Show that the string 0101101 belongs to CFL  $L(G)$ . Design a PDA M corresponding to CFG G and show that the string 0101101 is accepted by M.

Q6 b) What do you understand by "ambiguity in grammar". Consider the following grammar: 4

$S \rightarrow ASA / BSB / ASB / BSA / 1$

$A \rightarrow 0, B \rightarrow 1$

Derive the strings 00101, 11100 using both left and right derivation.

## Section - C

Q7a). Design a TM over  $\Sigma = (a, b)$  to accept the language  $L = \{ ww^r \mid w \in (a, b)^+ \}$ .

5

Q7 b) Prove the following:

2½ + 2½ = 5

- i) If a language L is recursive, then its complement  $L'$  is also recursive.

ii) The language  $L_c = \{M/M \text{ is a valid code for Turing Machine}\}$  is recursive

Q8. (a) When a language is said to be recursive or recursively enumerable language.

1½

(b) Prove that the function  $f_2(x, y) = x * y$  is primitive recursive.

3½

(c) Define Universal Turing Machine. Explain the encoding of UTM with the help of an example.

5

9. (a) Find whether the lists

2½

$M = (abb, aa, aaa)$  and  $N = (bba, aaa, aa)$  have a Post Correspondence Solution?

(b) Compute Ackermann's function for the following

5

$A(2,1)$      $A(2,2)$

(c) Write brief note on halting problem.

2½



**B.C.A., BBA, B.Com., B.Des. (FLD/CD/  
ID) (VI Sem.)**

1080

BVF 015

**B.C.A., BBA, B.Com., B.Des. (FLD/CD/ID) (SIXTH  
SEMESTER) EXAMINATION, 2023**

**FOUNDATION COURSE**

**BVF 015— Parenthood and Family Relations**

**TIME ALLOWED : TWO HOURS**

**Maximum Marks— 60**

*This question paper has eight questions. Candidates  
are required to attempt any five questions.*

*All questions carry equal marks.*

प्रश्न पत्र में आठ प्रश्न दिये गये हैं। परीक्षार्थी को कोई पाँच  
प्रश्नों के उत्तर देने हैं। सभी प्रश्नों के अंक समान हैं।

1. Define parenthood. Write types of parenthood. What are the different responsibilities associated with parenthood? Discuss giving real life examples. Also elaborate readiness needed for becoming a parent.

पितृत्व को परिभाषित कीजिये। पितृत्व के प्रकार लिखिये। पितृत्व से जुड़ी विभिन्न जिम्मेदारियाँ क्या हैं? वास्तविक जीवन से जुड़े उदाहरण

*Turn over*

देते हुये चर्चा कीजिये। माता-पिता बनने के लिये आवश्यक तैयारी को विस्तार से बताइये। 12

2. Mrs. and Mr. Sharma are planning on becoming parents. Being a student of this course, how would you make them aware about pre and post parenthood health issues and their management? Explain.

श्रीमती और श्री शर्मा माता-पिता बनने की योजना बना रहे हैं। इस कार्यक्रम की एक छात्रा होने के नाते, आप उन्हें पितृत्व से पहले और बाद के स्वास्थ्य मुद्दों और उनके प्रबंधन के बारे में कैसे जागरूक करेंगे? व्याख्या कीजिये। 12

3. Define ante-natal and post-natal care. Explain health, nutritional and emotional care during ante-natal, natal and post-natal time.

प्रसवपूर्व और प्रसवोत्तर देखभाल को परिभाषित कीजिये। प्रसवपूर्व, प्रसवोत्तर और प्रसव बाद के समय के दौरान स्वास्थ्य, पोषण और भावनारत्मक देखभाल की व्याख्या कीजिये। 12

4. What is the role of parents as facilitators in growth and development of children? Reflect your views by explaining milestones of development.

बच्चों की वृद्धि और विकास में सहायक के रूप में माता-पिता की क्या भूमिका है? विकास के पड़ावों की व्याख्या करते हुए अपने विचार व्यक्त कीजिये। 12

5. Explain different disciplinary techniques with their characteristics. How do these techniques have an impact on

the personality of children? Explain by giving real life examples.

