

Note: Attempt TOTAL FIVE questions.

Q1 is compulsory.

- Q1. a) Give the set of instructions to store contents of all the registers and flags of 8086 on the stack. [2]
- b) Why are address and data bus demultiplexed in 8086? Show the demultiplexing by suitable diagram. [2]
- c) Explain the maximum mode of operation of 8086. [2]
- d) If Data Segment contains 4000H and BX register contains 5000H, the 20-bit physical address generated is (i) 45000H, (ii) 54000H or (iii) None of these? [1]
- e) After Power is turned ON, what are the contents of the Program Counter of 8086? [1]
- f) Which assembler directives are used to assign names to variables in a program? Give examples of each. [2]
- g) What range of addresses can be used as I/O ports in 8086? What are the instructions used for sending and receiving data from the I/O ports? [2]
- Q2. a) Draw interfacing diagram for generating clock and reset signals in 8086. [3]
- b) Assume MEMDWS defines a double word beginning at the address 1000H (Fig. 1) in the Data segment. What physical address will BX be pointing after the following instruction sequence?
 LEA SI, MEMDWS
 LDS BX, DWORD PTR [SI]

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2

E0	1003H
00	1002H
80	1001H
10	1000H

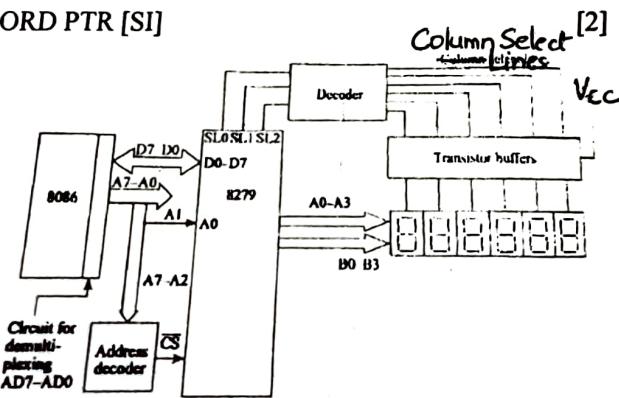


Fig. 1

Fig. 2

[2]

[Signature]

- c) What are the advantages of segmented memory?

- Q3. a) Give the addressing modes of the following instructions:
 i) MOV AH, [BX]
 ii) JMP [BX+DI]
- Give the symbolic representation of each. [2]
- b) Write a program to convert the 8-bit packed BCD number stored in the memory location 3000H:2000H into a binary number and store it in the offset address 2001H in the same segment. [3]
- c) Explain the following instructions:
 i) XLAT
 ii) CMP
- Q4. a) Write a time delay program to generate a delay of 120ms in an 8086 based system that runs on a 10MHz frequency clock. [3]
- b) Interface two 8K X 8 EPROMS with 8086, such that the memory address range assigned to them is FC000H to FFFFFH. Note that one EPROM will be the even bank and the other will be the odd bank. Use 74LS138 decoder to generate chip select signals. Use logic gates / or decoder to generate the control signals for both the chips. Draw the memory map for the two EPROMS. [4]
- Q5. a) Explain with a suitable diagram the working of INTR interrupts in 8086. [3]
- b) List the different numeric data formats supported by 8087.
 Express the decimal number 0.080078125 as a long real floating-point number. [4]
- Q6. a) Interface 8255 with 8086 in memory mapped I/O to cover the address range EXXX0H – EXXX3H, where 'X' indicates the don't cares. Write an initialization routine for 8255 to operate in mode 0 with Port A and Port C Upper as output ports and Port B and Port C Lower as input ports. Further write set of instructions to input data from Port B and Port C Lower and output it at Port A and Port C Upper respectively. [4]
- b) Explain the mode 0 and mode 2 operation of 8253/8254. Write set of instructions to latch the count of counter 1. Store the LSB of the count in (BL) and the MSB of the count in (BH) respectively. Assume address of counter 1 to be OFF01H. [3]
- Q7. a) Draw the block diagram of 8259A. Explain the function of each of the registers and the working of 8259A in the standalone mode on appearance of the interrupts on the IR lines. Mention the sequence of events till acknowledgement of the interrupts. [3]
- b) Fig. 2 shows the interface diagram of the seven-segment display of 8279 with 8086. The address of the command or status register is 42H and of the data register is 40H in 8279. Assume that six digits are to be displayed one by one on the seven segment displays. Write set of instructions to:
 i) Initialize 8279 for encoded output and 8-digit display.
 ii) Write the digits to be displayed in the Display RAM. [4]

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Total No. of Page(s): two

FIFTH SEMESTER

Roll No.

B.E. (ICE)

B.E. END SEM. EXAMINATION, November 2018

ICCC16: Process Dynamics & Control

Time: 3 Hrs.

Max. Marks: 40

Note: Attempt any **five** questions. All questions carry equal marks. Assume any missing data suitable.

1. [a] Explain briefly lumped parameter systems and distributed parameter systems? [2]
[b] Derive the mathematical model of a Stirred Tank Heater and specify all degree of freedom? [4]
[c] Develop the input-output model of Stirred Tank Heater. [2]
2. A PI controller given by $G_c(s) = K_c(1 + \frac{1}{\tau_I s})$ is employed to control a first order process $G_p(s) = \frac{K_p}{\tau_p s + 1}$. Find out the transfer function for resultant closed loop system if the transfer function of the measuring device and final control element is unity. Also find out the expressions for resulting damping ratio, natural frequency of oscillation and offset for servo problem, assuming that a unit step set-point is applied to the system. [8]
3. [a] Consider the tank system as shown in Fig. 1, where the flow rate of the outlet stream is proportional to the square root of the height of the liquid level. Show that the system has variable gain and time constant. [4]

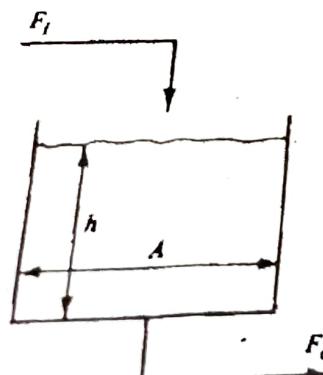


Fig. 1

[b] Explain the functioning of a single seated pneumatic control valve with the help of a neat and labelled diagram. Also, discuss the equal percentage valve characteristic? Why it is called logarithmic valve? [4]

4. [a] Consider the following open-loop unstable process $G_p(s) = \frac{3}{-2s+1}$. For a PI controller, find the range of stabilizing controller proportional gains (K_c) for an integral time constant of $\tau_I = 2$. [4]
[b] Consider the following process with an RHP zero: $G_p(s) = \frac{2.5(-s+1)}{(10s+1)(2s+1)}$. For P-only control, find the bound on the proportional gain to assure closed-loop stability of this process. [4]
5. (a) Discuss the design and implementation issues of feedforward controllers with the help of Stirred Tank Heater? [4]
(b) Write relative advantage and disadvantage of feedforward and feedback control systems? Why feedback control system is clubbed with feedforward control systems? Explain. [4]
6. A cascade control system is shown in figure below. The process transfer function $G_p(s) = \frac{(s+1)}{(s-3)}$ is unstable.

