

# NATIONAL INSTITUTE OF TECHNOLOGY, DELHI

## MID-SEMESTER EXAMINATION

B. Tech (3rd Year): Semester-1 (2023)  
Course Name: Engineering Economics and Accountancy  
Time: 1 hour 30 minutes

Course Code: HML351  
Date: 10.10.2023 (Tuesday)  
Max. Marks: 25

Instructions: (1) Question no.1 is compulsory for all

(2) Attempt any four out of the five questions from Question No. 2-6.

(3) Each question carries 5 marks.

(4) There are six questions in all.

(5) Use of Scientific/ normal calculator is allowed.

1. (a) What is the relationship between the effective and nominal rate of interest?

(b) State whether the following statements are True or False.

(1) If the discount rate decreases, the present value of a given future amount decreases.

(2) The present value interest factor for a dollar on hand today is 0.

(c) A person deposits a sum of Rs. 1,00,000 in a bank for his son's education who will be admitted to an engineering course after 6 years. The bank pays 10% interest rate, compounded annually. Find the future amount (value) of the deposited money when admitting his son in the engineering course. [Note: Value of  $(1.10)^6 = 1.7715$ ]

(1+2+2)

2. A rental company spent \$2500 on a new air compressor 7 years ago. The annual rental income from the compressor has been \$750. The \$100 spent on maintenance the first year has increased each year by \$25. The company plans to sell the compressor at the end of next year for \$150. Construct the cash flow diagram from the company's perspective and indicate where the present worth now is located. (5)

3. What do you mean by Capital budgeting? What key factors need to be considered essential before the investment appraisal process is taken up in financial management?(5)

4.(a)Aroop is looking forward to his retirement in 2024. He wants to invest some money so that he can earn Rs.20,000 per annum for the next 10 years. If the rate of interest is 10% compounded annually, what is the amount of the current investment? [Value of compounding factor in this case at 10% interest rate for the next 10 years is 6.145]

(b)Support the numerical with a proper cash flow diagram of the situation.

(c) What is the fundamental difference between annuity due and regular annuity?

**(3+1+1)**

5.Walmart company has an investment opportunity in India costing Rs. 30,000 with the following expected net cash flow (i.e., after taxes);

<b>Year</b>	<b>Net Cash Flow</b>
1	4,000
2	4,000
3	4,000
4	4,000
5	4,000
6	7,000
7	9,000
8	12,000
9	9,000
10	2,000

Using a 10% as the cost of capital (rate of discount), determine the following:

(a) Net Present value of the investment

(b) Profitability index(5)

6. (a) Mention the cases where the net present value (NPV) and internal rate of return (IRR) approaches are similar and differ in their decision criteria.

(b)A company will purchase either Machine Xor Machine Y. Following are the information regarding the two. The estimated life of both the machine is five years with no salvage value.

	Cost (in Rs.)	Anticipated cash flows after tax per year				
		Year 1	Year 2	Year 3	Year 4	Year 5
Machine X	17,18,750	1,50,000	1,80,000	13,75,000	9,62,500	4,12,000
Machine Y	27,50,000	6,78,500	9,62,500	11,00,000	11,68,750	5,50,000

You are required to advise the management as to which one should be procured using the IRR method of project appraisal. The lower rate of discount is 12% while the higher discount rate is 14% for both the machines.

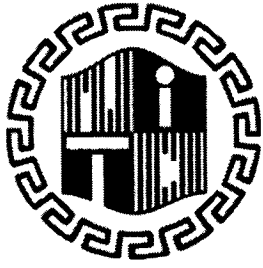
(5)

