SECTION - A

There are FOUR questions in this section. Answer any THREE.

1. A CSP has a set \( X = \{x_1, ..., x_n\} \) of variables, each having a domain \( D = \{d_1, ..., d_m\} \) of values. In addition, the CSP has a set \( C = \{C_1, ..., C_m\} \) of constraints, each relating to a subset of \( X \) and specifying the allowable combinations of assignments to the variables in that subset.

   a) Give a general definition of a solution to the CSP. Given a binary CSP, define what it means for a directed arc \( x_i \rightarrow x_j \) between variables \( x_i \) and \( x_j \) to be arc consistent.

   b) Give an example of how a directed arc \( x_i \rightarrow x_j \) can fail to be arc consistent. Explain how this can be fixed.

   c) Describe the AC-3 algorithm for enforcing arc consistency. Prove that the time complexity of the AC-3 algorithm is \( O(n^2d^2) \), where \( d \) is the size of the largest domain.

   d) Suggest a way in which the concept of arc consistency, also known as 2-consistency, can be extended to sets of three rather than two variables. In the remainder of the question we refer to this as 3-consistency. Give an example of how a set of three variables might fail to be 3-consistent, and show how 3-consistency might then be imposed.

12+3

2. a) With the help of a pseudo code give a general description of the operation of the Recursive Best-First Search (RBFS) algorithm. Explain why RBF might be used in preference to the A* search algorithm.

   b) Consider the following search tree.

   ![Search Tree](image)

   The numbers by the nodes denote the sum of some path cost and heuristic. The boxed nodes are goals. Describe in detail the way in which the RBFS algorithm searches this tree. Your answer should indicate the order in which nodes are expanded, the reason that this order is used, and should state which of the three goals is found and why. Note that smaller numbers represent more desirable nodes.

   c) What are the problems associated with the Depth First Search algorithm? Describe how the Iterative Deepening Search (IDS) algorithm addresses some of these problems.
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3. a) Discuss the facilities and problems of a greedy search algorithm. Discuss how simulated annealing addresses the main problem of this algorithm.
   b) How do evolutionary algorithms work? Define the term self adaptation in the context of evolutionary algorithms.
   c) What are the differences between a search tree used for an adversarial search versus a tree for classical single-agent search problems? Why do we use Depth First Search to solve adversarial search problems? Describe the operation of alpha-beta pruning.

4. a) Define in your own words: intelligence, artificial intelligence, agent, rationality, and logical reasoning. Explain how a model based reflex agent operates. Also write the pseudo code of the agent.
   b) Four additional features that can be built into AI agents are: internal states, goals, utility functions, and learning. Explain how each of these can enable an agent to act more intelligently. Illustrate your answer with some simple examples.
   c) For each of the following activities, give a PEAS description of the task environment.
      (i) Playing soccer
      (ii) Exploring the subsurface oceans of Titan
      (iii) Playing a tennis match
      (iv) Performing a high jump
   d) “Surely animals, humans, and computers cannot be intelligent—they can do only what their constituent atoms are told to do by the laws of physics.” Is the latter statement true, and does it imply the former? Justify.

SECTION – B

There are FOUR questions in this section. Answer any THREE.

5. a) Climactic data shows that, both oceanic temperature and atmospheric pressure contribute to the formation of a low pressure zone in offshore regions. The probabilities that the oceanic surface temperature is greater than 25° C (condition known as T-kick) and that the atmospheric pressure is less than 92 kilo-Pascal (condition known as P-kick) are 65% and 60% respectively for any instant of time. The probabilities that a low zone will be formed due to both T-kick and P-kick, due to T-kick only, due to P-kick only and due to reasons other than T-kick and P-kick are 80%, 35%, 45% and 10% respectively. There is a 48% probability that the low zone will result in moderate rain-fall. However, if Coriolis force, a peculiar tropical wind pattern, is present, then the low zone may result in tropical cyclone. There is a 25% prior probability of the presence of Coriolis force (known as C-force). The probabilities that a cyclone will build up due to both C-force and low zone, due to C-force only, due to low zone only and due to none of them are 95%, 22%, 24% and 8% respectively.