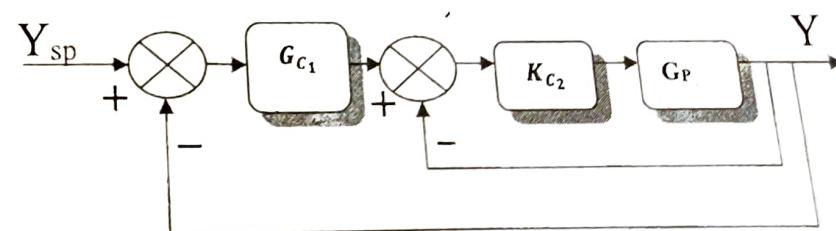


Fig. 2

- (a) Determine the maximum range of K_{c_2} values for which the inner loop will be stable. [4]
(b) Now assume $K_{c_2} = 6$ and G_{c_1} is a PI controller with gain K_{c_1} and τ_I . Find the values of K_{c_1} and τ_I such that the closed loop

poles of the transfer function from Y_{SP} to $Y(s)$ are $s = -0.5 \pm 0.25j$ [4]

7. [a] Discuss the architecture of Programmable Logic Controller (PLC). [4]
[b] Develop the physical and programmed ladder diagram for a motor with the following: NO start button, NC stop button, thermal overload limit switch open on high temperature, green light when running, red light for thermal overload. [6]
8. Write short note on *any two.* [4+4]
- i) Inverse response compensator.
 - ii) Valve positioner.
 - iii) Supervisory Control and Data Acquisition.
 - iv) Split-range control.
-

END SEMESTER EXAMINATION, Nov., 2018
ICC17: Analog and Digital Communication

Time: 3:00 Hrs.

Max. Marks: 40

Note:

Question No. 1 is compulsory to answer and then answer any FOUR Questions from the rest.

1. Select your choice appropriately for the following statements. [1X8]
- a) The sampling of a function $f(t)\sin(2\pi f_0 t)$ starts from a zero crossing. The signal can be unambiguously detected if sampling time T is
- (a) $T = \frac{1}{2f_0}$ (b) $T > \frac{1}{2f_0}$ (c) $T < \frac{1}{2f_0}$ (d) $T \leq \frac{1}{2f_0}$
- b) Find the value of the integral $\int_{-1}^2 [t^4 + 1] \delta(t - 5) dt$
- c) A trigonometric Fourier Series has
- i. single sided spectrum
 - ii. double-sided spectrum
 - iii. power spectrum
 - iv. all of above
- d) In the process of uniform sampling a signal in the time domain results in a periodic spectrum in the frequency domain with a period equal to the _____.
- e) The modulation index of an AM wave is changed from 0 to 1. The transmitted power is
- (a) unchanged (b) halved (c) increased by 50% (d) Quadrupled
- f) Give an example of a signal which is time-limited and band-limited both simultaneously.
- g) The probability density function of a random variable X is given by:

$$f(x) = \begin{cases} \frac{1}{b-a}, & a \leq x \leq b \\ 0, & \text{otherwise} \end{cases}$$

The variable X is said to have

- i. Poisson distribution
- ii. Gaussian distribution
- iii. Rayleigh distribution
- iv. uniform distribution

156

similar in following respects

- h) The white noise and an impulse function is similar in following respects
 - (a) both have similar magnitude spectrum
 - (b) both have similar phase spectrum
 - (c) both have similar magnitude and phase spectrum
 - (d) they have nothing similar
2. Consider a random data pattern consisting of binary 1's and 0's, where the probability of obtaining either a binary 1 or a binary 0 is $\frac{1}{2}$. Calculate the PSD for the Bipolar NRZ signaling. What is the first null bandwidth of the signal. [6+2]
- 3.
- a) Differentiate between Probability Density Function and Probability Distribution Function. [2]
 - b) What happens when sampling rate is lower than Nyquist rate? Justify your answer with proper evidence. [3]
 - c) Differentiate between PAM, PWM, and PPM. [3]
- 4.
- a) Differentiate between Trigonometric Fourier Series and Exponential Fourier Series forms of representation of any time-limited signal. Establish the relationship between their coefficients. In what ratio these coefficients will change if the signal becomes periodic? [5]
 - b) State and prove Parseval's Theorem. [3]
- 5.
- a) A surface is ruled with parallel lines, which are at distance d from each other. Suppose that we throw a needle of length l on the surface at random. What is the probability that the needle will intersect one of the lines. (Assume suitable conditions and data). [4]
 - b) Prove that if $w(t)$ is real and an even function of t , $W(f)$ is real and if $w(t)$ is real and an odd function of t , $W(f)$ is imaginary.. [4]
- 6.
- a) The signal $x(t) = 0.5 + 1.5 \cos[(\frac{2}{3})\pi t] + 0.5 \sin[(\frac{2}{3})\pi t] V$ is passed through an RC low-pass filter of $R = 1$ ohm and $C = 1$ F. Find the input PSD and output PSD. [4]
 - b) Explain all the stages required to generate PCM signal from a given analog signal. [4]
- 7.
- a) Given an angle modulated signal $x(t) = 10 \cos[(10^8)\pi t + 5 \sin 2\pi(10^3)t]$. Determine the maximum phase deviation and the maximum frequency deviation. [4]
 - b) Describe the importance of Digitally Modulated Bandpass Signaling System used in Communication. [4]
8. Write SHORT notes on any THREE of the following topics. [8]
- a) Importance and uses of Eye Diagram used in Communication.
 - b) Characteristics of Line Codes used for Digital Signaling.
 - c) Difference between Narrowband and Wideband FM.
 - d) Generation of Frequency Modulated Wave.
 - e) How to avoid Inter-symbol Interference.

Total No. of Page(s): 2

Roll No.....

FIFTH SEMESTER

B.E. (ICC18)

B.E. END SEM. EXAMINATION, DEC-2017- :

ICC18: CONTROL SYSTEM II

Time: 3:00 Hrs.

Max. Marks: 40

Note: Attempt Any 5 questions.

