

Program: B. Sc. TE 2-Yr 3rd Sem.
Semester: Winter

Date: September 30, 2022 (Friday)
Time: 02:30 pm – 04:00 pm

ISLAMIC UNIVERSITY OF TECHNOLOGY (IUT)
ORGANISATION OF ISLAMIC COOPERATION (OIC)
DEPARTMENT OF TECHNICAL AND VOCATIONAL EDUCATION (TVE)

Exam: Mid Semester Examination

Academic year: 2021 - 2022

Course Number: TVE 4117

Full Marks: 75

Course Title: Curriculum Development, Administration & Supervision of Technical and Vocational Education.

Duration: 90 minutes

There are **4 (four)** questions. Answer any **3 (three)**

1. a) Differentiate between *formal*, *informal* and *hidden* curriculum. (5+5+5+10)
 b) Who are the stakeholders in the curriculum development process? (CO1)
 c) What are advantages of a common curriculum used by different schools?
 d) Explain one of the models of curriculum development with a diagram.

2. a) Which philosophical stance (Perennialism, Essentialism or Progressivism) will you consider when planning for a curriculum of a diploma engineering program (3 or 4 year) in your country? (10+7+8) (CO2)
 b) How can you adapt TPACK within a model of Curriculum practice? Explain with an example.
 c) What is *curriculum alignment* and why *curriculum alignment* is important for curriculum implementation?

3. a) Explain with a diagram - the three-way-relationship during curriculum implementation. (7+8+10) (CO1, CO4)
 b) Why do teachers need to consider *misconceptions* and *cultural background* to facilitate learning for all students?
 c) What are the main three purposes of instructional objectives? Explain the relationship between learning experience and learning outcome with a schematic diagram.

4. Study the following situation: (25) (CO2)

It is the first day of classes and Brian is standing at the door of his classroom, patiently waiting to meet his new teacher and peers. As he looks inside, he marvels at the colorful posters illustrating dinosaurs and the artwork decorating the classroom walls. All of a sudden, he is startled by a screaming voice that shouts "Quiet!!!!" Brian shakes, takes a step back, and is almost about to cry when his new teacher shows up at the door to greet him. Unfortunately, the teacher's screaming continues as school days go by and now Brian feels scared about his teacher, even when she speaks softly to him.

Apply Pavlov's paradigm for studying Classical Conditioning theory to explain the above situation. Using schematic diagrams, identify the following terms when you explain the above situation in the classroom.

- (i) Neutral Stimulus (NS)
- (ii) Unconditioned stimulus (UCS)
- (iii) Unconditioned Response (UCR)
- (iv) Conditioned Stimulus (CS)
- (v) Conditioned Response (CR)

Program: DTE 1st Semester
Semester: Winter

Date: October 05, 2022 (Wednesday)
Time: 10:30 am – 12:00 pm

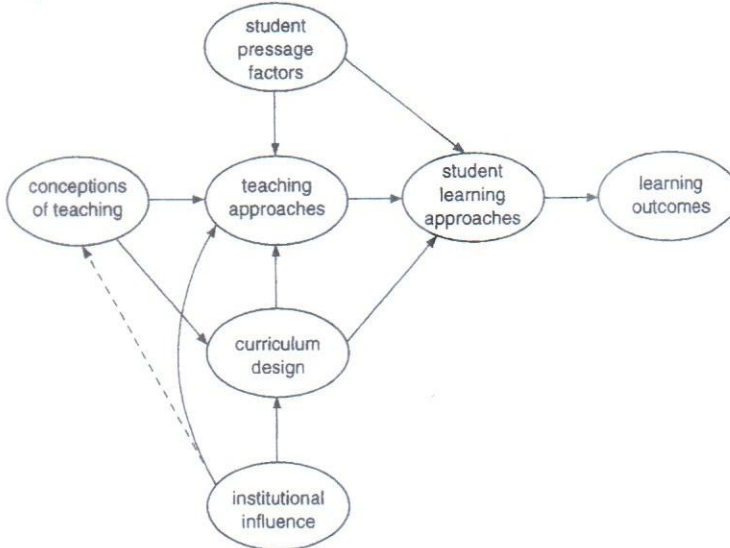
ISLAMIC UNIVERSITY OF TECHNOLOGY (IUT)
ORGANISATION OF ISLAMIC COOPERATION (OIC)
DEPARTMENT OF TECHNICAL AND VOCATIONAL EDUCATION (TVE)

Exam: Mid Semester Examination
Course Number: TVE 4125
Course Title: Methods & Techniques of Teaching

Summer Semester: 2021 - 2022
Full Marks: 75
Duration: 90 minutes

There are 4 (four) questions. Answer 3 (three) questions. Questions 1 & 4 are Compulsory. The symbols have their usual meaning.

1. a) What is learning meant to you? Describe your meaning with *two examples* related to students' learning approaches in Technical Education (TE). [CO1] 10
- b) Students learning outcome is connected to other components as shown in the diagram. Explore your own understanding in your answer script after analyzing the following diagram in relation to achieve the learning outcomes. [CO1] 15



Source: Kember (1997)

2. a) Learning is process and product oriented. Explain how learning in technical education is linked with process and product. [CO1] 10
- b) Discuss the cognitive *learning theory* on the basis of following points: [CO1] 15
 - Learning process;
 - Role of a teacher;
 - Role of a learner.
3. a) Identify three major benefits of using discussing method with examples while you will be using in face-to-face teaching. [CO2] 09
- b) “How demonstration method of teaching will work in technical education”, explain it step by step. [CO2] 16
4. a) Identify four techniques with examples to motivate students in your teaching of technical education. [CO1] 10
- b) In which context Lecture method of teaching is most suitable? Clarify your answer with example [CO2] 15

Program: DTE 1st Sem & BSc TE 1st Sem
Semester: Winter semester

Date: October 04, 2022 (Tuesday)
Time: 10:30 am to 12:00 pm

ISLAMIC UNIVERSITY OF TECHNOLOGY (IUT)
 ORGANISATION OF ISLAMIC COOPERATION (OIC)
 DEPARTMENT OF TECHNICAL AND VOCATIONAL EDUCATION (TVE)

Exam: Mid Final Examination
Course Number: Hum 4137
Course Title: Islamiyat

Academic Year: 2021 - 2022
Full Marks: 75
Duration: 90 minutes

There are 4 (four) questions. Answer 3 (three) questions. The symbols have their usual meaning.

- | | | | |
|----|--|----|------|
| 1. | a) What are the sources of shariah as Islamic code of life? | 15 | CO 1 |
| | b) What we understand by ijma? | 10 | |
| 2. | a) What is the relation between Islam and salam? | 10 | CO 1 |
| | b) What are the basic teachings of Quran? | 15 | |
| 3. | a) How Quran was preserved in the time of revelation? | 15 | CO 3 |
| | b) Why Hazrat Uthman did order to burn copies of the Quran? | 10 | |
| 4. | a) How Islam has restored the status of women as it was given by ALLAH subhanahu wa taala. | 10 | CO 4 |
| | b) How Islam has given the highest dignity for human being in every sphere of life. | 15 | |

ISLAMIC UNIVERSITY OF TECHNOLOGY (IUT)

ORGANISATION OF ISLAMIC COOPERATION (OIC)

Department of Computer Science and Engineering (CSE)

MID SEMESTER EXAMINATION

WINTER SEMESTER, 2021-2022

DURATION: 1 HOUR 30 MINUTES

FULL MARKS: 75

CSE 4175: Computer Programming

Programmable calculators are not allowed. Do not write anything on the question paper.