विभिन्न अनुशासनात्मक तकनीकों को उनकी विशेषताओं के साथ समझाइये। इन तकनीकों का बच्चों के व्यक्तित्व पर क्या प्रभाव पड़ता है? वास्तविक जीवन के उदाहरण देकर समझाइये। 12

6. Depression and suicide cases of children are increasing in these days. What are the reasons for this? Can positive parenting help reduce such cases? If yes, then tell its strategies.

आजकल बच्चों में अवसाद और आत्महत्या के मामले बढ़ रहे हैं। इसके क्या कारण हैं? क्या सकारात्मक पालन-पोषण ऐसे मामलों को कम करने में मदद कर सकता है? यदि हाँ, तो उसकी रणनीतियाँ बताइये। 5+7=12.

7. What are the reasons of sibling rivalry and aggression in children? Explain. What are the methods of handling such behavioural problems? Discuss. Reflect your views on appropriate methods.

बच्चों में सहोदर प्रतिद्वंद्विता और आक्रामकता के क्या कारण हैं? व्याख्या कीजिये। ऐसी व्यवहार संबंधी समस्याओं से निपटने के तरीके क्या हैं? चर्चा कीजिये। उपयुक्त विधियों पर अपने विचार व्यक्त कीजिये। 5+5+2=12

8. It is said that positive inter-personal relationships can minimize conflicts in family. How far do you agree with this statement? Justify. Explain different causes and resolution of conflicts in family.

**B.Tech. (VI Sem.)**  
1444

ECO 307

**B.Tech. (SIXTH SEMESTER)  
EXAMINATION, 2023**

(CS / IT / EE)

**ECO 307— Fundamentals of Economics**

**TIME ALLOWED : THREE HOURS**

**Maximum Marks— 60**

*Attempt six questions in all, selecting two questions from each Section. All questions carry equal marks.*

**SECTION A**

1. What is economics? How is macroeconomics different from microeconomics?  
4+6=10
2. Explain the concept of elasticity of demand. Distinguish between price elasticity, income elasticity and cross elasticity of demand.  
3+7=10
3. Explain any *three* of the following:—
  - (a) Scope of engineering economics
  - (b) Factors affecting demand

Turn over



(c) Types of demand

(d) Measurement of point elasticity of demand.

10

#### SECTION B

4. Explain the difference between a short-run and long-run production function. State and explain the properties of isoquants with the help of suitable diagrams.  $4+6=10$

5. Analyse carefully the conditions of equilibrium of an individual firm under perfect competition both in the short-run and long-run periods. Illustrate your answer with diagrams. 10

6. Write short notes on the following:—

(a) Distinguish between fixed cost and variable cost

(b) Optimal input combination

(c) Relationship between average cost and marginal cost. 10

#### SECTION C

7. Explain the concept of capital budgeting. What is its significance?  $3+7=10$

8. What is meant by depreciation? Explain straight line and declining balance methods of calculating depreciation.  $3+7=10$

9. Explain any *three* of the following:—

(a) Interest formulas

(b) Principle of economic equivalence

(c) Cash flow diagram

(d) Net present value.

10

B.Tech. (CS/IT) (SIXTH SEMESTER) / MCA / M.Sc. (CS)  
(SECOND SEMESTER) EXAMINATION, 2023

CS 317— Artificial Intelligence and Machine Learning

TIME ALLOWED : THREE HOURS

Maximum Marks— 60

*Attempt six questions in all, selecting two questions from each Section. All questions carry equal marks.*

Section A

Q:1 a) What are the limitations of Predicate logic as a tool for Knowledge representation?  
Encode following statements in to predicate calculus also **Prove that "Colonel West is a criminal"**.

- It is a crime for an American to sell weapons to hostile nations
- Nono has some missiles
- All of its missiles were sold to it by Colonel West
- Missiles are weapons
- An enemy of America counts as "hostile"
- West, who is American
- The country Nono is an enemy of America

7

b) Describe some methods of reducing dimensionality?

3

Q:2 Elaborate on the following search techniques:

- a) Greedy best first search
- b) A\* search
- c) Memory bounded heuristic search

$3\frac{1}{2}+3\frac{1}{2}+3=10$

Q:3 The sliding-tile puzzle consists of 3 black tiles, 3 white tiles and an empty space in the configuration shown in fig:

B	B	B		W	W	W
---	---	---	--	---	---	---

A tile may move in to adjacent empty location. This has a cost of 1. A tile can hop over one or two other tiles in to the empty position. This has a cost equal to the number of tiles jumped over. The goal is to have all the white tiles to the left of all the black tiles. The position of the blank is not important.