1 (a) A system is described by dynamic equation

$$\frac{dx(t)}{dt} = Ax(t) + Bu(t)$$

$$y(t) = Cx(t)$$

Where $A = \begin{pmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ -1 & -2 & -3 \end{pmatrix}$; $B = \begin{pmatrix} 0 \\ 0 \\ 1 \end{pmatrix}$; $C = [1 \ 0 \ 0]$

Find the transfer relation between $X(s)$ and $U(s)$

4

(b) Derive Jordan Canonical form for the system described by the following differential equation

$$\frac{d^3y}{dt^3} + \frac{4d^2y}{dt^2} + \frac{5dy}{dt} + 2y = \frac{2du^2}{dt^2} + \frac{6du}{dt} + 5u$$

4

2 (a) Find the zero-input response of the system given by the following

state equation: $\begin{pmatrix} x'(1) \\ x'(2) \end{pmatrix} = \begin{pmatrix} 1 & 0 \\ 1 & 1 \end{pmatrix} \begin{pmatrix} x_1 \\ x_2 \end{pmatrix}$

$$\begin{pmatrix} x_1(0) \\ x_2(0) \end{pmatrix} = \begin{pmatrix} 1 \\ 0 \end{pmatrix}$$

4

(b) A control system is represented as.

$$\begin{pmatrix} x'(1) \\ x'(2) \end{pmatrix} = \begin{pmatrix} 0 & 1 \\ 0 & 0 \end{pmatrix} \begin{pmatrix} x_1 \\ x_2 \end{pmatrix} + \begin{pmatrix} 0 \\ 1 \end{pmatrix} u$$

It is desired to place the closed-loop poles at $s=-1$ and $s=-2$. Determine the state feedback gain matrix by use of Ackermann's formula.

4

3.(a) Derive the describing function of ON-OFF non-linearity with hysteresis.

6

(b) Explain the concept of jump resonance with neat sketch.

?

4 (a) Explain the terms: (i) Positive definiteness. (ii) Negative definiteness. (iii) Positive Semi definiteness. (iv) Negative Semi definiteness. 4

(b) A second order system is represented by $X' = AX$, $A = \begin{pmatrix} -1 & 1 \\ -2 & -4 \end{pmatrix}$ use Lyapunov theorem and determine the stability of the origin of the system. Write the Lyapunov function $V(x)$.

4

5. (a.) Derive the Euler's Lagrange equation.

4

(b) Find the optimum of $J = \int_0^2 [x^2(t) - 2tx(t)] dt$, that satisfy the boundary (initial and final) condition $x(0) = 1, x(2) = 5$.

4

6. (a) Examine the stability of the system described by the following equation using Krasovakii's theorem

$$x' = x_1$$

$$\text{and } x' = x_1 - x_2 - x_2^3$$

4

(b) Obtain the modal matrix for the given system matrix:

$$A = \begin{pmatrix} 0 & 1 & 0 \\ 3 & 0 & 2 \\ -12 & -7 & -6 \end{pmatrix}$$

4

7. Short note: (any two)

(4X2)

(a.) Properties of state transition matrix

(b) Concept of controllability and observability

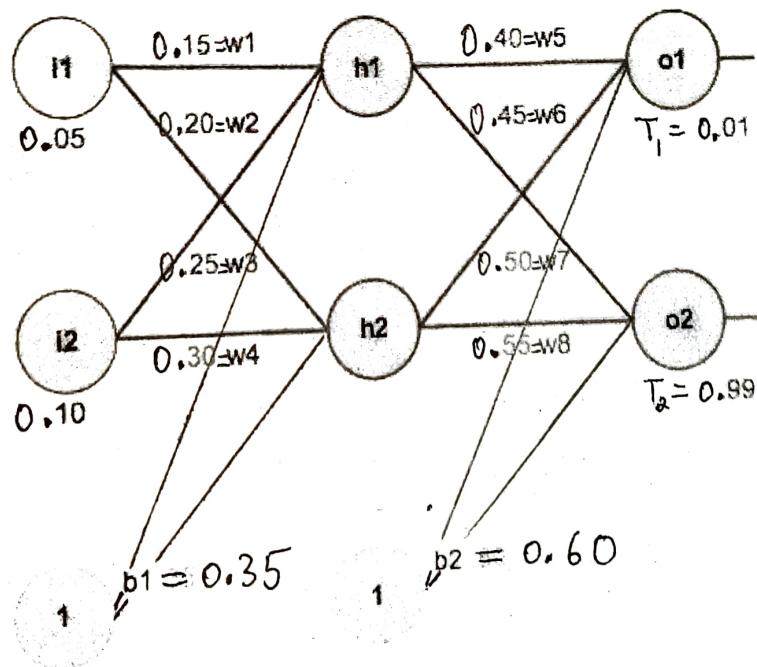
(c) Cayley Hamilton theorem

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Note: Assume suitable data if considered necessary and indicate the same clearly.
All questions carry equal marks

Whenever a question is being attempted, all its parts/sub-parts must be attempted contiguously. This means that before moving on to the next question to be attempted, candidates must finish attempting all parts/sub-parts of the previous question attempted. This is to be strictly followed.

1. Explain A* search algorithm with a suitable example.
2. (a) Resolution Principle and its types with a suitable example
(b) Explain the concept of fuzzy genetic hybrid systems with a suitable example.
3. (a) Explain different Defuzzification methods with a suitable example.
(b) Let m be a positive integer. A relation R is defined on the set Z by " aRb if and only if $a - b$ is divisible by m " for $a, b \in Z$. Show that R is an equivalence relation on set Z .
4. Solve the following using Error back propagation algorithm. (Assume Learning rate = 0.5, Activation function = sigmoid). (Show the updated weights for one iteration at-least).



5. Using Genetic algorithm maximise $f(x) = x^2$ over $\{0, 1, 2, \dots, 31\}$ with initial x values of (13, 24, 8, 16). Show one cross over and mutation operation.

D Sem

4/12/18 (FN)

177

B.E (COE,ECE,ICE,BT,IT)
Number of pages 1

Roll number.....

END SEMESTER EXAMINATION-NOVEMBER 2018
EO004 - Human Resource Management

Time: 3 Hours

Note: * Attempt any FIVE questions.
* All questions carry equal marks.
* Questions should be correctly numbered and answers neatly written.

Maximum Marks: 50

Q.1. What are the distinctive qualities of a 'knowledge worker'? How are they different from factory workers?

Q.2. Explain the challenges of applying traditional management practices for knowledge workers.

Q. 3. What are BPO companies? Explain the various services offered by Indian BPO companies and their reasons for offering those services.

Q. 4. Discuss any four challenges faced in the implementation of labour laws in BPOs.

Q. 5. What are 'flexitime jobs'? Explain their advantages and disadvantages for employees.

Q. 6. What is meant by 'workforce diversity'? What are the reasons for increasing workforce diversity in business organizations?

Q. 7. Explain the reasons for increasing feminization of workforce in organizations. Describe any two labour laws in India to build more inclusive work environments for women.