Answer all 3 (three) questions. Marks of each question are written in the right margin with brackets.

1. a) A set of three numbers, a , b , and c is called a Pythagorean triple if, 10
 $a^2 + b^2 = c^2$, or $b^2 + c^2 = a^2$, or $c^2 + a^2 = b^2$
 Write a program that takes three numbers as input and checks whether they are a Pythagorean triple.
- b) Write a program that will take a number n as input from the user and draw a pattern similar to the 10
 following figure. The output shown here is for $n = 5$.



Figure 1: Sample output for Question 1(b)

- c) Write the output for the following block of code: 5

```

#include<stdio.h>
int main()
{
    int i, j, a, b;
    int k = 5;
    for(i = 1, j = 1; i < 10000; j++, i *= 10)
    {
        k = k + i + j;
        for(a = i, i = 0; i < 10; i++);
        printf("%d\n", k / i*10);
        i = a;
    }
}

```

Figure 2: Code snippet for Question 1(c)

2. a) You have been assigned the task of developing a grading software to calculate the grades of the 11
 students. The software will take the mark m ($0 \leq m \leq 100$) obtained by a student as input and then print the grade of the student according to Table 1. You have also been instructed to only use switch case in the program. The use of if condition will not be accepted by the clients.

Table-1: Grade table for Question 2(a)

Grade	Marks
A	70-100
B	50-69
C	40-49
F	0-39

- b) What is a programming language? Describe different levels of programming languages with examples for each of them. 7
- c) What are the limitations of using switch instead of if statement? Explain using a suitable example. 7
3. a) Write a program that will repeatedly take positive integers as input from the user. As soon as the user enters zero or any negative integer, the program will stop taking new inputs and print how many prime numbers have been given as input thus far. A sample output of the program is given below: 12

```
Enter number: 8
Enter number: 90
Enter number: 7
Enter number: 23
Enter number: 50
Enter number: -8
Total prime numbers: 2
```

Figure 4: Sample out for Question 3(a)

- b) Write a program that takes two integers a and b as input and prints a^b . Do not use the library function `pow()` in your code. 7
- c) What is the scope of a variable? Differentiate between global and local variables with suitable examples. 6

ISLAMIC UNIVERSITY OF TECHNOLOGY (IUT)
ORGANISATION OF ISLAMIC COOPERATION (OIC)
DEPARTMENT OF MECHANICAL AND PRODUCTION ENGINEERING

Mid Semester Examination
Course Number: math 4311/4599
Course Title: Vector Analysis, Multivariable Calculus
and Complex Variables

Winter Semester: 2021 - 2022
Full Marks: 75
Time : 1.5 Hours

There are 3 (three) questions. Answer **all of them**. The symbols have their usual meanings. Marks of each question and corresponding CO and PO are written in the brackets.

1. (a) Examine whether the vectors $\mathbf{i} - 2\mathbf{j} + 3\mathbf{k}$, $5\mathbf{i} + 6\mathbf{j} - \mathbf{k}$ and $3\mathbf{i} + 2\mathbf{j} + \mathbf{k}$ form a linearly dependent set or a linearly independent set. If dependent, find a linear relation among them. [11]
[CO1, PO1]
- (b) Find the area of the parallelogram having diagonals $3\mathbf{i} + \mathbf{j} - 2\mathbf{k}$ and $\mathbf{i} - 3\mathbf{j} + 4\mathbf{k}$. [07]
[CO1, PO1]
- (c) Give the geometrical interpretation of the cross product of vectors. [07]
[CO1, PO1]
2. (a) Find the volume of the parallelepiped whose edges are represented by the vectors $\mathbf{c} \times \mathbf{a}$, $\mathbf{a} \times \mathbf{b}$ and $\mathbf{b} \times \mathbf{c}$. [12]
[CO1, PO1]
- (b) If $\mathbf{F}(x, y, z) = x^2yz\mathbf{i} - 2xz^3\mathbf{j} + xz^2\mathbf{k}$ and $\mathbf{G}(x, y, z) = 2z\mathbf{i} + y\mathbf{j} + x^2\mathbf{k}$, find $\frac{\partial^2}{\partial x \partial y}(\mathbf{F} \times \mathbf{G})$ at $(1, 0, -2)$. [13]
[CO1, PO1]
3. (a) Find the directional derivative of $\phi(x, y, z) = 4xz^3 - 3x^2y^2z$ at $(2, -1, 2)$ in the direction of the vector $2\mathbf{i} - 3\mathbf{j} + 6\mathbf{k}$. [13]
[CO1, PO1]
- (b) Find an equation for the tangent plane to the surface $2xz^2 - 3xy - 4x = 7$ at the point $(3, -1, 2)$. [12]
[CO1, PO1]

ISLAMIC UNIVERSITY OF TECHNOLOGY (IUT)
ORGANISATION OF ISLAMIC COOPERATION (OIC)
DEPARTMENT OF BUSINESS AND TECHNOLOGY MANAGEMENT

Mid-Semester Examination
Course No. : CEE 4361
Course Title : Civil and Environmental Technology I

Winter Semester, A. Y. 2021-2022
Time : 1.5 Hours
Full Marks : 75

There are 4 (Four) questions. Question no. 1 is compulsory and answer any 2 (Two) from the rest. Do not write on this question paper. The figures in the right margin indicate full marks.

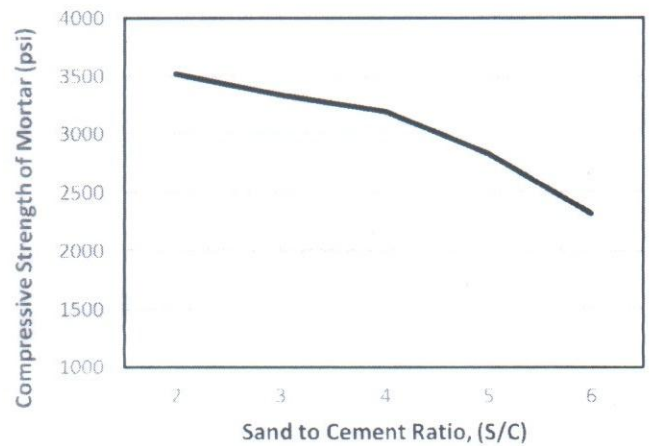
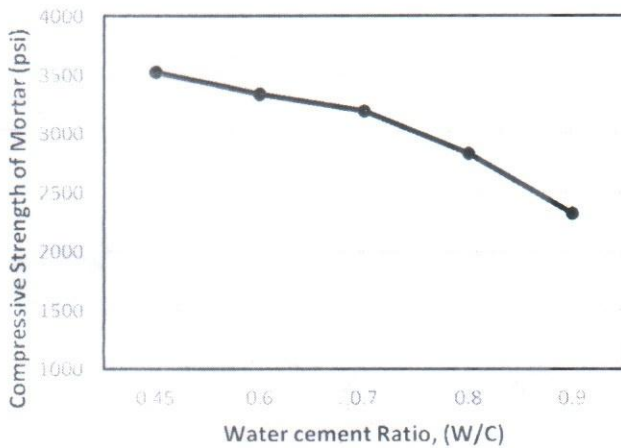
- 1. Suppose, you are in charge for supervision of an ongoing construction project where 5 inch brick wall of 25 feet long and 10 feet height will be constructed. Also, mixture proportion of mortar is necessary for plastering work. The following data are provided:
Table with 2 columns: Property, Value
(a) Mention the required properties that should be kept in mind while purchasing bricks, cement and sand for the above mentioned construction work.
(b) Calculate the total number of bricks required to be purchased for the construction work.
(c) Estimate the amount of each ingredient (in weight & volume) for a mortar of 3500 psi compressive strength necessary for plastering work of the both surfaces of the wall.
(d) Why curing is required after plastering works? Mention the probable common defects that may occur in plaster works with recommended mitigation options.
2. (a) Describe the followings: (i) Creep (ii) Modulus of Rigidity (iii) Efflorescence (iv) Hardness
(b) What is meant by grade 60 of steel? Determine the final length of a 400 mm 60 grade steel bar subjected to a tensile strength of 20.7 MPa.
(c) Draw a typical stress-strain diagram of a mild steel specimen mentioning its salient features.
3. (a) Mention the steps of brick manufacturing process. Which is the most important step to impart strength in bricks and why?
(b) Briefly discuss the 'Hydration' phases of cement.
(c) Define 'Initial Setting Time' and 'Final Setting time' of cement.