Contd ……….. P/3
i) Draw a Bayesian Network that represents the above scenario correctly.

ii) Using Variable Elimination algorithm, find the probability of P-kick if a cyclone has already formed.

iii) If both T-kick and P-kick are present in the environment, what is the probability that a tropical cyclone will be formed?

b) Write short note on:
   i) Markov Blanket.
   ii) Clustering.

a) Convert the following sentences into predicate form and then, into clause form and hence build a knowledge base:

   i) Anything that is played by any student is tennis, soccer, or chess.
   ii) Anything that is chess is not vigorous.
   iii) Anyone who is healthy plays something that is vigorous.
   iv) Anyone who plays any chess does not play any soccer.

   (Conclusion) If every student is healthy, then every student who plays any chess plays some tennis.

Using the above knowledge base, prove the following by the method of resolution:

   Anyone who is healthy plays something that is vigorous.

b) Is there any problem with the following unification? Explain.

   (1) President (Obama, 2014, X1).
   (2) President (X2, T1, Senator (X1, Illinois)).

   Substitute: {Senator (X1, Illinois) / X1} {2014 / T1} {Obama / X2}

6. a) Suppose following predicates describe the environment of blocks completely having two agents in that environment. These two agents are Agent1 and Agent2.

   ON(A, B) - Block A is on block B.
   ONTABLE(A) - Block A is on the table.
   CLEAR(A) - There is nothing on top of block A.
   HOLDING(A, 1) - The Agent1’s arm is holding block A.
   HOLDING(A, 2) - The Agent2’s arm is holding block A.
   ARMEMPTY(1) - The Agent1’s arm is holding nothing.
   ARMEMPTY(2) - The Agent2’s arm is holding nothing.

    Now define the precondition, add-list and delete-list for the following action as a precursor to goal stack planning:
    i) STACK(X, Y, 1) and STACK(X, Y, 2).
    ii) UNSTACK(X, Y, 1) and UNSTACK(X, Y, 2).
    iii) PICKUP(X, 1) and PICKUP(X, 2).
    iv) PUTDOWN(X, 1) and PUTDOWN(X, 2).
b) Using the goal stack planning and the actions defined in 7(a), attain the goal state from the initial state as shown in Figure for 7(b) (Consider that, both Agent1 and Agent2 work equally).

![Initial state](image1)

![Goal state](image2)

Figure for 7(b)

c) What are the differences between linear and non-linear planning? State modal truth criterion.

8. a) Define de Finetti’s theorem. Apply the theorem to show that there is a bet for Agent 1 for the events \( x \) and \( y \) such that the outcomes are always in favor of Agent 1 if Agent 2 believes that the event \( x, y \) and \( (x \lor y) \) happen with probabilities 40%, 35% and 80% respectively.

b) Three prisoners, A, B, and C, are locked in their cells. It is common knowledge that one of them will be executed the next day and the others pardoned. Only the governor knows which one will be executed. Prisoner A asks the guard a favor: "Please ask the governor who will be executed, and then take a message to one of my friends B and C to let him know that he will be pardoned in the morning." The guard agrees, and comes back later and tells A that he gave the pardon message to B. What are A's chances of being executed, given this information? (Answer this mathematically, not by energetic waving of hands.)

c) With suitable examples, explain the five steps of TWEAK planning framework.

d) Define singly connected tree (poly tree) and multiply connected tree with suitable examples.
SECTION A

1. (a) Design an 8-bit D/A converter circuit using MC 1408 to produce a full scale output voltage \(20 \times \frac{255}{256}\) volt when all the switches are closed. (10)

(b) Discuss the following D/A characteristics and specifications. (i) Resolution (ii) Full-scale output voltage (iii) Accuracy specification (iv) Linearity specification. (10)