END SEMESTER EXAMINATION-NOVEMBER 2018
EO009 - Entrepreneurship

Time: 3 Hours

Note: * Attempt any FIVE questions.
 * All questions carry equal marks.
 * Questions should be correctly numbered and answers neatly written.

Maximum Marks: 50

- Q.1.** A. Explain the steps involved in preparing a marketing plan for a start-up business.
 B. Briefly describe the '4 Ps' approach to marketing mix.

- Q.2.** A. Give brief descriptions of the following.

- i) liquid assets
- ii) non-liquid assets
- iii) networth
- iv) planning horizon
- v) proforma income statement

- B. Differentiate between Fund Flow Statement and Cash Flow Statement.

- Q. 3.** A. Explain the break-even chart with a graphical representation of costs at various levels of activity.
 B. From the data given below, find out:
 i) breakeven point in sales value
 ii) number of units that must be sold to earn a profit of 90,000.

Fixed overhead costs	Rs. 7,20,000
Variable cost per unit	Rs. 150
Selling price per unit	Rs. 240

- Q. 4.** A. Differentiate between new ventures and established corporations (any four differences).
 B. Explain briefly:
 i) angel investors ii) venture capitalists
 iii) equity financing iv) debt financing

- Q. 5.** Explain various sources of funding available for start-ups in India.

- Q. 6.** A. What are the essential qualities of entrepreneurs who create sustainable businesses?
 B. Explain the role of capital and labour in entrepreneurship development.

- Q. 7.** A. What is the difference between patents and copyrights?
 B. Explain with the help of suitable examples (one each) importance of industrial design and trademarks for business organizations.

- Q. 8.** Write short notes on any two:
 i) Time management techniques for entrepreneurs ii) RADPAC model of negotiation
 iii) PESTLE analysis of business environment iv) Joint Ventures

Name:

189

Roll No:

End Semester Examination, November 2018
Fifth Semester, B.E, Instrumentation and Control Engineering

ICD-22: Intelligent Control

Time: 3:00 Hrs

M.M:50

Note: 1. Attempt any five questions. All questions carry equal marks.
2. Assume any suitable data, if missing.

Q1.(a) What do you mean by Fuzzy Relation? Explain in detail.
(b) The two fuzzy sets are given below:

$$A = \frac{0.2}{x_1} + \frac{0.5}{x_2} + \frac{1}{x_3} \text{ and } B = \frac{0.2}{y_1} + \frac{0.3}{y_2} + \frac{0.9}{y_3}$$

Calculate the fuzzy relationship between the two sets.

Q2.(a) What do you mean by fuzzy composition rule? Explain with example.
(b) Explain Tolerance and Equivalence relations with an example.

Q3.(a) What is defuzzification? Explain with example.
(b) What do you mean by Tautologies? Explain in detail.

Q4. If A is approximately equal to 5 and B is almost equal to 10. Then perform the following operations using continuous numbers having Lambda cut set.

- (i) A+B, (ii) B-A
(ii) B/A (iv) A*B

Q5. (a) Explain Concentration, Dilation and Intensification with example.
(b) What do you mean by tautologies? Explain with an example.

Q6. (a) Explain Mamdani and TSK graphical inference methods with suitable examples.
(b) Explain fuzzy logic control system with block diagram. Design a fuzzy logic controller for washing machine having 50% of Dust and 65% of Grease and evaluate the time required for cloth to be washed.

Q7. (a) Derive the generalized expression for calculation of weights using error back propagation neural network for i ($i=1, \dots, I$) number of inputs, one layer having j ($j=1, \dots, J$) number of hidden neurons and k ($k=1, \dots, K$) number of outputs.
(b) Calculate the updated weights of the neural network having three inputs, two neurons in hidden layer and one neuron in output layer using unipolar sigmoidal activation function for two iterations and assume all initial weights, inputs and target equal to 1.

END SEMESTER EXAMINATION : November, 2019

IC-301: Analog and Digital Communication

Time: 3:00 Hrs.

Max. Marks: 70

Note:

*Answer any FIVE Questions. Assume any suitable Data.
 Marks assigned to each question are shown next to them under
 bracket.*

1. a) State and Prove Sampling Theorem. [6]
 b) Differentiate between absolute bandwidth and 3-dB bandwidth. [4]
 c) Differentiate between Fourier Series and Fourier Transform. Describe the situations where plot of magnitude and phase both are relevant with respect to frequency of any signal. [4]

2. a) Describe the working principle of Balanced Modulator Circuit. [8]
 b) What are the conditions responsible for appearance of diagonal clipping for a given Envelop Detector Circuite. [6]

3. a) Derive the spectrum of Wide-Band FM for a given single tone modulating signal. [7]
 b) Differentiate between Natural and Instantaneous Sampling in terms of their effect in time Domain as well as Frequency Domain representation. [7]

4. Consider a random data pattern consisting of binary 1's and 0's, where the probability of obtaining either a binary 1 or a binary 0 is $\frac{1}{2}$. Calculate the PSD for the Unipolar NRZ signaling. What is the first null bandwidth of the signal. [10+4]

5. a) Differentiate between PAM, PWM, and PPM. Describe their generation Methods. [7]
 b) Explain the operation and uses of Matched Filter. [7]

6. a) The output SNR of a 10-bit PCM ($n=10$) was found to be 20 dB. The desired SNR is 42 dB. It was decided to increase the SNR to the desired value by increasing the number of quantization levels L. Find the fractional increase in the transmission bandwidth required for this increase in L. [8]
 b) A discrete RV has K equally likely possible values, 0, a, 2a,, (K-1)a. Find the mean, second moment, and standard deviation. [6]

7.

- a) Explain the operation and uses of Delta Modulation.
- b) Enumerate all possible Characteristics of Line Codes.

8. Write SHORT notes on any THREE of the following topics.

- a) Bandwidth Requirement of Digital Communication.
- b) Use of Eye Diagram.
- c) Importance of Bandpass Signaling.
- d) Generation of PCM
- e) Difference between Noise and Distortion.