4. For Bus Rapid Transit (BRT) project a sand sample was collected from nearby market and was sent to IUT Concrete Laboratory for sieve analysis. The sieve analysis results of that sample is given below:

Sieve No.	Sieve Opening (mm)	Wt. of sand Retained (gm)
#4	4.75	0
#8	2.36	0
#16	1.19	80
#30	0.59	110
#40	0.425	68
#50	0.3	55
#100	0.15	68
#200	0.075	20
Pan	-	23.73

- (a) Calculate FM of the sample. (Up to 3rd digit of your answer) (08) [1] [1]
- (b) Draw grading curve of the sample. (08) [1] [1]
- (c) Comment on the sample based on the sieve analysis data and grading curve. (04) [1] [1]

Appendix-01



**ISLAMIC UNIVERSITY OF TECHNOLOGY (IUT)
ORGANISATION OF ISLAMIC COOPERATION (OIC)**

Department of Computer Science and Engineering (CSE)

MID SEMESTER EXAMINATION

SUMMER SEMESTER, 2021-2022

DURATION: 1 HOUR 30 MINUTES

FULL MARKS: 75

CSE 4585: Computer Networks

Programmable calculators are not allowed. Do not write anything on the question paper.

Answer all 3 (three) questions. Marks of each question and corresponding CO and PO are written in the right margin with brackets.

- | | | |
|----|---|-----------------------|
| 1. | a) By applying a suitable probabilistic model, determine the maximum achievable throughput of a slotted ALOHA network. Derive a formula to calculate the average transfer delay of a slotted ALOHA network. | 5+6
(CO1)
(PO1) |
| | b) What is the slot time in CSMA/CD? Explain how the slot time is related to the maximum network length. | 6
(CO1)
(PO1) |
| | c) What are the significances of <i>To DS</i> and <i>From DS</i> flags of an IEEE 802.11 frame? How does the D (Duration) field relate to NAV? Distinguish between the Distributed Coordination Function (DCF) and the Point Coordination Function (PCF) as a MAC sublayer for <i>IEEE 802.11</i> . | 8
(CO1)
(PO1) |

OR

- | | | |
|----|--|-------------------------|
| | Briefly explain the access method (baseband layer) of Bluetooth. Mention the effective length of a one-slot frame and a three-slot frame of Bluetooth. In a Bluetooth frame, why does the 54-bit header portion contain three identical 18-bit sections? | 8
(CO1)
(PO1) |
| 2. | a) How does a bridge differ from a repeater? Demonstrate the learning procedure of a transparent bridge with a suitable example. Consider a system of four LANs (L_1 to L_4) interconnected by five bridges (B_1 to B_5). The bridges connect the LANs as follows: <ul style="list-style-type: none"> i. B_1 connects L_1 and L_2 ii. B_2 connects L_1 and L_3 iii. B_3 connects L_1, L_3, and L_4 iv. B_4 connects L_3 and L_4 v. B_5 connects L_1, L_2, and L_4 Assume B_4 as the root bridge. Show the forwarding and the blocking ports after applying the spanning tree protocol (STP). | 7+4
(CO1)
(PO1) |
| | b) In an IPv4 datagram, the M-bit is 0, the value of HLEN is 5, the value of total length is 200, and the fragment offset value is 200. What are the number of the first byte and the number of the last byte in this datagram? Is this the last fragment, the first fragment, or a middle fragment? | 5
(CO2)
(PO1) |
| | c) Which fields of the IPv4 header are mutable (the value changes from router to router)? Name the fields in the IPv4 header that are necessary to handle the fragmentation of packets. Briefly explain the source route option of IPv4. | 2+2+5
(CO2)
(PO1) |

3. a) What are the major motivations for summarization (route aggregation)? What might be a potential problem of summarization if the subnets are not geographically close to each other? What is the solution to the problem? (Your answer should include network diagrams using classless addressing.) 10
(CO2)
(PO2)

OR

- What is VLSM in IPv4? Considering a class C network explain the VLSM technique with the necessary diagrams. (Your answer should include the optimized VLSM worksheet.) 10
(CO2)
(PO2)
- b) What are the subnet address and broadcast address of the host 192.168.10.244/29? A router receives a packet on an interface with a destination address of 192.168.10.174/28. What will the router do with the packet? 4
(CO2)
(PO1)
- c) Suppose you are working in a reputed ISP. You are given a class B network address 172.16.0.0 and you are asked to create subnets from the given network using the subnet mask 255.255.255.192 (which equivalent is to /26 in CIDR). Now, as a network expert answer the following questions: 11
(CO2)
(PO1)
- i. How many subnets can be there?
 - ii. How many hosts per subnet?
 - iii. What are the valid first and last five subnets?
 - iv. What are the broadcast addresses for the first and last five subnets?
 - v. What are the valid hosts in the first and last five subnets?

ISLAMIC UNIVERSITY OF TECHNOLOGY (IUT)
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DEPARTMENT OF ELECTRICAL AND ELECTRONIC ENGINEERING

Mid Semester Examination

Course No.: EEE 4597

Course Title: Telecommunication Principles

Winter Semester, A. Y. 2021-2022

Time: 90 Minutes

Full Marks: 75

There are 4 (four) questions. Answer any 3 (three) questions. All questions carry equal marks. Marks in the margin indicate full marks. Programmable calculators are not allowed. Do not write on this question paper. All symbols bear their usual meanings. Assume reasonable values for missing data.