PRESENT VALUE TABLE

$r$ = interest rate; $n$ = number of periods until payment or receipt. ( $n$ )	Interest rates ( $r$ )									
	1%	2%	3%	4%	5%	6%	7%	8%	9%	10%
1	0.990	0.980	0.971	0.962	0.952	0.943	0.935	0.926	0.917	0.909
2	0.980	0.961	0.943	0.925	0.907	0.890	0.873	0.857	0.842	0.826
3	0.971	0.942	0.915	0.889	0.864	0.840	0.816	0.794	0.772	0.751
4	0.961	0.924	0.888	0.855	0.823	0.792	0.763	0.735	0.708	0.683
5	0.951	0.906	0.863	0.822	0.784	0.747	0.713	0.681	0.650	0.621
6	0.942	0.888	0.837	0.790	0.746	0.705	0.666	0.630	0.596	0.564
7	0.933	0.871	0.813	0.760	0.711	0.665	0.623	0.583	0.547	0.513
8	0.923	0.853	0.789	0.731	0.677	0.627	0.582	0.540	0.502	0.467
9	0.914	0.837	0.766	0.703	0.645	0.592	0.544	0.500	0.460	0.424
10	0.905	0.820	0.744	0.676	0.614	0.558	0.508	0.463	0.422	0.386
11	0.896	0.804	0.722	0.650	0.585	0.527	0.475	0.429	0.388	0.350
12	0.887	0.788	0.701	0.625	0.557	0.497	0.444	0.397	0.356	0.319
13	0.879	0.773	0.681	0.601	0.530	0.469	0.415	0.368	0.326	0.290
14	0.870	0.758	0.661	0.577	0.505	0.442	0.388	0.340	0.299	0.263
15	0.861	0.743	0.642	0.555	0.481	0.417	0.362	0.315	0.275	0.239
16	0.853	0.728	0.623	0.534	0.458	0.394	0.339	0.292	0.252	0.218
17	0.844	0.714	0.605	0.513	0.436	0.371	0.317	0.270	0.231	0.198
18	0.836	0.700	0.587	0.494	0.416	0.350	0.296	0.250	0.212	0.180
19	0.828	0.686	0.570	0.475	0.396	0.331	0.277	0.232	0.194	0.164
20	0.820	0.673	0.554	0.456	0.377	0.312	0.258	0.215	0.178	0.149

$r$ = interest rate; $n$ = number of periods until payment or receipt. ( $n$ )	Interest rates ( $r$ )									
	11%	12%	13%	14%	15%	16%	17%	18%	19%	20%
1	0.901	0.893	0.885	0.877	0.870	0.862	0.855	0.847	0.840	0.833
2	0.812	0.797	0.783	0.769	0.756	0.743	0.731	0.718	0.706	0.694
3	0.731	0.712	0.693	0.675	0.658	0.641	0.624	0.609	0.593	0.579
4	0.659	0.636	0.613	0.592	0.572	0.552	0.534	0.516	0.499	0.482
5	0.593	0.567	0.543	0.519	0.497	0.476	0.456	0.437	0.419	0.402
6	0.535	0.507	0.480	0.456	0.432	0.410	0.390	0.370	0.352	0.335
7	0.482	0.452	0.425	0.400	0.376	0.354	0.333	0.314	0.296	0.279
8	0.434	0.404	0.376	0.351	0.327	0.305	0.285	0.266	0.249	0.233
9	0.391	0.361	0.333	0.308	0.284	0.263	0.243	0.225	0.209	0.194
10	0.352	0.322	0.295	0.270	0.247	0.227	0.208	0.191	0.176	0.162
11	0.317	0.287	0.261	0.237	0.215	0.195	0.178	0.162	0.148	0.135
12	0.286	0.257	0.231	0.208	0.187	0.168	0.152	0.137	0.124	0.112
13	0.258	0.229	0.204	0.182	0.163	0.145	0.130	0.116	0.104	0.093
14	0.232	0.205	0.181	0.160	0.141	0.125	0.111	0.099	0.088	0.078
15	0.209	0.183	0.160	0.140	0.123	0.108	0.095	0.084	0.079	0.065
16	0.188	0.163	0.141	0.123	0.107	0.093	0.081	0.071	0.062	0.054
17	0.170	0.146	0.125	0.108	0.093	0.080	0.069	0.060	0.052	0.045
18	0.153	0.130	0.111	0.095	0.081	0.069	0.059	0.051	0.044	0.038
19	0.138	0.116	0.098	0.083	0.070	0.060	0.051	0.043	0.037	0.031
20	0.124	0.104	0.087	0.073	0.061	0.051	0.043	0.037	0.031	0.026

CUMULATIVE DISCOUNT FACTOR (CDF) TABLE



राष्ट्रीय प्रौद्योगिकी संस्थान दिल्ली

NATIONAL INSTITUTE OF TECHNOLOGY DELHI

(शिक्षामंत्रालय, भारत सरकार के अधीन एक स्वायत्त संस्थान)

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Autumn Semester AY 2023-24

Department of Computer Science and Engineering

Mid Semester Examination

October 09, 2023 (10:00 – 11:30 AM)

Degree	B. Tech.	Branch	CSE
Semester	V		
Subject Code & Name	CSL 363 – Graph Theory and Combinatorics		
Time: 90 Minutes	Answer All Questions		Maximum: 25 Marks