(c) Show the circuit diagram of dual-slope A/D converter and explain the functionality of the converter using integrated output waveform. What are the advantages and disadvantages of this type of converter? (15)

2. (a) Show the connection diagram of a hexadecimal keypad to microcomputer port to get meaningful data from the keyboard. Explain the functionality with a flowchart. (10)

(b) Give a comparison among the operations of 8255A in mode 0, mode 1 and mode 2. Show the control word formats for these three modes. (10)

(c) Design a 7-segment display system to display eight decimal digits by using 8279 and 7445. Explain the operation of the display by appropriate timing diagram. (15)

3. (a) Show the internal block diagram of software programmable timer/counter 8254. Why is this counter called programmable counter? Explain the functions of address inputs and gate input in each counter. (10)

(b) How are multiple 8259A and an 8254 connected in SDK-86 board? Show the truth table for the address decoder in the board. (10)

(c) Discuss the six steps in details to initialize a programmable peripheral device. (15)

4. (a) How is an interrupt executed by the priority interrupt controller 8259A? Explain this with appropriate diagram. How is the priority resolved? (10)

(b) Show how the microprocessor and DMA controller time-share the use of address, data and control base for DMA transfer from peripheral devices to memory. (10)
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Contd—Q. No. 4

(c) Explain the following signals in 8272 floppy disk interface.
   (i) PRE-SHIFT  (ii) VcoSYNC  (iii) WRITE PROTECT
   (iv) MFM MODE  (vi) LOW CURRENT.
   (d) Write short note on SCSI hard-disk interface.

SECTION—B

There are FOUR questions in this section. Answer any THREE.

5. (a) Design an arithmetic and logic unit, using two selection variables S₀ and S₁, which
    generates the following arithmetic and logic operations [you should not use any
    multiplexer].

    | S₀ | S₁ | Cᵢⁿ=0 | Cᵢⁿ=1 |
    |----|----|--------|--------|
    | 0  | 0  | F=A    |        |
    | 0  | 1  | F=A-B-1| F=A-B  |
    | 1  | 0  | F=A    | F=A+1  |
    | 1  | 1  | F=AB   | X (don't care) |

(b) Which arithmetic operations show the following attributes? Show them using a
    block diagram of a parallel adder.
    (i) C_out is always 1.
    (ii) C_out is always 0.
(c) Suppose you have an arithmetic operation F=A-B (signed 2's complement
    subtraction). If A<B, then boolean function, Y = S ⊕ V becomes 1 (where S denotes
    Signed flag and V denotes Overflow flag). Give an explanation.
(d) Design an arithmetic circuit with one selection variable S and two data inputs A and
    B. When S = 0, the circuit performs increment operation, F=A+1. When S=1, the circuit
    performs decrement operation, F=A-1.

6. (a) Draw a flowchart and a state diagram of a system that performs Booth's
    multiplication.

   (8+6=14)

(b) Write down the advantages and disadvantages of one flip-flop per state method.
    Design the control unit of the following state diagram using the microprogram control
    method [you need to show the block diagram and the truth table].

   (4+10=14)
(c) Using flip-flops, design one typical stage of a register that performs the following micro operations. [you must draw the figure]

\[ A \leftarrow A - 1 \] (decrement operation)  

7. (a) Implement the following function using an 8x4 Rom.

\[ F(A, B, C) = \prod(0, 2, 6) \]

(b) In SAP-1 the positive clock edge occurs halfway through each state. Why is this important?

(c) (i) Differentiate between machine cycle and instruction cycle.  
(ii) Suppose an instruction requires 3.5 machine cycles. A machine cycle requires 8 T-states. If the system clock has a frequency of 2.5 MHz, how long is an instruction cycle?

(d) (i) Write down the control words for ADD instruction in SAP-1 (for each T states).  
[ref:- fig: 7(d)]

(ii) Show the timing diagram of fetch and execution cycles for the SUB instruction.  
[ref:- fig: 7(d)]
8. (a) Draw the block diagram of SAP-2.