1. a) What will be the required bandwidth of the modulated waveform in DSB, if the modulating/baseband signal bandwidth is 300 Hz? Find out the minimum value of carrier frequency, ω_c in this case to eliminate the possibility of spectral overlap (for a spectra centered at $\pm \omega_c$). What will be the minimum antenna height for efficient radiation of the baseband signal? Will it be a good choice to directly transmit the baseband signal? 11
- b) Define modulation index. When is a carrier said to be over-modulated and what is its after effect? Name the schemes that can improve spectral efficiency of amplitude modulation. 2+3+2
- c) Explain the process of frequency mixing. Define up and down conversions. 3+4
2. a) Why is non-linear modulation termed as a single balanced modulator? Why are the single sideband (SSB) modulated outputs known as suppressed carrier signals? Name the methods for generation of SSB signal. What are the main advantages and disadvantages of direct method in FM generation? 6+2+5
- b) An angle modulated signal is described by $x_c(t) = 5 \cos[2\pi(10^6)t + 0.2 \sin(10^3)\pi t]$. Find $m(t)$ considering the following cases: 12
 - I. $x_c(t)$ is a PM signal with $k_p = 5$,
 - II. $x_c(t)$ is an FM signal with $k_f = 5\pi$.
3. a) Show mathematically why angle modulations (both PM & FM) are referred to as non-linear modulation. 8
- b) Using the single-tone modulating signal $\cos\omega_m t$, verify that the output of the SSB generator by phase shifter is indeed an SSB signal, and show that an upper-sideband (USB) or a lower-sideband (LSB) signal results from subtraction or addition at the summation junction. Also demonstrate the coherent demodulation of this SSB signal. 11
- c) Show the ASK, PSK, FSK representation for the binary NRZ code 101001. 6
4. a) Mention the repeater spacing, original wire bandwidth, number of channels multiplexed and net total bandwidth of T1 time division multiplexing. How can you separate the transmitted baseband signals in QAM scheme? Explain with an example. 4+9
- b) What makes Vestigial Sideband (VSB) amplitude modulation a clear compromise between DSB and SSB? Mention the problems of SSB in broadcast television. 7
- c) State the condition for demodulation of AM by an envelope detector. Mention the design criterion for discharge time constant RC for a simple envelope detector circuit. 5

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Program: B.Sc.Engg.(M)/B.Sc.TE (2 Year)
Semester: 7th/3rd

Date: 04 October 2022
Time: 2:30 PM to 4:00 PM

ISLAMIC UNIVERSITY OF TECHNOLOGY (IUT)
ORGANISATION OF ISLAMIC COOPERATION (OIC)
DEPARTMENT OF MECHANICAL AND PRODUCTION ENGINEERING

Mid-Semester Examination
Course Number: MCE 4705/91
Course Title: Applied Thermodynamics

Winter Semester: 2021 - 2022
Full Marks: 75
Time: 1.5 Hours

There are 3 (three) questions. Answer **all the** questions. The symbols have their usual meanings. Marks of each question and corresponding CO and PO are written in the brackets. Assume the reasonable values if required.

-
1. (a) What do you mean by internally, externally, and totally reversible processes? (05)
Explain them with physical interpretation. (CO1)
(PO1)
 - (b) What is compressibility factor? What do mean by the principle of (05)
corresponding states? (CO1)
(PO1)
 - (c) Draw the $T-s$ diagram of Stirling and Ericsson cycle and list down the (05)
processes. (CO1)
(PO1)
 2. (a) How do you illustrate the steady-flow and uniform-flow energy balance (05)
equations for single-stream devices? (CO2)
(PO2)
 - (b) How do you analyze the various processes of an isolated system in terms of (05)
change in entropy? (CO2)
(PO2)
 - (c) Analyze whether the following statement is true or false: (07)
“Work is entropy free, and it will not change the entropy of a fluid passing (CO2)
through an adiabatic steady-flow system with a single inlet and outlet.” (PO2)
Why is regeneration not recommended in a Brayton cycle with higher pressure
ratio? Evaluate with a cycle diagram.
 3. (a) Evaluate the pressure of nitrogen gas at $T = 175\text{K}$ and $v = 0.00375 \text{ m}^3/\text{kg}$ (10)
on the basis of (a) the ideal-gas equation of state, and (b) the van der Waals (CO3)
equation of state. Compare the values obtained to the experimentally determined (PO4)
value of 10,000 kPa.
 - (b) Air is compressed from an initial state of 100 kPa and 20°C to a final state (08)
of 600 kPa and 60°C. Evaluate the entropy change of air during this compression (CO3)
process by using (a) property values from the air table and (b) average specific (PO4)
heats.

- (c) A refrigerator uses refrigerant-134a as the working fluid and operates on the ideal vapor-compression refrigeration cycle except for the compression process. The refrigerant enters the evaporator at 120 kPa with a quality of 34% and leaves the compressor at 70°C. If the compressor consumes 450 W of power, compute (10)
(CO3)
(PO4)
- the mass flow rate of the refrigerant,
 - the condenser pressure, and
 - the COP of the refrigerator.
- (d) A turbojet aircraft is flying with a velocity of 280 m/s at an altitude of 9150 m, where the ambient conditions are 32 kPa and -32°C. The pressure ratio across the compressor is 12, and the temperature at the turbine inlet is 1100 K. Air enters the compressor at a rate of 50 kg/s, and the jet fuel has a heating value of 42,700 kJ/kg. Assuming constant specific heats for air at room temperature, 80% compressor and 85% turbine efficiency, compute (15)
(CO3)
(PO4)
- the velocity of the exhaust gases,
 - the propulsive power developed, and
 - the rate of fuel consumption.

Property Tables

TABLE A-1

Molar mass, gas constant, and critical-point properties

Substance	Formula	Molar mass, <i>M</i> kg/kmol	Gas constant, <i>R</i> kJ/kg·K*	Critical-point properties		
				Temperature, K	Pressure, MPa	Volume, m ³ /kmol
Air	—	28.97	0.2870	132.5	3.77	0.0883
Ammonia	NH ₃	17.03	0.4882	405.5	11.28	0.0724
Argon	Ar	39.948	0.2081	151	4.86	0.0749
Benzene	C ₆ H ₆	78.115	0.1064	562	4.92	0.2603
Bromine	Br ₂	159.808	0.0520	584	10.34	0.1355
<i>n</i> -Butane	C ₄ H ₁₀	58.124	0.1430	425.2	3.80	0.2547
Carbon dioxide	CO ₂	44.01	0.1889	304.2	7.39	0.0943
Carbon monoxide	CO	28.011	0.2968	133	3.50	0.0930
Carbon tetrachloride	CCl ₄	153.82	0.05405	556.4	4.56	0.2759
Chlorine	Cl ₂	70.906	0.1173	417	7.71	0.1242
Chloroform	CHCl ₃	119.38	0.06964	536.6	5.47	0.2403
Dichlorodifluoromethane (R-12)	CCl ₂ F ₂	120.91	0.06876	384.7	4.01	0.2179
Dichlorofluoromethane (R-21)	CHCl ₂ F	102.92	0.08078	451.7	5.17	0.1973
Ethane	C ₂ H ₆	30.070	0.2765	305.5	4.48	0.1480
Ethyl alcohol	C ₂ H ₅ OH	46.07	0.1805	516	6.38	0.1673
Ethylene	C ₂ H ₄	28.054	0.2964	282.4	5.12	0.1242
Helium	He	4.003	2.0769	5.3	0.23	0.0578
<i>n</i> -Hexane	C ₆ H ₁₄	86.179	0.09647	507.9	3.03	0.3677
Hydrogen (normal)	H ₂	2.016	4.1240	33.3	1.30	0.0649
Krypton	Kr	83.80	0.09921	209.4	5.50	0.0924
Methane	CH ₄	16.043	0.5182	191.1	4.64	0.0993
Methyl alcohol	CH ₃ OH	32.042	0.2595	513.2	7.95	0.1180
Methyl chloride	CH ₃ Cl	50.488	0.1647	416.3	6.68	0.1430
Neon	Ne	20.183	0.4119	44.5	2.73	0.0417
Nitrogen	N ₂	28.013	0.2968	126.2	3.39	0.0899
Nitrous oxide	N ₂ O	44.013	0.1889	309.7	7.27	0.0961
Oxygen	O ₂	31.999	0.2598	154.8	5.08	0.0780
Propane	C ₃ H ₈	44.097	0.1885	370	4.26	0.1998
Propylene	C ₃ H ₆	42.081	0.1976	365	4.62	0.1810
Sulfur dioxide	SO ₂	64.063	0.1298	430.7	7.88	0.1217
Tetrafluoroethane (R-134a)	CF ₃ CH ₂ F	102.03	0.08149	374.2	4.059	0.1993
Trichlorofluoromethane (R-11)	CCl ₃ F	137.37	0.06052	471.2	4.38	0.2478
Water	H ₂ O	18.015	0.4615	647.1	22.06	0.0560
Xenon	Xe	131.30	0.06332	289.8	5.88	0.1186

*The unit kJ/kg·K is equivalent to kPa·m³/kg·K. The gas constant is calculated from $R = R_u/M$, where $R_u = 8.31447$ kJ/kmol·K and M is the molar mass.