- a) Analyze the state space with respect to complexity and heaping.  
b) Propose a heuristic for solving this problem and analyze it with respect to admissibility, monotonicity & informedness.

5+5

## Section B

- Q:4 a) How can an algorithm be represented as a tree? Explain any one tree used for classification problem in machine learning. How do you evaluate the performance of a model?

7

- b) Differentiate classification and Regression with the help of a suitable example.

3

- Q:5 Classify instance No. 8 in the following dataset using Naive Bayes Classifier. Include the details of your NHC, probability calculations and how the final classification is determined. If a particular conditional probability is 0, assume its value is 1/10.

No.	Outlook	Temperature	Humidity	Play Golf
1	Sunny	Hot	Normal	N
2	Rain	Hot	High	N
3	Overcast	Hot	High	Y
4	Rain	Mild	High	Y
5	Rain	Cool	High	Y
6	Sunny	Mild	Normal	N
7	Overcast	Cool	Normal	Y
8	Sunny	Mild	High	?

10

- Q:6 a) What is the goal of the Support Vector Machine (SVM)? How to compute the margin? 5  
b) How can Markov models help in implementing probabilistic reasoning? 5

1443

2

## Section C

- Q:7 a) For the given set of points identify clusters using complete link and average link with applying agglomerative clustering.

5

	A	B
p1	1	1
p2	1.5	1.5
p3	5	5
p4	3	4
p5	4	1
p6	3	3.5

- b) What is the need of cross-validation for training models? What cross-validation technique would you use for weather forecasting data set (given in Q:5) and explain the method?

5

- Q:8 a) What is Multi-Armed Bandit Problem (MABP)? Explain how Thompson Sampling approach resolves any MABP with suitable examples. Write some practical applications of Thompson Sampling approach.

7

- b) When do we say two K-means algorithm has converged or when do we stop cluster reorganization in K-means.

3

- Q:9 a) What does an NLP pipeline consist of? What are the metrics used to test an NLP model? 5  
b) How is natural language processing useful in automatic text clustering problem? 5

1443

2

400

719,788

**BANASTHALI VIDYAPITH**  
**Second Periodical Test, January- May, 2023**

2016293

Class: **B.Tech. (CS\IT) VI Sem.**

Subject: **Statistics**

Paper (with code): **Probability & Statistical Methods (STAT204)**

Max Marks: **10**

No. of Students: **455**

Time Allowed: **1 hrs. 30 minutes**

Examination Date: **16/03/2023**

**Note:** Students are required to attempt **Three** questions. Question No. **1** is **compulsory**.

1. (a) A discrete random variable  $X$  is distributed as follows:

$x$	0	1	2	3	4	5	6	7
$p(x)$	0	0.15	0.05	0.1	0.25	0.20	0.15	0.1

Calculate (i)  $P(X \geq 1)$ , (ii)  $P(1 < X \leq 6)$ , (iii)  $E(X)$  and (iv) c. d. f. of  $X$ .

- (b) For the given joint density of  $(X, Y)$ , prove that it is actually a pdf and, hence, find the conditional pdf of  $Y$  given  $x$ .

$$f(x, y) = \begin{cases} y(1+x)^{-4}e^{-y(1+x)^{-1}}; & x \geq 0; y \geq 0 \\ 0 & \text{elsewhere.} \end{cases}$$

(2X2=4)



2. For a distribution, the mean is 10, variance is 16,  $\beta_1$  is +1 and  $\beta_2$  is 4. Obtain the first four moments about the origin, i.e., zero. Comment upon the nature of the distribution. (3)

OR

3. The distribution of a continuous random variable  $X$  in range  $(-3, 3)$  is given by

$$\text{the probability function; } f(x) = \begin{cases} \frac{(3+x)^2}{16}, & -3 \leq x \leq -1 \\ \frac{6-2x^2}{16}, & -1 \leq x \leq 1 \\ \frac{(3-x)^2}{16}, & 1 \leq x \leq 3 \end{cases}$$

(a) Verify that the area under the curve is unity.