(b) (i) Briefly describe the stack of SAP-2. Mention limitations of this stack.  
(ii) Write down the handshaking sequence of SAP-2.

(c) Consider the following SAP-2 subroutine:

<table>
<thead>
<tr>
<th>Instruction</th>
</tr>
</thead>
<tbody>
<tr>
<td>MVI C,0AH</td>
</tr>
<tr>
<td>LOOP1</td>
</tr>
<tr>
<td>LOOP2: DCR B</td>
</tr>
<tr>
<td>JNZ LOOP2</td>
</tr>
<tr>
<td>MVI B, 0CH</td>
</tr>
<tr>
<td>LOOP3: DCR B</td>
</tr>
<tr>
<td>JZ LOOP3</td>
</tr>
<tr>
<td>DCR C</td>
</tr>
<tr>
<td>NOP</td>
</tr>
<tr>
<td>JNZ LOOP1</td>
</tr>
<tr>
<td>HLT</td>
</tr>
</tbody>
</table>

Contd ... P/5
Assume the memory involved instructions, (LDA, STA, Immediate etc.) require 7 μs, pure register instructions require 4 μs, conditional jump instructions require 10 or 7 μs, NOP instruction requires 4 μs, HLT instruction requires 5 μs and any other instruction require 10 μs. Now determine the following, considering the above instructions executed in SAP-2 computer.

(i) How many bytes does the subroutine take to be stored in memory?
(ii) How long does it take to execute the subroutine?
(d) Briefly describe the characteristics of an indirect instruction of SAP-3.
SECTION – A

There are FOUR questions in this section. Answer any THREE.

1. (a) Describe the basic principle and architecture of standby sparing technique. What are the advantages of this redundancy over passive redundancy?

(b) Design self purging and sift out modular redundancy for 3 modules using basic gates. Compare gate requirements for these two redundancy techniques.

(c) You are to detect a faulty bit slice on either one half of the operand. Which time redundancy technique would you suggest? Explain with figures.

(d) Derive the equations of markov model for TMR system in the matrix form.

2. (a) Explain the operations performed by different components used for typical data transmission with necessary symbols and block diagrams.

(b) Demonstrate how the introduction of parity reduces undetected errors for a data transmission where data word size is 10 bit long. Assume probability of error in transmitting a bit is $10^{-9}$.

(c) Consider a 4 bit code with the set of valid codewords as {0000, 0101, 0011}. Consider all possible errors happened. Show maximum likelihood decoding for the received codewords.

3. (a) Show that a code C with distance $d$ corrects all errors with maximum weight $\left\lfloor \frac{d-1}{2} \right\rfloor$.

(b) Consider a code defined by $C = \{0000000, 1111111\}$. What are the capabilities of error correction and detection of this code?

(c) Design a parity system for 9 data bits to detect and correct 1 bit error.

(d) Consider the following Boolean functions:

\[ f_0 = A\overline{B} + BC + ABC + BD \]
\[ f_1 = A\overline{B} + \overline{B}C + CA \]
\[ f_2 = ABC + BCD \]

Design necessary circuits to detect all unidirectional errors.
4. (a) Consider a generator matrix as:

\[
\begin{bmatrix}
1 & 0 & 0 & 0 & 1 \\
0 & 0 & 1 & 1 & 0 \\
0 & 1 & 0 & 0 & 1
\end{bmatrix}
\]

Demonstrate the error correcting capability for the received codewords [1101] and [00101].

(b) What are the properties of cyclic code? Show the use of Linear Feedback Shift Register in encoding and decoding.

(c) Justify the following equation: failure rate \( \lambda = \frac{1}{S(t)} \frac{dF(t)}{dt} \) where \( S(t) \) and \( F(t) \) denote the number of components in operation and out of operation.

(d) A web server hangs once in 30 minutes on the average. What will be the reliability of the web server over a period of the day. It takes 10 seconds to restart the web server when it hangs. What is the availability of the web server in its first week of operation?