Source of Data: K. A. Kobe and R. E. Lynn, Jr., *Chemical Review* 52 (1953), pp. 117-236; and ASHRAE, *Handbook of Fundamentals* (Atlanta, GA: American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc., 1993), pp. 16.4 and 36.1.

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TABLE A-12
Saturated refrigerant-134a—Pressure table

Press., <i>P</i> kPa	Sat. temp., <i>T</i> _{sat} °C	Specific volume, m ³ /kg		Internal energy, kJ/kg			Enthalpy, kJ/kg			Entropy, kJ/kg·K		
		Sat. liquid, <i>v</i> _f	Sat. vapor, <i>v</i> _g	Sat. liquid, <i>u</i> _f	Evap., <i>u</i> _{fg}	Sat. vapor, <i>u</i> _g	Sat. liquid, <i>h</i> _f	Evap., <i>h</i> _{fg}	Sat. vapor, <i>h</i> _g	Sat. liquid, <i>s</i> _f	Evap., <i>s</i> _{fg}	Sat. vapor, <i>s</i> _g
60	-36.95	0.0007097	0.31108	3.795	205.34	209.13	3.837	223.96	227.80	0.01633	0.94812	0.96445
70	-33.87	0.0007143	0.26921	7.672	203.23	210.90	7.722	222.02	229.74	0.03264	0.92783	0.96047
80	-31.13	0.0007184	0.23749	11.14	201.33	212.48	11.20	220.27	231.47	0.04707	0.91009	0.95716
90	-28.65	0.0007222	0.21261	14.30	199.60	213.90	14.36	218.67	233.04	0.06003	0.89431	0.95434
100	-26.37	0.0007258	0.19255	17.19	198.01	215.21	17.27	217.19	234.46	0.07182	0.88008	0.95191
120	-22.32	0.0007323	0.16216	22.38	195.15	217.53	22.47	214.52	236.99	0.09269	0.85520	0.94789
140	-18.77	0.0007381	0.14020	26.96	192.60	219.56	27.06	212.13	239.19	0.11080	0.83387	0.94467
160	-15.60	0.0007435	0.12355	31.06	190.31	221.37	31.18	209.96	241.14	0.12686	0.81517	0.94202
180	-12.73	0.0007485	0.11049	34.81	188.20	223.01	34.94	207.95	242.90	0.14131	0.79848	0.93979
200	-10.09	0.0007532	0.099951	38.26	186.25	224.51	38.41	206.09	244.50	0.15449	0.78339	0.93788
240	-5.38	0.0007618	0.083983	44.46	182.71	227.17	44.64	202.68	247.32	0.17786	0.75689	0.93475
280	-1.25	0.0007697	0.072434	49.95	179.54	229.49	50.16	199.61	249.77	0.19822	0.73406	0.93228
320	2.46	0.0007771	0.063681	54.90	176.65	231.55	55.14	196.78	251.93	0.21631	0.71395	0.93026
360	5.82	0.0007840	0.056809	59.42	173.99	233.41	59.70	194.15	253.86	0.23265	0.69591	0.92856
400	8.91	0.0007905	0.051266	63.61	171.49	235.10	63.92	191.68	255.61	0.24757	0.67954	0.92711
450	12.46	0.0007983	0.045677	68.44	168.58	237.03	68.80	188.78	257.58	0.26462	0.66093	0.92555
500	15.71	0.0008058	0.041168	72.92	165.86	238.77	73.32	186.04	259.36	0.28021	0.64399	0.92420
550	18.73	0.0008129	0.037452	77.09	163.29	240.38	77.54	183.44	260.98	0.29460	0.62842	0.92302
600	21.55	0.0008198	0.034335	81.01	160.84	241.86	81.50	180.95	262.46	0.30799	0.61398	0.92196
650	24.20	0.0008265	0.031680	84.72	158.51	243.23	85.26	178.56	263.82	0.32052	0.60048	0.92100
700	26.69	0.0008331	0.029392	88.24	156.27	244.51	88.82	176.26	265.08	0.33232	0.58780	0.92012
750	29.06	0.0008395	0.027398	91.59	154.11	245.70	92.22	174.03	266.25	0.34348	0.57582	0.91930
800	31.31	0.0008457	0.025645	94.80	152.02	246.82	95.48	171.86	267.34	0.35408	0.56445	0.91853
850	33.45	0.0008519	0.024091	97.88	150.00	247.88	98.61	169.75	268.36	0.36417	0.55362	0.91779
900	35.51	0.0008580	0.022703	100.84	148.03	248.88	101.62	167.69	269.31	0.37383	0.54326	0.91709
950	37.48	0.0008640	0.021456	103.70	146.11	249.82	104.52	165.68	270.20	0.38307	0.53333	0.91641
1000	39.37	0.0008700	0.020329	106.47	144.24	250.71	107.34	163.70	271.04	0.39196	0.52378	0.91574
1200	46.29	0.0008935	0.016728	116.72	137.12	253.84	117.79	156.12	273.92	0.42449	0.48870	0.91320
1400	52.40	0.0009167	0.014119	125.96	130.44	256.40	127.25	148.92	276.17	0.45325	0.45742	0.91067
1600	57.88	0.0009400	0.012134	134.45	124.05	258.50	135.96	141.96	277.92	0.47921	0.42881	0.90802
1800	62.87	0.0009639	0.010568	142.36	117.85	260.21	144.09	135.14	279.23	0.50304	0.40213	0.90517
2000	67.45	0.0009887	0.009297	149.81	111.75	261.56	151.78	128.36	280.15	0.52519	0.37684	0.90204
2500	77.54	0.0010567	0.006941	167.02	96.47	263.49	169.66	111.18	280.84	0.57542	0.31701	0.89243
3000	86.16	0.0011410	0.005272	183.09	80.17	263.26	186.51	92.57	279.08	0.62133	0.25759	0.87893