(b) Obtain the mean and standard deviation of the above distribution.

(3)

4. (a) Define the moment generating function (m.g.f.). Also, explain the procedure to evaluate variance if the form of m.g.f. is given. (1.5)  
 (a) Suppose the current in a diode is assumed to follow a normal distribution with mean of 9mA and variance of 9mA. What is the probability that a measurement will exceed 12mA? Given that  $\phi(1) = 0.8413$ , where  $\phi(\cdot)$  represents the distribution function of  $N(0,1)$ . (1.5)

OR

5. A continuous random variable  $X$  has the probability density function given as

$$f(x) = \begin{cases} Ae^{-x/5} & x > 0 \\ 0 & \text{otherwise} \end{cases}$$

Find the value of  $A$  and show that for any two positive numbers  $s$  and  $t$ ,

$$P(X > s + t | X > s) = P(X > t)$$

(3)

# BANASTHALI VIDYAPITH

## Second Periodical Test, January-May, 2023

Class.....B.Tech. (CS) VI Semester .....

Subject.....Computer Science .....

Paper (with code).....ELE 509 Microprocessors and Microcontrollers .....

Max Marks % 10 No. of Students: ...90 + 90 + 85 = 265.....

Time Allowed: **1 hrs. 30 minutes**

Examination Date: ...Monday....13 March 2023.....

**Note:** Students are required to attempt **three** questions. Question No. 1 is **compulsory**.

Q.1. A small memory system for the 8086 microprocessor contains two EPROMS (16K\*8) and two RAMs (32K\*8). Design a memory interface to enable the 8086 microprocessor to write or read data (byte/word) to any 16 – bit location. Consider the suitable assumptions. **4 Marks**

Q.2. Design and interface a 4\*4 Keyboard with 8086 using 8255 programmable peripheral interface. Write an ALP to read the key pressed by the user. Consider suitable assumptions.

**OR**

Q.3. Differentiate the operation of DMA 8257 in SLAVE and MASTER mode in detail with schematic diagram. **3 Marks**

Q.4. Write a program to PUSH the data word available in the extra segment at Offset 8976H. Assume SS = 9854H, SP = CDFFH, ES = 4321H. Explain the internal operations during the program execution.

**OR**

Q.5. Explain any two in relevance of 8086 microprocessor:

- a) Latch
- b) Buffer
- c) Interrupt structure

**3 Marks**

Dr. Rahul K Vijay, Dr. Gaurav Sharma  
Paper Setter

## BANASTHALI VIDYAPITH

## First Periodical Test, January-May, 2023

Class.....B.Tech. (CS) VI Semester .....

Subject.....Computer Science .....

Paper (with code).....ELE 509 Microprocessors and Microcontrollers .....

Max Marks % 10

No. of Students: ...90 + 90 + 85 = 265.....

Time Allowed: **1 hrs. 30 minutes**

Examination Date: ...Monday,...30 January 2023.....

**Note:** Students are required to attempt **three** questions. Question No. **1** is **compulsory**.

- Q. 1.** Write a program for addition of two data bytes located at memory location 2800:0700H and 2800:0800H respectively. The resultant data byte must be stored at 2800:0900H. Also analyze the status of affected flags.

4 Marks

- Q. 2. a)** Determine the 20-bit physical address in the memory where given value 45 will be moved in the following instruction. Assume DS = 23, BP = 45, SS = 65 and BX = 34.

MOV [BP], 45

- b)** Explain and highlight the difference between NMI and INTR pin in 8086?

OR

- Q. 3.** Explain the architecture of 8086 with schematic diagram. 3 Marks
- Q. 4.** What is addressing modes? Explain any three addressing modes used in 8086 with examples.

OR

- Q. 5.** Explain the role of  $\overline{BHE}$  and  $A_0$  signal in 8086 with schematic diagram and example?