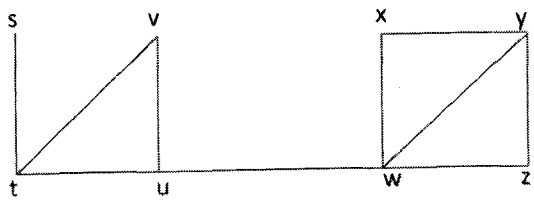
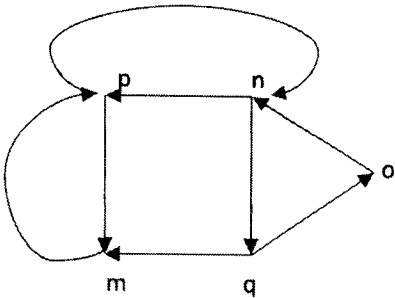
Q. No.	Questions	Marks	BL	CO
1.a	What is a <i>Residual Graph</i> ? How is it formed?	2 (1+1)	L2	CO3
1.b	Construct and analyze a <i>Simple Graph</i> for $x=4$ vertices where each vertex possesses maximum possible degree. A proper explanation is required.	3 (1+2)	L4	CO3
2.a	What are the differences between a Cycle and Circuit in a graph? Out of these two, which one is having a closer real-world applicability?	2 (1+1)	L2	CO5
2.b	Demonstrate and analyze the methodology to find connected components of a Graph with proper algorithm and explanation. Also discuss the application perspective of connected components.	3 (1+1+1)	L4	CO5
3.a	Demonstrate the role of <i>One-to-one Correspondence</i> in preserving incidence relationship in <i>Isomorphism</i> ?	2	L2	CO3
3.b	For the given undirected graph $G$ , as shown in Fig. 1, number of cut vertices are $m$ and number of cut edges are $n$ . Determine the value $m^n$ . A proper explanation is required.  	3	L3	CO3

Fig. 1: Graph  $G$  for Q. No. 3.b

4.a	What is a Pseudograph? Explain, how does it contribute to the wider application perspective of Graph Theory?	2 (1+1)	L2	CO3
4.b	<p>Analyze the given graph <math>X</math>, as shown in Fig. 2, to identify the directed walk(s) and directed cycle(s). Also, explain their properties.</p>  <p style="text-align: center;">Fig. 2: Graph <math>X</math> for Q. No. 4.b</p>	3 (1+1+1)	L4	CO5
5.a	<p>Analyze the following statement and justify, why does the cardinality of the given sets define as such?</p> <p><i>“An undirected graph <math>G</math> consists of a nonempty set <math>V</math> of vertices and a set <math>E</math> of edges”</i></p>	2	L4, L5	CO3
5.b	Apply the concept of <i>Incidence Matrix</i> to discuss a real-world scenario to represent and use information for solving a problem. Also, explain how does it augment adjacency matrix-based information?	3 (2+1)	L3	CO5

\*\*\*\*\*Good Luck\*\*\*\*\*

# National Institute of Technology, Delhi

Name of the Examination: Mid-Semester (Autumn Semester 2023)

Branch : B. Tech. (CSE, Minor Degree)

Semester : V

Title of the Course : Digital Image Processing

Course Code : CSBB 313

Time: 1:30 Hours

Maximum Marks: 25

**Note:** Attempt *all* sections. Be precise in your answer.

Assume any missing data. Marks are mentioned on the right side.

S. No.	Questions	Marks	CO	BL	PO
1.	Explain with examples that the perceived brightness is not a simple function of intensity. Also, write the distinctive properties of the photoreceptors of human eyes.	4	CO1	L2	PO1
2.	<p>You are hired to design the front end of an imaging system for studying the boundary shapes of cells, bacteria, viruses, and protein. The front end consists, in this case, of the illumination source(s) and corresponding imaging camera(s). The diameters of circles required to enclose individual specimens in each of these categories are 50, 1, 0.1, and 0.01 micro meter, respectively.</p> <p>(a) Can you solve the imaging aspects of this problem with a single sensor and camera? If your answer is yes, specify the illumination wavelength band and the type of camera needed. Identify the camera as being a color camera, far-infrared camera, or whatever appropriate name corresponds to the illumination source.</p> <p>(b) If your answer in (a) is no, what type of illumination sources and corresponding imaging sensors would you recommend? Specify the light sources and cameras as requested in part (a). Use the minimum number of illumination sources and cameras needed to solve the problem.</p>	4	CO3	L4	PO6