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TABLE A-13

Superheated refrigerant-134a

T °C	v m ³ /kg	u kJ/kg	h kJ/kg	s kJ/kg·K	v m ³ /kg	u kJ/kg	h kJ/kg	s kJ/kg·K	v m ³ /kg	u kJ/kg	h kJ/kg	s kJ/kg·K
P = 0.50 MPa (T _{sat} = 15.71°C)				P = 0.60 MPa (T _{sat} = 21.55°C)				P = 0.70 MPa (T _{sat} = 26.69°C)				
Sat.	0.041168	238.77	259.36	0.9242	0.034335	241.86	262.46	0.9220	0.029392	244.51	265.08	0.9201
20	0.042115	242.42	263.48	0.9384								
30	0.044338	250.86	273.03	0.9704	0.035984	249.24	270.83	0.9500	0.029966	247.49	268.47	0.9314
40	0.046456	259.27	282.50	1.0011	0.037865	257.88	280.60	0.9817	0.031696	256.41	278.59	0.9642
50	0.048499	267.73	291.98	1.0309	0.039659	266.50	290.30	1.0122	0.033322	265.22	288.54	0.9955
60	0.050485	276.27	301.51	1.0600	0.041389	275.17	300.00	1.0417	0.034875	274.03	298.44	1.0257
70	0.052427	284.91	311.12	1.0884	0.043069	283.91	309.75	1.0706	0.036373	282.88	308.34	1.0550
80	0.054331	293.65	320.82	1.1163	0.044710	292.74	319.57	1.0988	0.037829	291.81	318.29	1.0835
90	0.056205	302.52	330.63	1.1436	0.046318	301.69	329.48	1.1265	0.039250	300.84	328.31	1.1115
100	0.058053	311.52	340.55	1.1706	0.047900	310.75	339.49	1.1536	0.040642	309.96	338.41	1.1389
110	0.059880	320.65	350.59	1.1971	0.049458	319.93	349.61	1.1804	0.042010	319.21	348.61	1.1659
120	0.061687	329.91	360.75	1.2233	0.050997	329.24	359.84	1.2068	0.043358	328.57	358.92	1.1925
130	0.063479	339.31	371.05	1.2492	0.052519	338.69	370.20	1.2328	0.044688	338.06	369.34	1.2186
140	0.065256	348.85	381.47	1.2747	0.054027	348.26	380.68	1.2585	0.046004	347.67	379.88	1.2445
150	0.067021	358.52	392.04	1.3000	0.055522	357.98	391.29	1.2838	0.047306	357.42	390.54	1.2700
160	0.068775	368.34	402.73	1.3250	0.057006	367.83	402.03	1.3089	0.048597	367.31	401.32	1.2952
P = 0.80 MPa (T _{sat} = 31.31°C)				P = 0.90 MPa (T _{sat} = 35.51°C)				P = 1.00 MPa (T _{sat} = 39.37°C)				
Sat.	0.025645	246.82	267.34	0.9185	0.022686	248.82	269.25	0.9169	0.020319	250.71	271.04	0.9157
40	0.027035	254.84	276.46	0.9481	0.023375	253.15	274.19	0.9328	0.020406	251.32	271.73	0.9180
50	0.028547	263.87	286.71	0.9803	0.024809	262.46	284.79	0.9661	0.021796	260.96	282.76	0.9526
60	0.029973	272.85	296.82	1.0111	0.026146	271.62	295.15	0.9977	0.023068	270.33	293.40	0.9851
70	0.031340	281.83	306.90	1.0409	0.027413	280.74	305.41	1.0280	0.024261	279.61	303.87	1.0160
80	0.032659	290.86	316.99	1.0699	0.028630	289.88	315.65	1.0574	0.025398	288.87	314.27	1.0459
90	0.033941	299.97	327.12	1.0982	0.029806	299.08	325.90	1.0861	0.026492	298.17	324.66	1.0749
100	0.035193	309.17	337.32	1.1259	0.030951	308.35	336.21	1.1141	0.027552	307.52	335.08	1.1032
110	0.036420	318.47	347.61	1.1531	0.032068	317.72	346.58	1.1415	0.028584	316.96	345.54	1.1309
120	0.037625	327.89	357.99	1.1798	0.033164	327.19	357.04	1.1684	0.029592	326.49	356.08	1.1580
130	0.038813	337.42	368.47	1.2062	0.034241	336.78	367.59	1.1949	0.030581	336.12	366.70	1.1847
140	0.039985	347.08	379.07	1.2321	0.035302	346.48	378.25	1.2211	0.031554	345.87	377.42	1.2110
150	0.041143	356.86	389.78	1.2577	0.036349	356.30	389.01	1.2468	0.032512	355.73	388.24	1.2369
160	0.042290	366.78	400.61	1.2830	0.037384	366.25	399.89	1.2722	0.033457	365.71	399.17	1.2624
170	0.043427	376.83	411.57	1.3081	0.038408	376.33	410.89	1.2973	0.034392	375.82	410.22	1.2876
180	0.044554	387.01	422.65	1.3328	0.039423	386.54	422.02	1.3221	0.035317	386.06	421.38	1.3125
P = 1.20 MPa (T _{sat} = 46.29°C)				P = 1.40 MPa (T _{sat} = 52.40°C)				P = 1.60 MPa (T _{sat} = 57.88°C)				
Sat.	0.016728	253.84	273.92	0.9132	0.014119	256.40	276.17	0.9107	0.012134	258.50	277.92	0.9080
50	0.017201	257.64	278.28	0.9268								
60	0.018404	267.57	289.66	0.9615	0.015005	264.46	285.47	0.9389	0.012372	260.91	280.71	0.9164
70	0.019502	277.23	300.63	0.9939	0.016060	274.62	297.10	0.9733	0.013430	271.78	293.27	0.9536
80	0.020529	286.77	311.40	1.0249	0.017023	284.51	308.34	1.0056	0.014362	282.11	305.09	0.9875
90	0.021506	296.28	322.09	1.0547	0.017923	294.28	319.37	1.0364	0.015215	292.19	316.53	1.0195
100	0.022442	305.81	332.74	1.0836	0.018778	304.01	330.30	1.0661	0.016014	302.16	327.78	1.0501
110	0.023348	315.40	343.41	1.1119	0.019597	313.76	341.19	1.0949	0.016773	312.09	338.93	1.0795
120	0.024228	325.05	354.12	1.1395	0.020388	323.55	352.09	1.1230	0.017500	322.03	350.03	1.1081
130	0.025086	334.79	364.90	1.1665	0.021155	333.41	363.02	1.1504	0.018201	332.02	361.14	1.1360
140	0.025927	344.63	375.74	1.1931	0.021904	343.34	374.01	1.1773	0.018882	342.06	372.27	1.1633
150	0.026753	354.57	386.68	1.2192	0.022636	353.37	385.07	1.2038	0.019545	352.19	383.46	1.1901
160	0.027566	364.63	397.71	1.2450	0.023355	363.51	396.20	1.2298	0.020194	362.40	394.71	1.2164
170	0.028367	374.80	408.84	1.2704	0.024061	373.75	407.43	1.2554	0.020830	372.71	406.04	1.2422
180	0.029158	385.10	420.09	1.2955	0.024757	384.12	418.78	1.2808	0.021456	383.13	417.46	1.2677