3 Marks

Dr. Rahul K Vijay, Dr. Gaurav Sharma  
Paper Setter

# BANASTHALI VIDYAPITH

## Second Periodical Test, January-May, 2023

Class: B.Tech. (CS) VI Semester

Subject: Computer Science

Paper (with code): CS 317 Artificial Intelligence & Machine Learning

Max Marks: 10

No. of Students: 270

Time Allowed: 1 hrs. 30 minutes

Examination Date: 13/03/23

**Note:** Students are required to attempt **three** questions. Question No. 1 is **compulsory**.

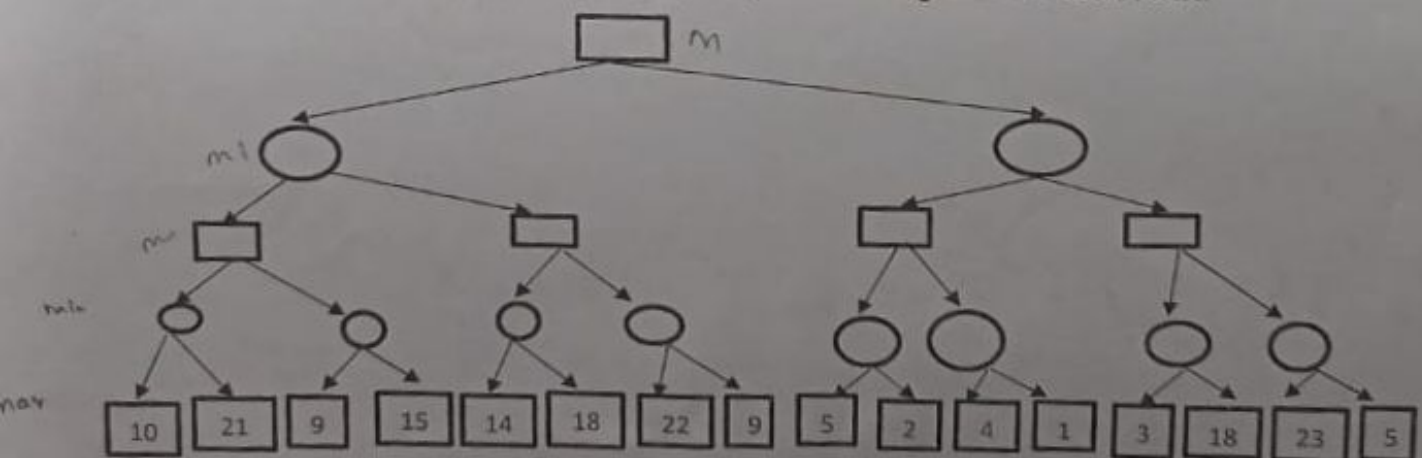
**Q 1.** (a) Calculate the z-score normalization for the following:

Marks
8
10
15
20

(b) What is feature engineering? Explain the difference between feature extraction and feature selection using examples.

2+2 =4 Marks

**Q 2.** Apply Alpha-Beta pruning on the following example considering the first node as MAX.

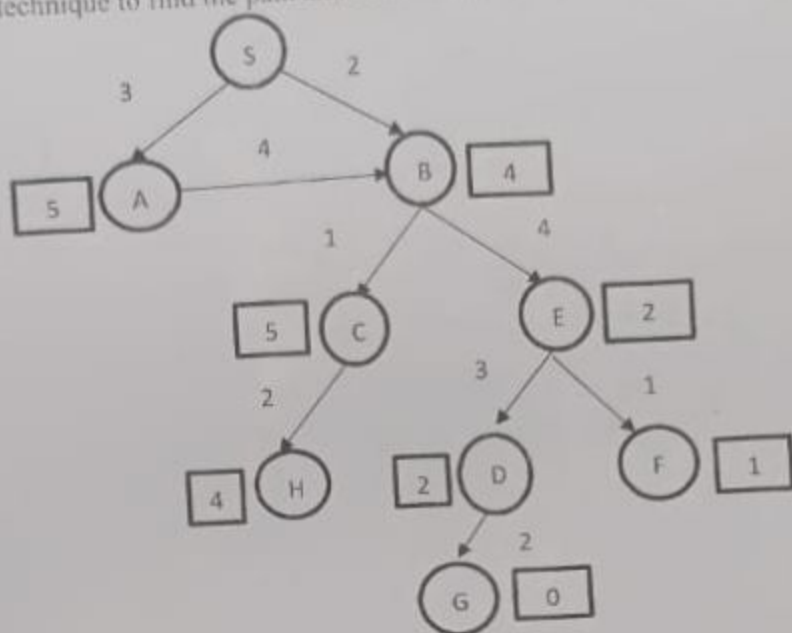


3 Marks



OR

Q 3. Use the AO\* technique to find the path and cost from S to G from the following graph.