3.	Explain the conversion process of photons into digital image. A CCD camera chip of dimensions 7×7 mm, and having 1024×1024 elements, is focused on a square, flat area, located 0.5 m away. How many line pairs per mm will this camera be able to resolve? The camera is equipped with a 35-mm lens.	4	CO2	L2	PO3																		
4.	<p>Consider the image segment shown in Fig. 1:</p> <p>(a) Let <math>V=\{0, 1\}</math> and compute the lengths of the shortest 4-, 8-, and m-path between p and q. If a particular path does not exist between these two points, explain why.</p> <p>(b) Repeat for <math>V=\{1, 2\}</math>.</p> <div style="text-align: center;"> <p>3   1   2   1 (q)</p> <p>2   2   0   2</p> <p>1   2   1   1</p> <p>(p)1   0   1   2</p> </div> <p>Fig.1. Image</p>	4	CO2	L1	PO3																		
5.	<p>Compute Histogram equalization on the following 8 × 8 image. The gray level distribution of the image is given below:</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td>Gray Level (<math>r_k</math>)</td> <td>0</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td> </tr> <tr> <td>No. of Pixels (<math>n_k</math>)</td> <td>8</td><td>10</td><td>10</td><td>2</td><td>12</td><td>16</td><td>4</td><td>2</td> </tr> </table>	Gray Level ( $r_k$ )	0	1	2	3	4	5	6	7	No. of Pixels ( $n_k$ )	8	10	10	2	12	16	4	2	6	CO3	L3	PO6
Gray Level ( $r_k$ )	0	1	2	3	4	5	6	7															
No. of Pixels ( $n_k$ )	8	10	10	2	12	16	4	2															
6.	<p>Write a short note on the following:</p> <p>(a) Order statistic filter</p> <p>(b) Isotropic filter for image sharpening</p>	2	CO1	L1	PO1																		



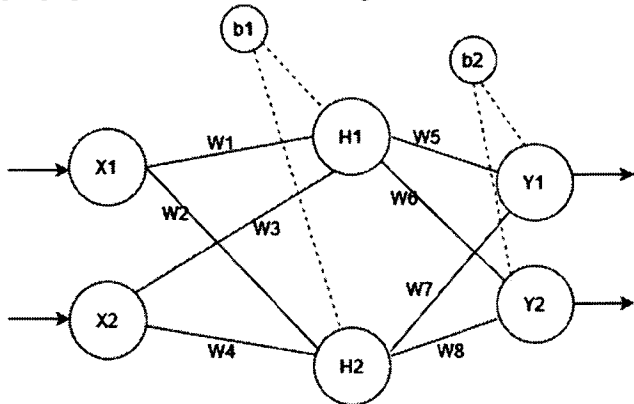
Roll No.:.....

# National Institute of Technology, Delhi

Mid Semester Examination (Autumn Semester 2023)

Branch : CSE, B.Tech (minor)  
Semester : 3<sup>rd</sup> year, V Sem  
Title of the Course : Machine Learning

Maximum Marks : 25  
Time : 1.5 Hours  
Course Code : CSBB 311

Q. No	Questions	Marks	CO	BL	P0
1 (a)	What is machine learning? Discuss the relation between machine Learning, Deep Learning, Artificial Neural Network.	2	CO1	L1	2
1 (b)	What do you mean by Supervised and Unsupervised learning? Explain with suitable examples.	2	CO1	L1	2
2 (a)	<p>The Artificial Neural Network shown in the figure consist of two inputs, <math>X1 = 0.5</math> and <math>X2 = 0.10</math> and two output <math>Y1</math> (Target <math>T1 = 0.02</math>) and <math>Y2</math> (Target <math>T2 = 0.89</math>). <math>H1</math> and <math>H2</math> are hidden layer neurons. <math>W_i</math> denotes the weight, <math>b1</math> and <math>b2</math> presents bias. The weights value is given below:  <math>W1=0.15</math>, <math>w2=0.20</math>, <math>w3 = 0.25</math>, <math>w4=0.30</math>, <math>w5=0.40</math>, <math>w6=0.46</math>, <math>w7=0.5</math> and <math>w8=0.55</math>, <math>b1=0.35</math> and <math>b2=0.60</math>            Using feed forward method find the error value considering Sigmoid as an activation function. Update weight 'w5' only using backpropagation method considering <math>\eta = 0.01</math>.</p> 	4	CO2	L2	3
2 (b)	Explain bias-variance trade-off in the context of model fitting using visual representations.	2	CO2	L2	3