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TABLE A-17

Ideal-gas properties of air

T K	h kJ/kg	P _r	u kJ/kg	v _r	s° kJ/kg·K	T K	h kJ/kg	P _r	u kJ/kg	v _r	s° kJ/kg·K
200	199.97	0.3363	142.56	1707.0	1.29559	580	586.04	14.38	419.55	115.7	2.37348
210	209.97	0.3987	149.69	1512.0	1.34444	590	596.52	15.31	427.15	110.6	2.39140
220	219.97	0.4690	156.82	1346.0	1.39105	600	607.02	16.28	434.78	105.8	2.40902
230	230.02	0.5477	164.00	1205.0	1.43557	610	617.53	17.30	442.42	101.2	2.42644
240	240.02	0.6355	171.13	1084.0	1.47824	620	628.07	18.36	450.09	96.92	2.44356
250	250.05	0.7329	178.28	979.0	1.51917	630	638.63	19.84	457.78	92.84	2.46048
260	260.09	0.8405	185.45	887.8	1.55848	640	649.22	20.64	465.50	88.99	2.47716
270	270.11	0.9590	192.60	808.0	1.59634	650	659.84	21.86	473.25	85.34	2.49364
280	280.13	1.0889	199.75	738.0	1.63279	660	670.47	23.13	481.01	81.89	2.50985
285	285.14	1.1584	203.33	706.1	1.65055	670	681.14	24.46	488.81	78.61	2.52589
290	290.16	1.2311	206.91	676.1	1.66802	680	691.82	25.85	496.62	75.50	2.54175
295	295.17	1.3068	210.49	647.9	1.68515	690	702.52	27.29	504.45	72.56	2.55731
298	298.18	1.3543	212.64	631.9	1.69528	700	713.27	28.80	512.33	69.76	2.57277
300	300.19	1.3860	214.07	621.2	1.70203	710	724.04	30.38	520.23	67.07	2.58810
305	305.22	1.4686	217.67	596.0	1.71865	720	734.82	32.02	528.14	64.53	2.60319
310	310.24	1.5546	221.25	572.3	1.73498	730	745.62	33.72	536.07	62.13	2.61803
315	315.27	1.6442	224.85	549.8	1.75106	740	756.44	35.50	544.02	59.82	2.63280
320	320.29	1.7375	228.42	528.6	1.76690	750	767.29	37.35	551.99	57.63	2.64737
325	325.31	1.8345	232.02	508.4	1.78249	760	778.18	39.27	560.01	55.54	2.66176
330	330.34	1.9352	235.61	489.4	1.79783	780	800.03	43.35	576.12	51.64	2.69013
340	340.42	2.149	242.82	454.1	1.82790	800	821.95	47.75	592.30	48.08	2.71787
350	350.49	2.379	250.02	422.2	1.85708	820	843.98	52.59	608.59	44.84	2.74504
360	360.58	2.626	257.24	393.4	1.88543	840	866.08	57.60	624.95	41.85	2.77170
370	370.67	2.892	264.46	367.2	1.91313	860	888.27	63.09	641.40	39.12	2.79783
380	380.77	3.176	271.69	343.4	1.94001	880	910.56	68.98	657.95	36.61	2.82344
390	390.88	3.481	278.93	321.5	1.96633	900	932.93	75.29	674.58	34.31	2.84856
400	400.98	3.806	286.16	301.6	1.99194	920	955.38	82.05	691.28	32.18	2.87324
410	411.12	4.153	293.43	283.3	2.01699	940	977.92	89.28	708.08	30.22	2.89748
420	421.26	4.522	300.69	266.6	2.04142	960	1000.55	97.00	725.02	28.40	2.92128
430	431.43	4.915	307.99	251.1	2.06533	980	1023.25	105.2	741.98	26.73	2.94468
440	441.61	5.332	315.30	236.8	2.08870	1000	1046.04	114.0	758.94	25.17	2.96770
450	451.80	5.775	322.62	223.6	2.11161	1020	1068.89	123.4	776.10	23.72	2.99034
460	462.02	6.245	329.97	211.4	2.13407	1040	1091.85	133.3	793.36	23.29	3.01260
470	472.24	6.742	337.32	200.1	2.15604	1060	1114.86	143.9	810.62	21.14	3.03449
480	482.49	7.268	344.70	189.5	2.17760	1080	1137.89	155.2	827.88	19.98	3.05608
490	492.74	7.824	352.08	179.7	2.19876	1100	1161.07	167.1	845.33	18.896	3.07732
500	503.02	8.411	359.49	170.6	2.21952	1120	1184.28	179.7	862.79	17.886	3.09825
510	513.32	9.031	366.92	162.1	2.23993	1140	1207.57	193.1	880.35	16.946	3.11883
520	523.63	9.684	374.36	154.1	2.25997	1160	1230.92	207.2	897.91	16.064	3.13916
530	533.98	10.37	381.84	146.7	2.27967	1180	1254.34	222.2	915.57	15.241	3.15916
540	544.35	11.10	389.34	139.7	2.29906	1200	1277.79	238.0	933.33	14.470	3.17888
550	555.74	11.86	396.86	133.1	2.31809	1220	1301.31	254.7	951.09	13.747	3.19834
560	565.17	12.66	404.42	127.0	2.33685	1240	1324.93	272.3	968.95	13.069	3.21751
570	575.59	13.50	411.97	121.2	2.35531						

ISLAMIC UNIVERSITY OF TECHNOLOGY (IUT)
ORGANISATION OF ISLAMIC COOPERATION (OIC)

Department of Computer Science and Engineering (CSE)

MID SEMESTER EXAMINATION

WINTER SEMESTER, 2021-2022

DURATION: 1 HOUR 30 MINUTES

FULL MARKS: 75

CSE 4775: Data Mining

Programmable calculators are not allowed. Do not write anything on the question paper.

Answer all **3 (three)** questions. Marks of each question and corresponding CO and PO are written in the right margin with brackets.

1. a) Consider the following transactions shown in Table 1:

Table 1: A transaction database

<i>Transaction ID</i>	<i>List of items in the transaction</i>
T1	B, A, T
T2	A, C
T3	A, S
T4	B, A, C
T5	B, S
T6	A, S
T7	B, S
T8	B, A, S, T
T9	B, A, S

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(CO3)
(PO2)

Find out the frequent patterns including conditional pattern base and conditional FP-Tree using Frequent Pattern Growth (FP-Growth) algorithm.

Assume that the minimum support count is 2.

- b) Assume that you are using the Apriori algorithm for generating frequent itemsets from the transactions shown in Table 1. Analyze how a hash-based technique can be used to reduce the number of candidate 2-itemsets examined. 4
(CO4)
(PO2)
- c) List all the strong association rules (with support s , confidence c , and lift l) for the frequent itemsets generated from Table 1, matching the following metarule, where X is a variable representing customers, and item denotes variables representing items (e.g., "A," "B,"). Assume that the minimum confidence is 50%. 6
(CO3)
(PO1)

$$\forall X \in \text{transaction}, \text{buys}(X, \text{item}_1) \Rightarrow \text{buys}(X, \text{item}_2) \wedge \text{buys}(X, \text{item}_3) [s, c, l]$$

2. a) Differentiate between nominal attributes and ratio-scaled attributes using suitable examples. 3
(CO1)
(PO2)
- b) Assume that you are working with a dataset with a single attribute *age*. The *age* values in ascending order are as follows: 2+2+3
(CO1)
(PO2)
13, 15, 16, 16, 19, 20, 20, 21, 22, 22, 25, 25, 25, 25, 30, 33, 33, 35, 35, 35, 35, 36, 40, 45, 46, 52, 70
- i. With proper justification, find out if the distribution of *age* is symmetric, positively skewed, or negatively skewed.
 - ii. Determine the mode of the data. Comment on the data's modality (i.e., bimodal, trimodal, etc.).
 - iii. Sketch a boxplot for the distribution of *age* and give its five-number summary.
- c) Assume that you are working with the following two documents: 5+2
(CO2)
(PO2)
- "Tenz is one of the best professional Valorant players Sentinels has acquired."
 - "Although not good as Tenz, Shahzam is doing great as Sentinels IGL."
- i. Calculate the cosine similarity between these two documents using their term frequency vectors and comment on their similarity.
 - ii. Explain why a distance measure such as Euclidean Distance is not suitable for comparing the two documents.

- d) Consider the dataset shown in Table 2, described using the following attributes:
- **ID:** Unique identifier for each franchise
 - **Offered_Food_Type:** The type of food offered by a franchise
 - **Customers_Served:** Number of customers served by a franchise
 - **Average_Rating:** Average rating of a franchise provided by customers

8
(CO2)
(PO2)

Table 2: A sample data table of different restaurant franchises

ID	Offered_Food_Type	Customers_Served (in thousand)	Average_Rating
1	Bengali	20	Excellent
2	Indian	25	Good
3	Mexican	27	Good
4	Mexican	22	Bad

Calculate the dissimilarity matrix of the dataset.