3 Marks

Q 4. (a) Consider the following facts:

1. All hounds howl at night.
2. Anyone who has any cats will not have any mice.
3. Light sleepers do not have anything which howls at night.
4. John has either a cat or a hound.

Proof the following conclusion using resolution.

(Conclusion) If John is a light sleeper, then John does not have any mice.

3 Marks

OR

Q 5. The sales of a company (in million dollars) for each year are shown in the table below.

x (year)	2005	2006	2007	2008	2009
y (sales)	12	19	29	37	45

- a) Find the least square regression line  $y = ax + b$ .
- b) Use the least squares regression line as a model to estimate the sales of the company in 2012.

1.5+1.5=3 Marks

Dipanwita Thakur & Sneha Asopa  
Paper Setter

# BANASTHALI VIDYAPITH

## First Periodical Test, Dec'22-May'23

Class – B.Tech (CS, IT, EE) – VI Sem

Subject – Commerce & Management

Paper (with code) – ECO307 – Fundamentals of Economics

No. of students: 585

Max Marks: 10

Time – 1 hour & 30 mins

Examination Date: 03-Feb-23

Note: Students are required to attempt **Three** questions. **Question No.1 is compulsory.**

**Q1.** Read the below scenario and use the information to complete the following questions.

You are 23 years old and about to graduate from college with a construction management degree. You never paid much attention to the economy but now you want to learn more since you're looking to start your career. You read the following article and try to understand the words and phrases that are examples of macroeconomics and of microeconomics.

WASHINGTON (AP) Dec. 17, 2019 — Construction of new homes rose again in November while applications for building permits rose to the highest level in 12 years. Housing has been on a rebound over the past several months, helped by the Federal Reserve which cut [the interest rate] three times this year in the face of a slowdown in global growth and uncertainties from President Donald Trump's trade policies & the ongoing US-China trade war. Economists are forecasting that the rebound in housing will continue, helping to support economic growth next year although there are still concerns that housing is being held back by constraints such as a lack of available land in many areas and a shortage of construction workers. The National Association of Home Builders reported that the rise in builder confidence reflected the decline in loan rates, a low supply of existing homes and a strong labor market with rising wages and the lowest unemployment rate in a half century. The report on housing statistics showed that home building increased the most in the South, a gain of 10.3%, followed by a 1.4% rise in the West. Home building fell a sharp 15.3% in the Midwest. Some of top real estate companies too were optimistic about the rebound.

### Questions –

1. Detail how is the overall economy doing? Also, mention some key words or phrases that support your answer. (2 Marks)
2. Given this information, do you think, it will be relatively easy or difficult for you to find a job in the construction industry? Justify your answer (2 Marks)

Q2. (a) Match the Economic terms with their concepts

(1.5 Marks)

Column A	Column B
1. Economics	A. Something that motivates the actions of individuals, businesses & policy-makers
2. Opportunity Cost	B. An economic expression describing the trade-off between producing weapons or consumer goods
3. Scarcity	C. A social science concerned with the study of people & choices
4. Incentives	D. The value of your next best alternative
5. Guns & Butter	E. It talks about the economic situations as they are
6. Positive Economics	F. The idea that we have unlimited wants but limited resources

Q2 (b) Explain briefly each of the terms mentioned in Column A

(1.5 Marks)

OR

Q3. On 26<sup>th</sup> January, thousands of stores across the country give away discounts, freebies, etc. ? Discuss in detail why is there still a cost even when you get freebies ?

(3 Marks)

Q4. (a) What do you understand by Absolute advantage & Comparative advantage ?

(1.5 Marks)

Q4 (b) Using the rule of comparative advantage, from the below table, please state which country should focus on making what product ? Please justify your answer with a Opportunity cost table, graph & anything else you feel necessary.

(1.5 Marks)

	Tea Tonnes	Coffee Tonnes
INDIA	20	10
SRI LANKA	16	2

OR

Q5. Economics is everywhere & understanding it can help you make better decisions – Discuss this statement & also detail the role and scope of engineering economics ?