3 (a)	<p>Calculate the information gain of Outlook, Temp, Humidity and Wind and discuss which feature should be selected as a root node of decision tree and why?</p> <table><tr><td>Day</td><td>Outlook</td><td>Temp</td><td>Humidity</td><td>Wind</td><td>Tennis?</td></tr><tr><td>D1</td><td>Sunny</td><td>Hot</td><td>High</td><td>Weak</td><td>No</td></tr><tr><td>D2</td><td>Sunny</td><td>Hot</td><td>High</td><td>Strong</td><td>No</td></tr><tr><td>D3</td><td>Overcast</td><td>Hot</td><td>High</td><td>Weak</td><td>Yes</td></tr><tr><td>D4</td><td>Rain</td><td>Mild</td><td>High</td><td>Weak</td><td>Yes</td></tr><tr><td>D5</td><td>Rain</td><td>Cool</td><td>Normal</td><td>Weak</td><td>Yes</td></tr><tr><td>D6</td><td>Rain</td><td>Cool</td><td>Normal</td><td>Strong</td><td>No</td></tr><tr><td>D7</td><td>Overcast</td><td>Cool</td><td>Normal</td><td>Strong</td><td>Yes</td></tr><tr><td>D8</td><td>Sunny</td><td>Mild</td><td>High</td><td>Weak</td><td>No</td></tr><tr><td>D9</td><td>Sunny</td><td>Cool</td><td>Normal</td><td>Weak</td><td>Yes</td></tr><tr><td>D10</td><td>Rain</td><td>Mild</td><td>Normal</td><td>Weak</td><td>Yes</td></tr><tr><td>D11</td><td>Sunny</td><td>Mild</td><td>Normal</td><td>Strong</td><td>Yes</td></tr><tr><td>D12</td><td>Overcast</td><td>Mild</td><td>High</td><td>Strong</td><td>Yes</td></tr><tr><td>D13</td><td>Overcast</td><td>Hot</td><td>Normal</td><td>Weak</td><td>Yes</td></tr><tr><td>D14</td><td>Rain</td><td>Mild</td><td>High</td><td>Strong</td><td>No</td></tr></table>	Day	Outlook	Temp	Humidity	Wind	Tennis?	D1	Sunny	Hot	High	Weak	No	D2	Sunny	Hot	High	Strong	No	D3	Overcast	Hot	High	Weak	Yes	D4	Rain	Mild	High	Weak	Yes	D5	Rain	Cool	Normal	Weak	Yes	D6	Rain	Cool	Normal	Strong	No	D7	Overcast	Cool	Normal	Strong	Yes	D8	Sunny	Mild	High	Weak	No	D9	Sunny	Cool	Normal	Weak	Yes	D10	Rain	Mild	Normal	Weak	Yes	D11	Sunny	Mild	Normal	Strong	Yes	D12	Overcast	Mild	High	Strong	Yes	D13	Overcast	Hot	Normal	Weak	Yes	D14	Rain	Mild	High	Strong	No	4	CO3	L3	3
Day	Outlook	Temp	Humidity	Wind	Tennis?																																																																																										
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D14	Rain	Mild	High	Strong	No																																																																																										
3(b)	Explain the difference between L1 and L2 Regularization in Linear regression and when each should be used.	2	CO2	L2	2																																																																																										
4 (a)	What do you mean by the vanishing gradient problem? How it occurs during backpropagation in an artificial neural network (ANN). Support your answer with the help of mathematical expressions if required.	2	CO2	L2	2																																																																																										
4 (b)	What is Bayes theorem? Discuss are the pros and cons of the Naive Bayes?	2	CO3	L2	2																																																																																										
5 (a)	<p>Perform KNN Classification on the following training instances (see table), each having two attributes (<math>X_1</math> and <math>X_2</math>). Compute the class label for the test instance <math>t1 = (3,7)</math> with <math>K=3</math> using Euclidean distance.</p> <table><tr><td>Training Instances</td><td><math>X_1</math></td><td><math>X_2</math></td><td>Output</td></tr><tr><td>I1</td><td>7</td><td>7</td><td>0</td></tr><tr><td>I2</td><td>7</td><td>4</td><td>0</td></tr><tr><td>I3</td><td>3</td><td>4</td><td>1</td></tr><tr><td>I4</td><td>1</td><td>4</td><td>1</td></tr></table>	Training Instances	$X_1$	$X_2$	Output	I1	7	7	0	I2	7	4	0	I3	3	4	1	I4	1	4	1	3	CO2	L3	3																																																																						
Training Instances	$X_1$	$X_2$	Output																																																																																												
I1	7	7	0																																																																																												
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I3	3	4	1																																																																																												
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5 (b)	The probability of Fires is rare (1%) but smoke is fairly common (10%) and 90% of dangerous fires makes smoke. Find the probability of dangerous fire when there is smoke using Bayes theorem.	2	CO2	L2	2																																																																																										