SECTION – B

There are FOUR questions in this section. Answer any THREE.

5. (a) Define reliability and unreliability as a conditional probability with examples.

(b) Explain different ways to achieve fault tolerance.

(c) Explain the meaning of stuck fault in digital circuits. Consider the following circuit:

\[
\begin{array}{c}
A \\
\downarrow \\
B \\
\downarrow \\
C \\
\uparrow \\
D \\
\downarrow \\
\uparrow \\
\downarrow \\
Z
\end{array}
\]

Determine the essential test patterns for all the stuck faults on line A, B, C, D and Z using fault detection table.

(d) Find out the test patterns for finding stuck faults on D using Boolean differences for the circuit shown in above figure.

6. (a) What is the motivation behind adaptive experiment for fault testing? How many tests are required on the average for an adaptive experiment?
(b) Discuss relative advantages and disadvantages of row and column method of fault simulation by running it for the following circuit.

(c) Outline the implementation strategy for semi-active replication using any programming language. Discuss APIs for the method invocation and communication in the system.

7. (a) What are the characteristics of a robust software? Consider a software that reads OMR answer scripts and generate results of the students. Write necessary code segments such that the system becomes robust.

(b) Consider the acceptance testing in software testing phase and in fault tolerant software design. Discuss with necessary example of acceptance testing in the following cases:
   (i) Sending data from one location to another over the network.
   (ii) Generating results of a semester for CSE department.
   (iii) Calculation of interest for clients of a bank.

8. (a) Discuss the characteristics and overhead requirement of Recovery Block and N Version programming.

(b) You are to write a sorting system that takes string input through a file and writes the sorted strings in another file. Consider acceptance voting where multiple version of sorting will be used with acceptance testing. Design the acceptance test and multiple version of the sorting.

(c) Explain how staging in passive redundancy provides more fault tolerance than simple redundancy.
SECTION – A

There are FOUR questions in this section. Answer any THREE.

1. (a) With necessary examples show that imaging is possible in any range of the entire EM spectrum though human beings can see only in a narrow portion of EM spectrum. (10)
(b) What do you mean by histogram equalized image? What are the necessary conditions that the corresponding transfer must follow in histogram equalization? What do these conditions guarantee? Describe a transfer function that follows these conditions and show that it results a histogram equalized image. (25)

2. (a) Derive equations of 1st order and 2nd order derivatives of an image and show their response in constant intensity area, edge, line, gray ramp and noise point of an image. (25)
(b) Why do we need log transform to visualize the Fourier transform of an image? Explain Gamma correction. (10)

3. (a) Write a generalized equation of filtering operation. How does it differ from a linear smoothing filter? Justify its usage in removing unnecessary details from an image. (12)
(b) Establish the background of Hough transform to locate straight lines in a binary image. Make necessary changes in the Hough transform to find circles of constant radius. (23)

4. (a) Explain contrast stretching. Show that thresholding is a special case of contrast stretching. Write down the thresholding equation to isolate the Bit-plane-7 of a grayscale image. (17)
(b) Why do we accumulate the differences of multiple frames from a reference frame instead of using the difference of a single frame from a reference frame to find moving objects in a video sequence? Define absolute, positive and negative accumulative difference images and show how they are used to find different characteristics of a moving object. (18)
5. (a) What is predictive coding? Distinguish lossless and lossy predictive coding technique for an image.  
   (5+5)

(b) Draw the block diagrams of (i) an encoder and (ii) a decoder of a lossy predictive coding model.  
   (5+5)

(c) Describe the delta modulation technique for lossy predictive coding. Given an input sequence \{14, 15, 14, 15, 13, 15, 15, 14\} with \(\alpha = 1\) and \(\zeta = 6.5\), show the steps of delta modulation process.  
   (7+8)

6. (a) What is Walsh-Hadamard transform (WHT)? Derive the basis image for WHT-based transformation for \(u = 2\) and \(v = 3\). How is it different from discrete Fourier transform (DFT)?  
   (5+5+5)