Instructions to Candidate	1. Attempt five questions in ALL. 2. Question 1 is compulsory. 3. Assume any data suitably, if necessary
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1.	(a) Indicate different flags of 8086 flag register. [2]
	(b) Differentiate between physical address, logical address and virtual address. [2]
	(c) Explain the use of the <i>MN/MX</i> and ALE pins of 8086. [2]
	(d) Explain PUSH POP operation with suitable examples of memory and associated data? [2]
	(e) Explain the assembler directives of 8086. [2]
	(f) Draw the internal block diagram of 8253 / 8254. [2]
2.	(a) Interface two 32K X 8 RAMs with 8086. Assume the starting addresses of the RAMs are 00000H and C0000H respectively. [4]
	(b) Draw the timing diagram of Memory Read Machine Cycle of 8086. [3]
3.	(a) From how many sources can the 8086 be interrupted? Also, explain the sequence of steps performed by the 8086 when it receives an interrupt. [3]
	(b) Write a program to sort 256 bytes of data in ascending order. The bytes of data to be sorted are stored in memory locations 2000H onwards and the sorted data should be stored at memory locations 2200H onwards. [4]
4.	(a) Draw interfacing diagram to connect 8*3 key keyboard to 8086 through 8279 in encoded scan mode. Show only the relevant pins. [4]
	(b) Write initialization instructions to set the mode; then clear the display and then write display RAM of 8279. Assume the address of Command Port is 41H and that of Data Port is 40H. [3]
5.	(a) Give the format of the I/O and BSR control words of 8255. [2]

(b) Write a program that will cause four (4) LEDs to flash 10 times when a push button (PB) switch is pressed (Fig. 1). Assume working frequency of 8086 to be of 5MHz, and persistence of vision is 0.1sec. The addresses are 41H, 42H, 43H and 44H. [5]

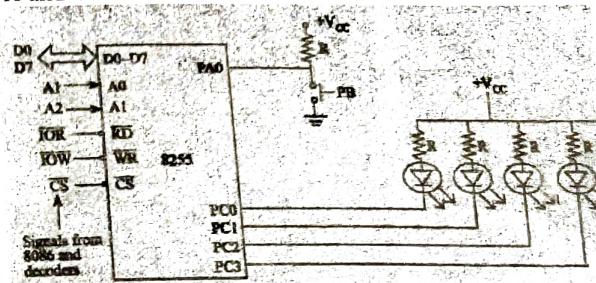


Fig. 1

6. (a) List the various modes of 8253 / 8254. What is the use of GATE signal in the operation of the various modes? [4]
- (b) Explain the Read Back Command in 8254 with suitable diagram. [3]
7. (a) Explain the Operational Command Words of 8259 and how are they different from the Initialization Command Words? [3+1]
- (b) Write a program to read the contents of the following registers of 8259:
 (i) IMR
 (ii) IRR
 (iii) ISR
 Assume the addresses of 8259 to be COH and C2H. [3]
8. (a) Explain the internal structure of 8087 coprocessor with block diagram. [3]
- (b) Convert -1000.5 to single-precision floating point number. [4]

I hereby assign to the Netaji Subhas University of Technology all rights including copyright of the said paper, I have destroyed all the notes, rough drafts and carbon papers used to the question paper mentioned above and retain no copy of it.

FIFTH SEMESTER

B.E. END SEM. EXAMINATION, November 2019

ICCC16: Process Dynamics & Control

Max. Marks: 40

Time: 3 Hrs.

Note: Attempt any **five** questions. All questions carry equal marks. Assume any missing data suitable.

- [a] Derive the mathematical model of a Stirred Tank Heater and specify all degree of freedom? [4]
 - Define the term "control configuration" and develop three different control configurations for the temperature control problem in the Stirred Tank Heater. [2]
 - Determine the hardware elements required for the feedback control configuration for the temperature control problem in the Stirred Tank Heater. [2]
- [a] To what process control problem is split-range control an appropriate solution? Explain with help of example. [3]
 - Explain the functioning of a double seated pneumatic control valve with the help of a neat and labelled diagram. [3]
 - An equal percentage control valve has rangeability of 32. If the maximum flow rate is $100 \text{ m}^3/\text{hr}$, find the flow at $2/3$ and $4/5$ open settings? [2]
- [a] What is the ratio control, and why is it useful in process control? Give three specific examples. [2]
 - How do you select the desired value of the ratio in a ratio control system? [1]
 - Why is it that ratio control can be considered a special form of feedforward control? [1]
 - Discuss the design and implementation issues of feedforward controllers with the help of Stirred Tank Heater? [4]
- [a] A surge tank as shown in Fig.1 is designed with a slotted weir so that the outflow rate, w , is related to liquid level as, $w = Rh^{3/2}$ where R is a constant. If a single stream enters the tank with mass flow rate w_i , find the transfer function $H'(s)/W_i'(s)$. Identify the

gain and all time constants. Verify units. The cross-sectional area of the tank is A . Density ρ is constant. [4]

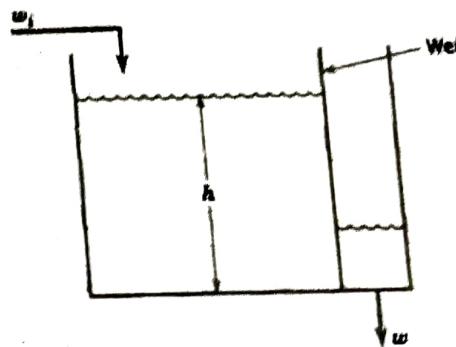


Fig. 1

- The block diagram of a feedback control system is shown in Fig.2. Determine the values of K_C that result in a stable closed-loop system. [4]

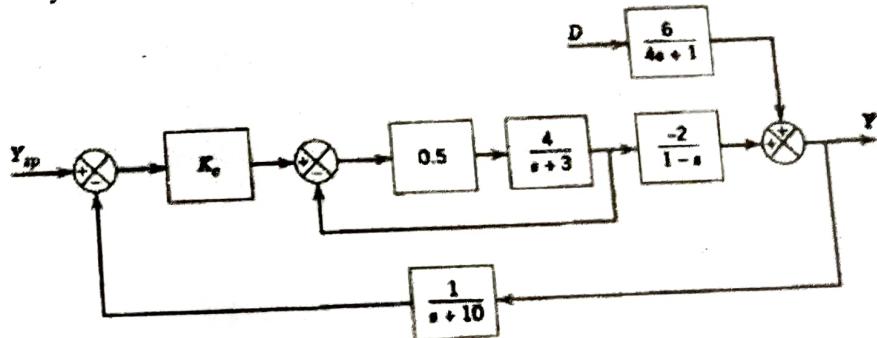


Fig. 2

- Show that, for a stable first-order process

$$g_p(s) = \frac{k_p}{(\tau_p s + 1)}$$

a PI controller will have an oscillatory response if

$$\tau_I < \frac{4k_p k_c \tau_p}{(1 + k_p k_c)}$$

- Find the gain of proportional controller that produce a closed-loop response for a second-order system with decay ratio equal

to $\frac{1}{4}$. The process is described by

[4]

$$G_p(s) = \frac{1}{s^2 + 3s + 1}$$

and

$$G_m(s) = G_f(s) = 1$$

6. [a] What are the relative advantages and disadvantages of the proportional, integral and derivative control actions? What are their characteristic effects on the closed-loop response of a process? [4]

[b] What is the fundamental characteristic structure of cascade control? What are the essential requirements for the successful implementation of cascade control? What is the main purpose of the secondary loop in a cascade control structure? [4]

7. [a] What is a Programmable Logic Controller (PLC). Discuss the PLC architecture in detail with the help of block diagram. [4]

[b] Given two single-pole switches, write a program and physical ladder diagram that will turn on an output when either switch A or switch B is closed. [2]

[c] Given four NO (Normally Open) pushbuttons (A-B-C-D), write a program and physical ladder diagram that will turn a lamp on if pushbuttons A and B or C and D are closed. [2]

8. Write short note on *any two.* [4+4]

i) Smith Predictor.

ii) I/P Converter.

iii) Distributed Control System.

iv) Override control to protect a boiler system.