# National Institute of Technology, Delhi

Name of the Examination: B. Tech

Branch : CSE

Semester : V

Title of the Course : Operating System

Course Code : CSBB 302

Time: 1.5 Hours

Maximum Marks: 25

Note : Please attempt all

questions

Q. No.	Questions	Marks	CO	BL	PO	PI Code														
1	<p>Consider the modification of the Reader/Writer Problem by considering the following scenario: let us assume a single changing room in a department store. The changing room can be used by men or women. However, if a women is inside of the changing room, only another women can enter the changing room, and any man must wait for the changing room until no women is inside of the changing room. The same applies for men. It means, if a man is inside of the changing room, only another man can enter the changing room, and women have to wait until all men leave the changing room.</p> <p>Write the pseudo code using the semaphores for the "women" process and for the "man" process. You can use semaphores.</p>	3	CO1	L1	1															
2	<p>Here is a table of processes and their associated running times. All of the processes arrive in numerical order at time 0.</p> <table border="1" style="margin-left: 40px;"> <tr> <td>Process ID</td><td>P1</td><td>P2</td><td>P3</td><td>P4</td><td>P5</td><td>P6</td></tr> <tr> <td>CPU Running Time</td><td>2</td><td>6</td><td>1</td><td>4</td><td>3</td><td>8</td></tr> </table> <p>Show the scheduling order for these processes under 3 policies: First Come First Serve (FCFS), Shortest-Remaining- Time- First(SRTF), Round- Robin(RR) with times lice quantum = 1</p>	Process ID	P1	P2	P3	P4	P5	P6	CPU Running Time	2	6	1	4	3	8	4	CO1	L1	1	
Process ID	P1	P2	P3	P4	P5	P6														
CPU Running Time	2	6	1	4	3	8														
3	<p>Jobs A and B are completely CPU- bound processes. Job C requires 1 unit of CPU followed by 4 time units of I/O, in a pattern repeated thrice, followed by 1 unit of CPU (see table below). For each of the following scheduling polices, draw the Gantt chart, calculate the turnaround time for each job, and provide the total number of context switches.</p> <ol style="list-style-type: none"> <li>Round Robin with a 5-unit time quantum</li> <li>Round Robin with a 1-unit time quantum</li> <li>Shortest Remaining Processing Time first SRPT (job size is next contiguous CPU burst; 1-unit time quantum)</li> <li>From the given workload, which of the above scheduling policies maximize(s) CPU utilization (there might be more than one)?</li> <li>From the given workload, which of the above scheduling policies is most suited for interactive</li> </ol>	6	CO1	L1	1															