(b) Which coding uses zigzag ordering for coefficient sequence scanning in JPEG? Why does it perform better than the ordering sequence used in the other coding technique?  
   (10)

(c) Given the sample 4x4 8-bit image:

\[
\begin{array}{cccc}
21 & 21 & 243 & 243 \\
21 & 21 & 243 & 243 \\
21 & 21 & 243 & 243 \\
21 & 21 & 243 & 243 \\
\end{array}
\]

(i) Compute the entropy of the above image.  
(ii) Compress the image using Huffman coding.  
   (5+5)

7. (a) Describe the image formation model. From this model, justify the necessity of homomorphic filtering and formulate the mathematical derivation of this filtering.  
   (24)

(b) Name different image sensor arrangements. Describe the one that is used in CT/PET. Justify whether the resolution in this arrangement can be adjusted.  
   (11)

8. (a) Explain mask mode radiography. What is the basic image operation performed in this procedure? State the issues in this image operation and describe some way outs of these issues.  
   (14)

(b) Show that convolution of a digital function with respect to a discrete unit impulse function copies the digital function at impulse location. From this result along with the derivation of Fourier spectrum of a 1D box function, explain the ringing effect of ideal low pass filter.  
   (21)
SECTION - A

There are FOUR questions in this section. Answer any THREE.

1. (a) Classify forecast based on time horizon and explain which type is more accurate and why. (10)
(b) A toy manufacturer uses 48,000 rubber wheels per year for its popular dump truck series. The firm makes its own wheels which it can produce at a rate of 800 per day. The toy trucks are assembled uniformly over the entire year. Carrying cost is $1 per wheel a year. Setup cost for a production run of wheels is $45. The firm operates 240 days per year. Determine the following:
(i) Optimal run size
(ii) Minimum total annual cost for carrying and setup
(iii) Cycle time for the optimal run size
(iv) Run time
(c) What are the limitations of "Jury of executive opinion"? Explain how these can be eliminated. (5)
(d) Discuss the relative advantages and disadvantages of qualitative and quantitative forecasting techniques. (5)

2. (a) End item A has a planned lead time of 2 weeks. There are currently 120 units on hand and schedule receipts of 50 units will arrive at week 3. (20)

<table>
<thead>
<tr>
<th>Week</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
</tr>
</thead>
<tbody>
<tr>
<td>Demand</td>
<td>41</td>
<td>44</td>
<td>84</td>
<td>42</td>
<td>84</td>
<td>86</td>
<td>7</td>
<td>18</td>
<td>49</td>
<td>30</td>
</tr>
</tbody>
</table>

(i) Compute the planned order releases using lot-for-lot.
(ii) Compute the planned order releases using PPB where the ratio of setup to holding cost is 200.
(iii) Compare the total cost for the above two lot sizing techniques. The setup cost is $100 and holding cost is $1 per unit per week.
(b) Describe the assumptions of Linear Programming. (15)
3. (a) In EOQ model, at which order quantity, the total inventory cost is minimum? Explain your answer.

(b) A firm manufactures three products A, B, C. Time to produce product A is twice that for B and thrice that for C and they are to be produced in the ratio of 3:4:5. The relevant data is given in table 3(b). If the whole labor is engaged in manufacturing product A, 1600 units of this product can be produced. There is demand for at least 300,250 and 200 units of products A, B and C and the profit earned per unit is $50, $40 and $70 respectively. Formulate the problem as a linear programming problem.

(c) LubeCar specializes in fast automobile oil change. The garage buys car oil in bulk at $3 per gallon. A discount price of $2.50 per gallon is available if the garage purchases more than 1000 gallons. The garage services approximately 150 cars per day and each oil change takes 1.25 gallons. LubeCar stores bulk oil at the cost of $0.02 per gallon per day. Also the cost of placing an order for bulk oil is $20. There is a 2-day lead time for delivery. Determine the optimal inventory policy.