(3 Marks)

## BANASTHALI VIDYAPITH

### First Periodical Test, January -May, 2023

Class: B. Tech. (CS/IT)- VI Semester

Subject: Statistics

Paper (with code): STAT 204: Probability and Statistical Methods

Max Marks : 10

No. of Students: 455

Time Allowed: 1 hrs. 30 minutes

Examination Date: 02/02/2023

**Note:** Students are required to attempt **three** questions. Question No. **1** is **compulsory**.

Q1. (a) A person applies for the post of manger in two firms  $A$  and  $B$ . He estimates that the probability of his being selected in firm  $A$  is 0.75, being rejected in firm  $B$  is 0.95, and being rejected in at least one of the firms is 0.55. Find the probability that he will be selected in at least one of the firms. (2)

(b) If  $A_1, A_2, \dots, A_n$  be a partition of sample space i.e.  $A_i \cap A_j = \phi$  for  $i \neq j$  and  $B$  be any arbitrary event such that  $B \subseteq (\cup A_i)$  then show that:

$$P(A_i|B) = \frac{P(A_i) P(B|A_i)}{\sum_{i=1}^n P(A_i) P(B|A_i)} \quad \text{for } i = 1, 2, \dots, n.$$

(2)

Q2. In a bolt factory machines  $A$ ,  $B$  and  $C$  manufacture respectively 25%, 35% and 40% of the total. Of their output 5, 4, 2 percent respectively are defective bolts. A bolt is drawn at random from the product and is found to be defective. What are the probabilities that it was manufactured by machines (i)  $A$ , (ii)  $B$ , and (iii)  $C$ ? (3)



OR

Q3. Discuss the concept of pair wise independent and mutually independent events. Two fair dice are thrown independently. Three events  $A, B, C$  are defined as follows:

$A$ : Odd face with first dice,  $B$ : Odd face with second dice,  $C$ : Sum of points on two dice is odd.

Are the events  $A, B, C$  i) Pair wise independent, ii) mutually independent? (3)

Q4. (a) If  $A$  and  $B$  are independent events then show that  $A$  and  $B^c$  are also independent.

(b) Define conditional probability with examples. Show that conditional probability satisfies the axioms of probability. (1+2)

OR

Q5. (a) Give the classical and statistical definitions of probability. What are the objections raised in these definitions?

(b) When are a number of cases said to be equally-likely? Give an example of the four cases which are not equally-likely. (2+1)

(Dr. Gulab Singh, Dr. Naresh Chandra, Dr. Praveen K. Tripathi)

**BANASTHALI VIDYAPITH**  
**First Periodical Test, January-May, 2023**

Class.....B.Tech (CS) VI Sem .....

Subject.....Computer Science.....

Paper (with code).....Theory Of Computation (CS315).....

Max Marks : 10

No. of Students: .....266.....

Time Allowed: **1 hrs. 30 minutes**

Examination Date: 01/02/2023

**Note:** Students are required to attempt **three** questions. Question No. **1** is **compulsory**.

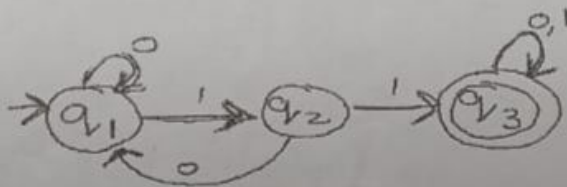
Q1. a) For each of the following languages, construct DFA that accepts the language. The  $\Sigma$  is  $\{0, 1\}$ .

- i. The set of all strings which are divisible by 3 for binary alphabet.
- ii.  $L = \{w \mid 101 \text{ is not a substring of } w\}$ .

Q1.b) Construct regular expression for the following languages

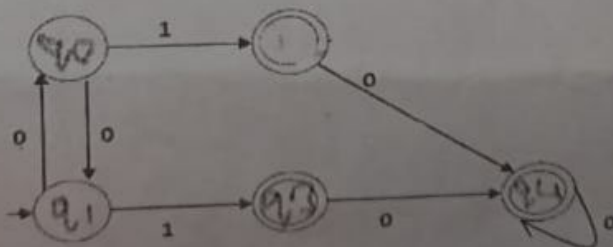
- i. The set of all strings over  $\{0, 1\}$  having at most one pair of 0's or at most one pair of 1's.
- ii. The set of all strings over  $\{a, b\}$  in which the number of occurrences of  $a$  is divisible by 3.