END SEMESTER EXAMINATION : November, 2019

ICC17: Analog and Digital Communication

Time: 3:00 Hrs.

Max. Marks: 40

Note: Answer any FIVE Questions. Assume any missing data. Numbers given inside the brackets on right side of each question are indicative of their allocated Marks.

1.

- a) What are the benefits of using Modulation Techniques for transmission of Information Signal? [4]
- b) State and Prove Convolution Theorem. [2]
- c) Define Analog and Digital Signal with suitable examples. [2]

2.

- a) Describe the working principle of Product Modulator Circuit. [4]
- b) Sketch $v(t)$ and find $V(f)$ for $v(t)=A \prod \left(\frac{(t-2T)}{4T}\right) + B \prod \left(\frac{(t-2T)}{2T}\right)$. [4]

3.

- a) An angle-modulated signal with carrier frequency $\omega_c=2\pi\times 10^5$ is described by the equation

$$s(t)=10 \cos(\omega_c t + 5 \sin 3000t + 10 \sin 2000\pi t)$$
 - i. Find the power of the modulated signal.
 - ii. Find the modulation index, β .
 - iii. Find the phase deviation, $\Delta\phi$
 - iv. Determine the associated bandwidth.
 - v. Whether the equation belongs to Frequency Modulation or Phase Modulation?
Justify your Answer. [5]
- b) What is the effect of environmental noise on Frequency Modulated wave and how is it handled? [3]

4.

- a) Derive the expression of Probability Mass Function for Poisson Random Variable. [4]
- b) Differentiate between Natural and Instantaneous Sampling in terms of their effect in Frequency Domain representation. [4]

5. Consider a random data pattern consisting of binary 1's and 0's, where the probability of obtaining either a binary 1 or a binary 0 is $\frac{3}{4}$ and $\frac{1}{4}$ respectively. Calculate the PSD for the Unipolar RZ signaling. What is the first null bandwidth of the signal. [5+3]

6. a) What is the minimum number of bits required for an ADC to quantise a signal that varies from $5 \mu\text{V}$ to 200 mV so that $\text{S/N} \geq 40 \text{ dB}$? [4]
b) State and prove the Sampling Theorem. Describe the measures to avoid Inter-symbol Interference. [4]
7. a) Explain the operation and usefulness of Delta Modulation. [4]
b) Enumerate all possible Characteristics of Line Codes. [4]
8. Write SHORT notes on any THREE of the following topics. [8]
a) Advantages of Digital Communication.
b) Use of Matched Filter
c) Benefits of Bandpass Signaling.
d) Types of AM Modulation
e) Difference between Noise and Distortion.

FIIFTH SEM.

B.E. END SEM. THEORY EXAM. (NOV.-DEC. 2019)

ICC18 : CONTROL SYSTEMS - II**B.E. (ICE)**

Max. Marks: 40

Time: 3:00 Hrs.

Note: Attempt ANY FIVE questions.
All questions carry equal marks.

- 1. [a]** A Linear Time Invariant System is characterized by the homogenous state equation

$$\begin{bmatrix} \dot{x}_1 \\ \dot{x}_2 \end{bmatrix} = \begin{bmatrix} 1 & 0 \\ 1 & 1 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix}$$

- (i) Compute the solution of the homogenous equation assuming the initial state vector

$$x(0) = \begin{bmatrix} 1 \\ 0 \end{bmatrix}$$

- (ii) Consider now that the system has a forcing function and is represented by the following non-homogenous state equation

$$\begin{bmatrix} \dot{x}_1 \\ \dot{x}_2 \end{bmatrix} = \begin{bmatrix} 1 & 0 \\ 1 & 1 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix} + \begin{bmatrix} 1 \\ 0 \end{bmatrix} u$$

where u is unit step function. Compute the solution of this state equation assuming $x(0) = \begin{bmatrix} 1 \\ 0 \end{bmatrix}$.

- [b]** Consider the system

$$x = \begin{bmatrix} 1 & 1 \\ 0 & 1 \end{bmatrix} x + \begin{bmatrix} b_1 \\ b_2 \end{bmatrix} u$$

$$y = [d_1 \quad d_2] x$$

Find the condition of complete state controllability and observability.

- 2. [a]** Consider the system described by the state model

$$\dot{x} = Ax$$

$$y = Cx$$

where $A = \begin{bmatrix} -1 & 1 \\ 1 & 2 \end{bmatrix}$ $C = [1 \quad 0]$

Design a full order observer. The desired pole location for the observer matrix are $-5, 5$.

- [b] Comment on the stability of following non-linear system using Direct Method of Lyapunov.

$$\begin{aligned}\dot{x}_1 &= x_2 \\ \dot{x}_2 &= -x_1 - x_1^2 x_2\end{aligned}$$

3. [a] Use Krasovskii's theorem to show that the equilibrium state $x = 0$ of the system described by

$$\begin{aligned}\dot{x}_1 &= -3x_1 + x_2 \\ \dot{x}_2 &= x_1 - x_2 - x_2^3\end{aligned}$$

is asymptotically stable in the large.

- [b] Consider a linear homogenous system

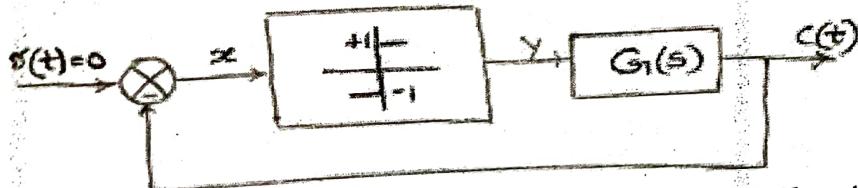
$$\begin{bmatrix} \dot{x}_1 \\ \dot{x}_2 \end{bmatrix} = \begin{bmatrix} 0 & 1 \\ -1 & -1 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix}$$

Formulate Lyapunov's function to test the stability. Choose Q as identity matrix.

4. [a] State and describe the Common Phenomena occurring in non-linear system.