	<p>jobs? If there is more than one, explain the primary advantage of using one over the other.</p> <p>You can ignore the context switching overhead in your calculations. For Round Robin, you can assume that the order in the ready queue is A, B, C. For each job sequence, C stands for CPU and I stands for I/O.</p> <table><tr><th>Job ID</th><th>Arrival</th><th>Execution pattern</th><th>Length</th></tr><tr><td>A</td><td>0</td><td>CCCCCCCCCCCC</td><td>10</td></tr><tr><td>B</td><td>1</td><td>CCCCCCCCCCCC</td><td>11</td></tr><tr><td>C</td><td>2</td><td>CIHICIHICIHIC</td><td>16</td></tr></table> <p>As an example, the beginning of a FIFO scheduling policy (without preemption) would look like: AAAAAAAAAABBBBBBBBBBBBCxxxxCxxxxCxxxxC</p> <p>Where x represents an idle CPU. Note that in this example, job A began at time 0 and finished at time 10. A job that Arrives at time 1 can begin at time 1.</p>	Job ID	Arrival	Execution pattern	Length	A	0	CCCCCCCCCCCC	10	B	1	CCCCCCCCCCCC	11	C	2	CIHICIHICIHIC	16							
Job ID	Arrival	Execution pattern	Length																					
A	0	CCCCCCCCCCCC	10																					
B	1	CCCCCCCCCCCC	11																					
C	2	CIHICIHICIHIC	16																					
4	<p>Consider a multilevel feedback queue scheduler with three queues, number 0 to 2. The scheduler first executes all Processes in queue 0. Only when queue 0 is empty will it execute processes in queue 1. Similarly, processes in queue 2 will only be executed if queue 0 and 1 are empty. A process that arrive for queue 1 will preempt a process in queue 2. A process in queue 1 will be turn be preempted by a processes arriving for queue2. A process entering the ready queue is put in queue 0. A process in queue 0 is given a time quantum of 4 milliseconds. If it does not finish within this unit, it is moved to the tail of the queue1. If queue 0 is empty, the process at the head o fthe queue 1 is given of 8 Milliseconds. If it does not complete, it is preempted and is put in queue 2. Processes in queue 2 are run onn an FCFS basis only when queue 0 and 1 are empty.</p> <p>Suppose that the following processes arrive for executing at the times indicated (numbers are in milliseconds).</p> <table><tr><th>Process</th><th>Arrival Time</th><th>Burst Time</th></tr><tr><td>P1</td><td>0</td><td>16</td></tr><tr><td>P2</td><td>14</td><td>6</td></tr><tr><td>P3</td><td>19</td><td>3</td></tr><tr><td>P4</td><td>20</td><td>1</td></tr><tr><td>P5</td><td>21</td><td>14</td></tr></table> <p>(i). Draw a gantt chart illustrating their execution. (ii). Compute the average waiting time.</p>	Process	Arrival Time	Burst Time	P1	0	16	P2	14	6	P3	19	3	P4	20	1	P5	21	14	6	CO2	L2	1	
Process	Arrival Time	Burst Time																						
P1	0	16																						
P2	14	6																						
P3	19	3																						
P4	20	1																						
P5	21	14																						
5	<p>Raman has just invented a new scheduling algorithm that he claims gives the highest priority to processes that have just entered the system. But he is fair to all processes. The algorithm work like this: There are two queues, one for new process and one for old processes. When a process enters the system, it is put at the end of new queue. After 2 milliseconds on the new queue, whether a process has been scheduled or not. It is moved to the end of the old queue. When it is time to schedule a process, the system schedules the process at the head of one of the queues. Alternating between the two queues. Each process runs to completion before the next process is scheduled. Assume that processes enter the system at random times and that most processes take much longer than 2 milliseconds to execute.</p>	6	CO2	L2	2																			

	<p>(i). Dose this algorithm give the highest priority to new processes? Explain your answer. (maximum 25 words)</p> <p>(ii). Is this algorithm starvation free? Explain your answer. (maximum 25 words)</p> <p>(iii). Discuss weather this algorithm is fair to all processes. By "fair" we mean every process has a wait time approximately equal to the average wait time, assuming all processes have close to the same execution time. (maximum 25 words)</p>						
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Roll No.: .....

# National Institute of Technology, Delhi

Name of the Examination: B.Tech.

Mid Semester Examination (Autumn, 2023)

Branch : CSE

Semester : 5<sup>th</sup>

Title of the Course : Computer Networks

Course Code : CSB 304

Time: 1 Hour 30 Minutes

Maximum Marks: 25

Note: All questions are compulsory.

COURSE OUTCOMES		COGNITIVE LEVELS
CO1	To Understand role of various layers of ISO/OSI model and various data communication techniques.	Understanding (Level II)
CO2	To Understand the basic MAC protocols and various design issues related to Data Link Layer.	Understanding (Level II)

Course Outcomes(CO's)	CO1	CO2
Questions No.	Q1, Q2, Q3, Q5	Q4, Q6, Q7 & Q8

Answer the following questions.

- Q1.** For  $n$  devices in a network, what is the number of cable links required for a mesh, ring, bus, and star topology? [2 Marks]
- Q2.** An Image is  $1600 \times 1200$  pixels with 24-bits/pixel. Assume the image is uncompressed. How long does it take to transmit it over a 56-kbps modem channel? [3 Marks]  
a) Over a 1-Mbps cable modem? b) Over a 10-Mbps Ethernet? c) Over 100-Mbps Ethernet?
- Q3.** Find the maximum possible data rate through a 3000 Hz bandwidth link: [4 Marks]  
a) If link is assumed to be noiseless with two signal levels transmission  
b) If the link is assumed to be noisy with signal-to-noise ratio as 1023.  
Give the Comments on the Data rates difference obtained in a) and b).
- Q4.** What is the significance of Bandwidth-Delay Product parameter in computing the utilization of a Node to Node Link? [2 Marks]
- Q5.** Describe a suitable technique to increase the bandwidth utilization of a link. Assume that the link is used to carry only digital signals. [4 Marks]
- Q6.** What is the role of Data Link Control sub-layer in Data Communication? [3 Marks]