4. (a) Show that there is an unbounded solution to the following L.P problem.

Maximize, \[ Z = 4x_1 + x_2 + 3x_3 + 5x_4 \]
subject to,
\[ 4x_1 - 6x_2 - 5x_3 - 4x_4 \geq -20 \]
\[ -3x_1 - 2x_2 + 4x_3 + x_4 \leq 10 \]
\[ -8x_1 - 3x_2 + 3x_3 + 2x_4 \leq 20 \]
\[ x_1, x_2, x_3, x_4 \geq 0 \]

(b) Discuss the limitations of rule-based dispatching system.

(c) Use Johnson's rule to obtain the optimum sequence for processing the jobs shown through work centers A and B.

<table>
<thead>
<tr>
<th>Job</th>
<th>Job times (hours)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Work center A</td>
</tr>
<tr>
<td>a</td>
<td>2.50</td>
</tr>
<tr>
<td>b</td>
<td>3.80</td>
</tr>
<tr>
<td>c</td>
<td>2.20</td>
</tr>
<tr>
<td>d</td>
<td>5.80</td>
</tr>
<tr>
<td>e</td>
<td>4.50</td>
</tr>
</tbody>
</table>
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SECTION – B
There are FOUR questions in this section. Answer any THREE.

5. (a) Describe the four basic management functions. (12)

(b) Explain the difference between effectiveness and efficiency with appropriate example. Describe the challenges of management. (5+6)

(c) What are the fundamental elements a bureaucracy should have according to Weber? Describe organization according to systems approach. (3+9)

6. (a) Describe the contingency factors influencing structural decisions of an organization. (12)

(b) What is a boundaryless organization? Explain different types of boundaryless organization. (10)

(c) Explain the five bases of power with appropriate examples. Differentiate between classical and acceptance view of formal authority. (7+6)

7. (a) Assume guaranteed base rate is 25 Tk/hour. Total number of pieces to be produced is 300 pieces. Low task is 100 pieces/hour which is 75% of standard task. The worker takes 2 hours to complete the job and his share is 40%. Calculate the rate of incentive for worker according to Halsey Plan. (10)

(b) Explain the four aspects of reinforcement theory with examples. (10)

(c) Differentiate between rationality and bounded rationality. (5)

(d) Describe expectancy theory. (10)

8. (a) Briefly explain the steps of strategic management process. (10)

(b) Describe the five competitive forces in industry analysis. (10)

(c) Show the human resources management processes in a flow chart. (7)

(d) Write down the factors influencing compensation and benefits. (8)
There are FOUR questions in this section. Answer any THREE.

1. (a) 'Sociology is the study of social relationship' — Justify this statement on the basis of the nature of sociology. (7)

   (b) Describe the four factors that contributed to the development of sociology as an independent discipline. (10½)

   (c) Illustrate the contribution of Max Weber in the field of sociology. (6)

2. (a) Define social norms. Explain why culture is considered as a normative system of a society. (10)

   (b) What do you understand by civilization? Make a comparison between culture and civilization. (13½)

3. (a) How does socialization shape human behaviour? Critically evaluate the roles of family, peer group and educational institute as the agents of socialization. (13½)

   (b) Critically discuss different stages of socialization. (10)

4. Write short notes on any three of the following: (23½)

   (a) Different systems of stratification

   (b) White collar crime

   (c) Labeling theory of deviance

   (d) Juvenile delinquency.

Contd ........... P/2
5. (a) What are the major technological developments occurred during industrial revolution? (13½)
(b) Discuss the cultural and economic impacts of globalization on our society. (10)

6. (a) The study of population uses some specific calculation techniques to measure population. What are these techniques? (13½)
(b) Critically discuss the 'Malthusian Theory of Population'. (10)

7. (a) What are the basic differences between 'Urban Ecology' and 'New Urban Sociology'? (15½)
(b) What are the forces of migration? Discuss with example. (8)

8. Write short notes on any THREE of the following: (23½)
(a) Capitalism
(b) Agrarian Society
(c) Noise Pollution
(d) 'Abraham Darby'
SECTION A

There are FOUR questions in this section. Answer any THREE.