- [b] For the system shown in figure below, where an ideal relay is connected with a plant having

$$G(s) = \frac{1}{s(s+1)(s+2)}$$



Determine whether a limit cycle exists and if exists, determine the amplitude and frequency of the limit cycle.

5. [a] Derive Euler-Lagrange equation for fixed end point problem in calculus of variation.
 [b] Find an extremal curve for the functional

$$J(x) = \int_{t_0}^{t_f} (1 + \dot{x}^2(t))^{1/2} dt,$$

the boundary conditions $t_0 = 0, x(0)$ are specified, $t_f = 0, x(t_f)$ are free but $x(t_f)$ is required to lie on the line $\theta(t) = -5t + 15$.

6. [a] State a general optimal control problem and derive the necessary equations to solve for the unknowns

- States (x)
- Control (u)
- Lagrange Multiplier (λ)

Define Hamiltonian function.

- [b] A system is described by the following equations:

$$\dot{x}_1 = u(t)$$

$$x_1(0) = 1$$

$$I = \frac{x_1^2}{2} + \frac{1}{2} \int_0^2 u^2 dt$$

Find the optimal control u^* .

7. Write short notes on followings:

- (a) Linear Regulator Problem in Optimal Control.
- (b) Design of Control System by Pole-placement Method.

-----X-----

Time: 03:00 Hrs.

Max. Marks: 50

Note: Note: 1. Attempt all questions

2. Assume suitable data if considered necessary and indicate the same clearly.

- Suppose there is equality $a + 2b + 3c + 4d = 30$, use genetic algorithm to find the value of a, b, c, and d that satisfy the above equation assuming the following 6 chromosomes are randomly generated (for the above values of a,b,c & d) for mutation probability of 10%.

$$\text{Chromosome[1]} = [a;b;c;d] = [12;05;23;08]$$

$$\text{Chromosome[2]} = [a;b;c;d] = [02;21;18;03]$$

$$\text{Chromosome[3]} = [a;b;c;d] = [10;04;13;14]$$

$$\text{Chromosome[4]} = [a;b;c;d] = [20;01;10;06]$$

$$\text{Chromosome[5]} = [a;b;c;d] = [01;04;13;19]$$

$$\text{Chromosome[6]} = [a;b;c;d] = [20;05;17;01]$$

(12)

2. (a) Let. $X = \{x_1, x_2, x_3\}$ and

$$R = \begin{bmatrix} 0.7 & 0.9 & 0.4 \\ 0.1 & 0.3 & 0.5 \\ 0.2 & 0.1 & 0 \end{bmatrix} \quad \text{Is R transitive?} \quad (5)$$

- (b). Let $X=\{1,2,3\}$ and $Y=\{1,2\}$. Derive the fuzzy relationship, if the membership function associated with each order pair is given by. (5)

$$\mu_R(x, y) = e^{-(x-y)^2}$$

- (c) Let R be a fuzzy relation defined by the following relational matrix

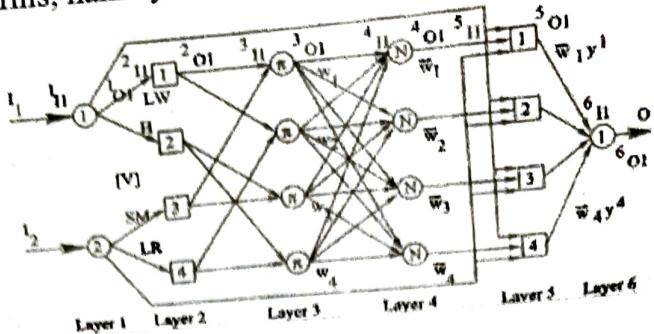
$$R = \begin{bmatrix} & y_1 & y_2 & y_3 & y_4 & y_5 & y_6 \\ x_1 & 0.1 & 0.2 & 0.4 & 0.8 & 1 & 0.8 \\ x_2 & 0.2 & 0.4 & 0.8 & 1 & 0.8 & 0.6 \\ x_3 & 0.4 & 0.8 & 1 & 0.8 & 0.4 & 0.2 \end{bmatrix}$$

(5)

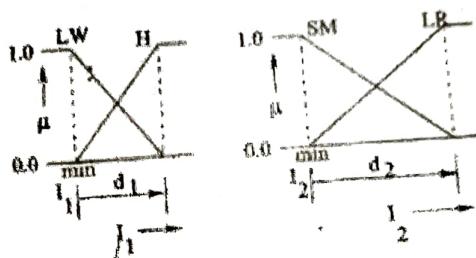
Determine the projection of $R(x,y)$ on X.

3. Below figure shows the schematic view of an ANFIS used to model a process having 2 inputs: I_1, I_2 and one output O. Two linguistic terms, such as LW(Low) and H(High)

have been utilised to represent first input I_1 . Similarly, the second input I_2 , has been expressed using two linguistic terms, namely SM(Small) and LR(Large). (15)



The connecting weights(expressed in the normalised form from 0.0 to 1.0) between the nodes of first and second layers are denoted by [V] matrix. The membership function distributions of the input variables are assumed to be triangular in nature.



The starting values of I_1 and I_2 are assumed to be 1 and 5 units respectively. For the first input I_1 , the base width of LW and H right-angled triangles is kept equal to d_1 . Similarly d_2 represents the base-width of SM and LR right angled triangles. Also according to first-order Takagi and Sugeno's model of FLC, the rules are- $y_i = a_i I_1 + b_i I_2 + c_i$.

Rule Number	a_1	b_1	c_1
1	0.2	0.3	0.1
2	0.2	0.4	0.11
3	0.3	0.3	0.13
4	0.3	0.4	0.14

The values of d_1 and d_2 vary in the ranges- $0.8 \leq d_1 \leq 1.5$; $4 \leq d_2 \leq 6$. Assume the normalised weights values as follows: $[V_{11} = V_{12} = V_{23} = V_{24}]^T = [0.3, 0.5]^T$ and determine the value of output(O) for $I_1=1.8$, $I_2=7$.

4. Write a note on the following

(a) Activation functions (2)

(b) Momentum based gradient descent (2)

(c) Universal Approximation theorem (4)

Total No. of Page(s): 02

Roll No.....

FIFTH SEMESTER**B.E. (ICE)****B.E(ICE) FINAL EXAMINATION, NOV-DEC. 2019**

ICD-03

Artificial Intelligence Techniques and Applications

Time: 03:00 Hrs.