- Q7. Illustrate using a suitable example that how *Go Back N ARQ* Protocol is superior to *Stop and Wait ARQ*. [5 Marks]
- Q8. In the Fig.1 below original bytes sequences are given. Give the byte sequence after doing Byte stuffing process during framing in data link layer. [2 Marks]

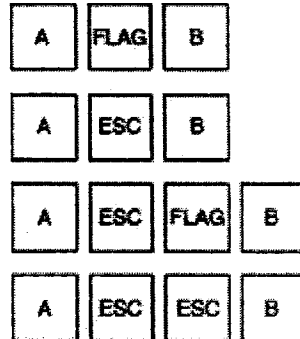


Fig.1 Original Byte Sequences as Payload

\*\*\*\*\*All the Best\*\*\*\*\*

# National Institute of Technology, Delhi

Name of the Examination: B.Tech Third Year (AY 2023-2024)

Mid Semester Examination

Branch :CSE

Semester : V

Title of the Course :Computer Organization

Course Code :CSB301

Time: 1.5 Hours

Maximum Marks: 25

Note: 1. The Question1 is mandatory. (1 Marks)

2. Attempt **ANY TWELVE** questions from question number 2 to 16. (2 Marks each)

Que No	Question	MARKS	CO	PO	BL
1	Why it is necessary to amend the <b>ARCHITECTURE</b> of computer system time to time?	1	1,2	1	1-5
2	Given the Boolean function $F=xy'z+x'y'z+xyz$ a) Draw the logic diagram using original Boolean function. b) Simplify the expression using Boolean algebra and draw the logic diagram from the simplified expression. c) Compare total number of gates with the diagram of part (a).	2	2,3	2	1-5
3	Design a combinational circuit with three inputs x, y and z and three output A, B, C. When the binary input is 0, 1, 2 or 3, the binary output is one greater than the input. When the binary input is 4, 5, 6 or 7 the binary output is one less than the input.	2	2,3	2	1-5
4	Represent decimal number 8620 in a) excess-3 code and b) 2421 code	2	2,3	2	1-5
5	Show the value of all bits of a 12-bit register that hold the number equivalent to 215 in BCD.	2	2,3	2	1-5
6	Design a 4-bit combinational circuit decrementer using four full adder circuit.	2	2,3	2	1-5
7	<b>Assume</b> that the 4-bit arithmetic circuit is enclosed in one IC package. Show the connections among two such ICs to form an 8-bit arithmetic circuit.	2	2,3	2	1-5



8	<p>The 8-bit registers AR, BR, CR and DR initially having the following values:</p> <p>AR=11110010 BR=11111111 CR=10111001 DR=11101010</p> <p>Determine the 8- bit values in each register after the execution of the following sequence of microoperations:</p> <p><math>AR \leftarrow AR + BR</math>  <math>CR \leftarrow CR \wedge DR, BR \leftarrow BR + 1</math>  <math>AR \leftarrow AR - CR</math></p>	2	2,3	2	1-5
9	Starting from an initial value 11011101, determine the sequence of binary values in Register R after a logical shift-left, followed by a circular shift-right, followed by a logical shift-right and a circular shift-left.	2	2,3	2	1-5
10	Represent the number $(+46.5)_{10}$ as a floating-point binary number with 24 bits. The normalized fraction mantissa has 16 bits, and the exponent has 8 bits.	2	2,3	2	1-5
11	Write a symbolic program to add 100 numbers. Add comment line to each instruction.	2	2,3	2	1-5
12	Write a set of microinstructions to compare two words.	2	2,3	2	1-5
13	Derive an algorithm in flowchart form for adding and subtracting two fixed point binary numbers when negative numbers are in signed -1's complement representation.	2	2,3	2	1-5
14	Show the contents of registers E, A, Q and SC during the process of multiplication of two binary numbers, 11111(multiplicand) and 10101 (multiplier). The signs are not included.	2	2,3	2	1-5
15	Why should the sign of the remainder after a division be the same as the sign of the dividend?	2	2,3	2	1-5
16	Explain the different types of printers you had seen visually in your surroundings. Explain the advantages and disadvantages of the same. Try to list the specifications and operational details. Visualize the same, if possible.	2	2,3	2	1-5