Q1. c) Find the regular expression for the following DFA using Arden's Theorem.



[1+1+2]

Q2. Minimize the following DFA using Equivalence theorem.



OR

Q3 . Construct a Mealy Machine for the following Moore machine

Present State	Next State		Output
	0	1	
$\rightarrow q_0$	$q_1$	$q_2$	1
$q_1$	$q_3$	$q_2$	0
$q_2$	$q_2$	$q_1$	1
$q_3$	$q_0$	$q_3$	1

[3]

Q4 Convert the following NFA to DFA

Present State	Next State		$\epsilon$ (epsilon)
	0	1	
$\rightarrow A$	FC	$\phi$	BF
B	$\phi$	C	$\phi$
C	$\phi$	$\phi$	D
D	E	A	$\phi$
E	A	$\phi$	BF
*F	$\phi$	$\phi$	$\phi$

OR

Q5. Show the language  $L = \{ ww \mid w \in \{a,b\}^* \}$  is not regular .

[3]

Paper Sette  
Dr. Neelam Sharm

**BA/BBA/B.Com./BCA/B.Sc.(Geology) /  
Mathematics/H.Sc./Biotech/Bio)/BA-LL.B./  
BBA-LL.B./B.Com.-LL.B./B.Tech. (VI Sem.)**

**1078**

**VOC 015**

**BA/BBA/B.Com./BCA/B.Sc.(Geology)/Mathematics/  
H.Sc./Biotech/Bio)/BA-LL.B./BBA-LL.B./B.Com.-  
LL.B./ B.Tech. (SIXTH SEMESTER)  
EXAMINATION, 2023**

**PAPER VOC 015— Entrepreneurship – II**

**TIME ALLOWED : TWO HOURS**

**Maximum Marks— 60**

*The question paper contains eight questions. Students have to attempt any five questions. All questions carry equal marks.*

1. Everyone wants their ideas to be loved, only a fraction of those ideas are worth executing. To learn in an idea has a chance to succeed, it needs to be validated. Justify the statement.
2. A young guy wanting to own a particular pair of shoes went to a nearby shop but was unsuccessful. Frustrated, he came up with an idea to sell shoes online. Rather than conducting

*Turn over*



extensive and expensive market research, he built a basic website. Then he approached a shoe store, clicked pictures of shoes and placed them on his site. Upon receiving the order he would purchase and ship it. Although he made loss in beginning it turned out to be an incredible way to test an idea. It was seen that the idea was working and he started to turn his concept into fully functional business. This is the story of Nick Swinmurn who built Zappos which he later sold to Amazon for USD 1.2 billion. By referring the complete details determine which approach was followed by Nick and explain the same in details.

3. You are recently hired to work as a marketing manager for a boutique hotel in Mumbai. This hotel is the only one of its kind and is not part of a chain. It has 50 rooms that have been carefully designed to fit a niche customer range with an eye for design and luxury. The owner wants your suggestion in deciding the price range for rooms and other services. Determine which pricing strategy you will use for each of the given services and justify your choice:—
  - (a) Room rates (weekends and weekdays)
  - (b) Restaurant food
  - (c) Buffets in breakfast and dinner
  - (d) Banquet halls for parties
  - (e) Conference rooms for meetings.
4. Project Management is critical to your business success. As per Mckinsey survey almost 60% of senior executives

responded that developing a strong project management discipline is the top priority of the organization as they look to the future. When done right it helps in a well balanced workflow which can further help a business to achieve its goals, increase ROZ as well as scale. The above statement talks about the wide importance of Project Management. Do you agree with the aspect? Justify your stance and explain the importance in detail.

5. Team building is the process of creating a team that cohesively works together towards a common goal. A close knit team ensures productivity and good work environment. Justify the statement in light of importance of team building and also explain how it is an essential part in launching a new business.
6. A marketing channel strategy is a plan for how a company will reach its customers through various marketing channels. This strategy includes selecting which channels to use, allocating resources to each channel and setting goals. In light of this statement suggest the marketing channel and strategy for the below mentioned cases:—
  - (a) An established brand of noodles
  - (b) An edtech startup
  - (c) A new cosmetic range of a new startup
  - (d) An electric two wheeler of an established brand.