Max. Marks: 50

Note: 1. Attempt all questions**2. Assume suitable data if considered necessary and indicate the same clearly.**

1. Explain Best First Search algorithm with a suitable example (8)

2. A diagnostic test has a probability 0.95 of giving a positive result when applied to a person suffering from a certain disease, and a probability 0.10 of giving a (false) positive when applied to a non-sufferer. It is estimated that 0.5% of the population are sufferers. Suppose that the test is now administered to a person about whom we have no relevant information relating to the disease (apart from the fact that he/she comes from this population). Calculate the following probabilities:

(a) that the result will be positive;

(b) that, given a positive result, the person is a sufferer;

(c) that, given a negative result, the person is a non-sufferer;

(d) that the person will be misclassified (10)

3. A company is trying to decide whether to bid for a certain contract or not. They estimate that merely preparing the bid will cost £10,000. If their company bid then they estimate that there is a 50% chance that their bid will be put on the "short-list", otherwise their bid will be rejected. Once "short-listed" the company will have to supply further detailed information (entailing costs estimated at £5,000). After this stage their bid will either be accepted or rejected. The company estimate that the labour and material costs associated with the contract are £127,000. They are considering three possible bid prices, namely £155,000, £170,000 and £190,000. They estimate that the probability of these bids being accepted (once they have been short-listed) is 0.90, 0.75 and 0.35 respectively.

What should the company do and what is the expected monetary value of your suggested course of action? Also draw the decision for the above problem. (12)

4. (a) Explain "Means End analysis" with a suitable example. (5)

4. (b) Using Genetic algorithm(GA) maximise $f(x) = x^3 - 60 * x^2 + 900 * x + 100$ over $\{0 < x < 31\}$ with initial x values of (28,15,23,4). Show for single point cross over and mutation operation over at least two iterations. (7)

5. Derive Error back propagation for a 3 input, 2 hidden layer(3 neurons in each layer) & 2 output neural network assuming sigmoidal activation for at least 2 epochs. (8)

Time: 3:00 Hours

Max Marks: 50

Note: Marks are indicated against each question

NOTE: 1. ANSWER TOTAL SIX QUESTIONS.

2. QUESTIONS 6 & 7 ARE COMPULSORY.

3. MARKS ARE INDICATED AGAINST EACH QUESTION

QUESTION 1 (7 Marks)

What is Copyright protection? Where is it applicable?

What are its terms and conditions? What are the conditions for its infringement?

QUESTION 2 (7 Marks)

What is Venture Capital Funding? Explain its pros and cons.

Name few important factors a Venture Capitalist looks at while screening ventures for funding.

What are the essential elements a good business plan must have?

QUESTION 3 (7 Marks)

What is an IPO? Explain its pros and cons.

How does it compare with Private Placement as a means of funding a venture?

QUESTION 4 (7 Marks)

What is a business plan? Why should one make a business plan?

What are the essential elements a good business plan must have?

QUESTION 5 (7 Marks)

What is business valuation & why is it needed?

What are some of the popular methods of start-up valuation?

Briefly explain the basic steps of a valuation process.

QUESTION 6 (12 Marks) WRITE SHORT NOTES ON ANY 4 BELOW

QUESTION 6 (12 Marks) WRITE SHORT NOTES ON ANY 4 BELOW

1. Crowd-funding
2. Incubators & Accelerators
3. Common strategies for venture growth
4. Due Diligence
5. Important Acts for doing Business in India
6. The Term Sheet
7. Seed Funding
8. Market Research

QUESTION 7 (10 Marks)

Analyse the enclosed case titled "SEARCH FOR FUNDING" given on Page 2.

SEARCH FOR FUNDING

Uresh and Seema Kumar opened their grocery store one year ago. They estimated it would take six months to break even. As they had gone into the venture with enough capital to cover their start by six months, they were confident they would need no outside financing. But sales have been slower than anticipated, and most of their funds now have been used to purchase inventory or cover monthly expenses. On the other hand, the store is doing better each month and the Kumars are convinced they will be able to turn a profit within next six months.

At present, they want to secure additional financing. Specifically, they would like to raise some money to expand their product line. The store currently focuses most heavily on daily-need items and is developing a loyal customer following. However, this market is not large enough to sustain the business. The Kumars feel that if they expand into an additional market such as fresh-foods, fruits, and vegetables, they can develop two market segments that, when combined, would prove profitable. Seema is convinced that people tend to spend enough money per month on these additional items, and customer loyalty among those in this segment tends to be very high.

The Kumars own all of their inventory. They also have at a local bank a line of credit which they have partly used. Most of their monthly expenses are covered out of the initial capital with which they started the business. But they will be out of money in three months if they are not able to get additional funding.

Kumars have considered investigating a number of sources for funding. The two primary ones are a loan from their bank and a private stock offering to investor. They have a meeting scheduled with their accountant friend who they hope can advise them on how to raise more capital. For the moment, the Kumars are focusing on writing a business plan. They hope to have the plan completed before the end of the week and take it with them to the accountant. The biggest problem they are having in writing the plan is that they are unsure of how to direct their presentation. Should they aim it at a bank or an investor? After meeting with the accountant, they plan to refine the plan and direct it towards appropriate source.

1. Should the Kumars focus on first establishing the business rather than trying to raise more money for business expansion? Give reasons to support your answer.
2. What are the points in favour of Kumars in this venture, to enable them to raise more money?
3. What are the points not in favour of Kumars in this venture, which can prevent them from raising more money at present?
4. What can Kumars do additionally or differently, to make the business more appealing for being funded?
5. How would you recommend Kumars should seek additional capital? Draw a comparison between seeking money from the bank as compared to raising money from an investor.

Name of Examination: Semester V, November/December 2019

Subject/Name of Course: Basics of Human Resource Management

Max Marks – 50

Time: 3.00 Hours

Course No – EO004

Instructions to Candidates	1. Write your Roll No. on the top immediately on receipt of this question paper. 2. Attempt any one part, <u>a or b</u> from each question. All questions carry equal marks. 3. Assume any missing data suitably, if necessary.
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S. No.	QUESTION	MARKS/Cos
1	(a) What are the primary objectives of Human Resource Planning? What is the role of demographic and technological factors in HR planning? (b) Explain workforce diversity & downsizing as two major challenges before Human Resource management.	10 CO1
2	(a) Explain the differences among job specification, job description and job evaluation with the help of suitable examples. (b) Describe the methods and purpose of job evaluation.	10 CO2
3	(a) What are the internal factors that affect recruitment policy of the organization? (b) Explain any five sources of recruitment with their advantages and disadvantages. Give examples of job profiles suitable for these sources of recruitment.	10 CO3
4	(a) Describe the various steps involves in Selection Process. (b) It is said that job interviews play the most important role in selection of candidates for the job. Do you agree? Give reasons for your answer. Explain important types of interviews and their purpose.	10 CO4
5	(a) What is the role of induction for new employees in an organization? Explain with the help of examples. (b) Write short notes on any two of the following i) Significance of Hawthorne studies for HRM ii) Personality tests iii) Job Design iv) HR information systems	10 CO5