1. (a) Discuss with examples the terms "Compensation", "Employer" and "Dependant" as per provisions of Workman's Compensation Act, 1932. 
(b) Enumerate the circumstances under which an employer is liable to pay compensation. 
(c) Explain the meaning of "arising out of employment" and "arising in the course of employment" with the help of an example. 

2. (a) Distinguish between the term "Wages" and "Bonus" as per Payment of Wages Act, 1923. 
(b) Discuss briefly the provisions regarding –
   (i) Employer’s liability for payment of wages. 
   (ii) Time for payment of wages. 
   (iii) Mode of payment of wages. 
   (iv) Minimum wages. 

3. (a) Define the term "Apprentice", "Retrenchment" and "Employer" as per Employment of Labor (Standing Order), 1965. Give illustrations to justify your answer. 
(b) Give a brief outline of the provisions regarding leave and holiday of a worker. 
(c) Describe briefly the circumstances under which an employer may declare lay-off in his Industrial undertakings. 

4. Write short notes: [Any Three]
   (a) Labor Court. 
   (b) Strike and Lockout. 
   (c) Collective Bargaining Agent. 
   (d) Dismissal of a worker. 

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HUM 411 (CSE)

SECTION - B
There are FOUR questions in this section. Answer any THREE.

5. (a) "an agreement enforceable by law is a contract" – Explain the definition as per Contract Act, 1872, bringing out clearly the essentials of a valid contract. (15)
(b) Explain the meaning of the terms "offer", "consideration" and "Free consent" with suitable example. Illustrate with example how an offer can be made, accepted and revoked. (8 \frac{1}{3})

6. (a) Define the term Negotiable Instrument and highlight its essential features. Give examples of various types of negotiable instruments used in trade and business. (10)
(b) Define Promissory Note and show how it differs from Bill of Exchange. (8)
(c) List down the various grounds under which a cheque may be dishonoured. (5 \frac{1}{3})

7. (a) Define and classify "Company" as per Companies Act 1994. (10)
(b) Mention any five points of difference between Limited Company and Partnership. (5 \frac{1}{3})
(c) What do you understand by Articles of Association? Give a short list of its contents. (8)

8. (a) Define Partnership as per Partnership Act, 1932 and explain its essential features. (15)
(b) Briefly describe the provisions regarding registration of a partnership firm. What are the disabilities of an unregistered firm? (8 \frac{1}{3})
SECTION - A
There are FOUR questions in this section. Answer any THREE.

1. (a) Explain the factors of nationality. (11½)
   (b) Distinguish between 'De Facto' and 'De Jure' sovereignty. (12)

2. (a) Discuss in brief the merits and demerits of democracy. (11½)
   (b) Explain the role of opposition political party in a parliamentary democracy. (12)

3. (a) Illustrate the meaning of 'Independence of Judiciary'. (7)
   (b) Write on the relation between rights and duties. (8)
   (c) Classify modern form of government with relevant examples. (8½)

4. Write short notes on any three of the following: (23½)
   (a) Federal Government
   (b) Theory of Surplus Value
   (c) Nature of Dictatorship
   (d) Internationalism.

SECTION - B
There are FOUR questions in this section. Answer any THREE.

5. (a) Explain the agenda for good governance. (11½)
   (b) Define bureaucracy. Why has bureaucracy overdeveloped in third world countries? (12)

6. (a) Explain the salient features of Bangladesh constitution. (11½)
   (b) Analyze the functions of Paurushova's as an urban local government in Bangladesh. (12)

7. (a) Discuss the principles of the foreign policy of Bangladesh. (11½)
   (b) Critically evaluate the role of United Nations in ensuring world peace. (12)

8. (a) Discuss the importance of Language Movement of 1952. (11½)
   (b) Describe the impact of 1970 election on the emergence of Bangladesh. (12)