3. a) Assume that you are working with a dataset with a single attribute *salary*. The *salary* values (in 1000 BDT) in ascending order are as follows:
5, 10, 13, 35, 35, 35, 35, 36, 37, 37, 39, 40, 45, 46, 52, 53, 54, 54, 57, 57, 57, 60, 62, 62, 150, 160, 180.
- i. There are different normalization methods like min-max normalization, z-score normalization, etc. Depending on the given samples, which normalization method should you use to normalize these values? Justify your answer.
 - ii. Apply the normalization method you selected in 3(a)(i) to normalize the following *salary* values: 13, 35, 45, 150.
- b) i. Sketch an equiwidth histogram of width 10 for the data in 3(a).
ii. Use *smoothing by bean means* to smooth the data in 3(a), using a bin depth of 3. Illustrate your steps. Comment on the effect of this technique for the given data.
- c) Consider the following contingency table shown in Table 3:

1+4
(CO2)
(PO2)

5+5
(CO2)
(PO2)
10
(CO3)
(PO1)

Table 3: Job placement by type of training (Observed Frequencies)

Placed in a job?	Type of training		Total
	Vocational Education	Work Skills Training	
Yes	175	125	300
No	25	125	150
Total	200	250	450

Present the null hypothesis and apply the Chi-Square test for statistical significance to hypothesize whether there exists a correlation between the type of training received and the rate of job placement for a probability of error level (alpha value), $p = 0.05$. You can find a partial list of critical values in Table 4.

Table 4: Chi-Square (χ^2) Distribution

Degrees of Freedom	Area to the Right of Critical Value									
	0.995	0.99	0.975	0.95	0.9	0.1	0.05	0.025	0.01	0.005
1	—	—	0.001	0.004	0.016	2.706	3.841	5.024	6.635	7.879
2	0.01	0.02	0.051	0.103	0.211	4.605	5.991	7.378	9.21	10.597
3	0.072	0.115	0.216	0.352	0.584	6.251	7.815	9.348	11.345	12.838
4	0.207	0.297	0.484	0.711	1.064	7.779	9.488	11.143	13.277	14.86
5	0.412	0.554	0.831	1.145	1.61	9.236	11.071	12.833	15.086	16.75
6	0.676	0.872	1.237	1.635	2.204	10.645	12.592	14.449	16.812	18.548
7	0.989	1.239	1.69	2.167	2.833	12.017	14.067	16.013	18.475	20.278
8	1.344	1.646	2.18	2.733	3.49	13.362	15.507	17.535	20.09	21.955
9	1.735	2.088	2.7	3.325	4.168	14.684	16.919	19.023	21.666	23.589
10	2.156	2.558	3.247	3.94	4.865	15.987	18.307	20.483	23.209	25.188
11	2.603	3.053	3.816	4.575	5.578	17.275	19.675	21.92	24.725	26.757
12	3.074	3.571	4.404	5.226	6.304	18.549	21.026	23.337	26.217	28.299
13	3.565	4.107	5.009	5.892	7.042	19.812	22.362	24.736	27.688	29.819
14	4.075	4.66	5.629	6.571	7.79	21.064	23.685	26.119	29.141	31.319
15	4.601	5.229	6.262	7.261	8.547	22.307	24.996	27.488	30.578	32.801
16	5.142	5.812	6.908	7.962	9.312	23.542	26.296	28.845	32	34.267
17	5.697	6.408	7.564	8.672	10.085	24.769	27.587	30.191	33.409	35.718
18	6.265	7.015	8.231	9.39	10.865	25.989	28.869	31.526	34.805	37.156
19	6.844	7.633	8.907	10.117	11.651	27.204	30.144	32.852	36.191	38.582
20	7.434	8.26	9.591	10.851	12.443	28.412	31.41	34.17	37.566	39.997
21	8.034	8.897	10.283	11.591	13.24	29.615	32.671	35.479	38.932	41.401
22	8.643	9.542	10.982	12.338	14.042	30.813	33.924	36.781	40.289	42.796
23	9.26	10.196	11.689	13.091	14.848	32.007	35.172	38.076	41.638	44.181
24	9.886	10.856	12.401	13.848	15.659	33.196	36.415	39.364	42.98	45.559
25	10.52	11.524	13.12	14.611	16.473	34.382	37.652	40.646	44.314	46.928
26	11.16	12.198	13.844	15.379	17.292	35.563	38.885	41.923	45.642	48.29
27	11.808	12.879	14.573	16.151	18.114	36.741	40.113	43.194	46.963	49.645
28	12.461	13.565	15.308	16.928	18.939	37.916	41.337	44.461	48.278	50.993
29	13.121	14.257	16.047	17.708	19.768	39.087	42.557	45.722	49.588	52.336
30	13.787	14.954	16.791	18.493	20.599	40.256	43.773	46.979	50.892	53.672
40	20.707	22.164	24.433	26.509	29.051	51.805	55.758	59.342	63.691	66.766
50	27.991	29.707	32.357	34.764	37.689	63.167	67.505	71.42	76.154	79.49

ISLAMIC UNIVERSITY OF TECHNOLOGY (IUT)
ORGANISATION OF ISLAMIC COOPERATION (OIC)
DEPARTMENT OF ELECTRICAL AND ELECTRONIC ENGINEERING

Mid-Semester Examination
Course Number: EEE 4791
Course Title: Control System Engineering

Winter Semester: 2021 - 2022
Full Marks: 75
Time: 1 Hour 30 Minutes

There are **04 (four)** questions. Answer any **03 (three)** questions. The symbols have their usual meanings. Marks of each question are written in the brackets in right margin.

1.a) Define control system. What are the advantages of control systems? (2+4)

b) A system is described by the following differential equation: (6)

$$\frac{d^3y}{dt^3} + 3\frac{d^2y}{dt^2} + 5\frac{dy}{dt} + y = \frac{d^3x}{dt^3} + 4\frac{d^2x}{dt^2} + 6\frac{dx}{dt} + 8x$$

Find the expression for the transfer function of the system, $Y(s)/X(s)$.

c) A system is described by the following differential equation: (6)

$$\frac{d^2x}{dt^2} + 4\frac{dx}{dt} + 5x = 1$$

with the zero initial conditions. Show a block diagram of the system, giving its transfer function and all pertinent inputs and outputs.

d) Find the transfer function, $G(s) = V_o(s)/V_i(s)$, for each network shown in Fig. 1(d). (7)

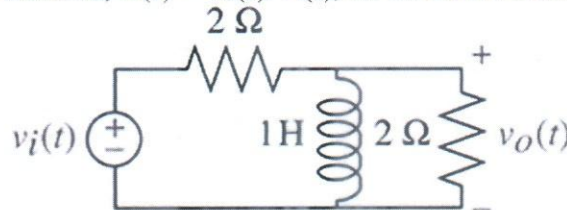


Fig. 1(d)

2 Derive the equation of a generalized second order system. Derive the solution of underdamped second order system. From the solution derive the equation for the Peak Time (T_r), Settling Time (T_s) percentage overshoot (%OS). Use suitable assumptions if necessary. (25)

3.a) Reduce the block diagram shown in following Fig. 3(a) to a single block, $T(s) = C(s)/R(s)$. (17)

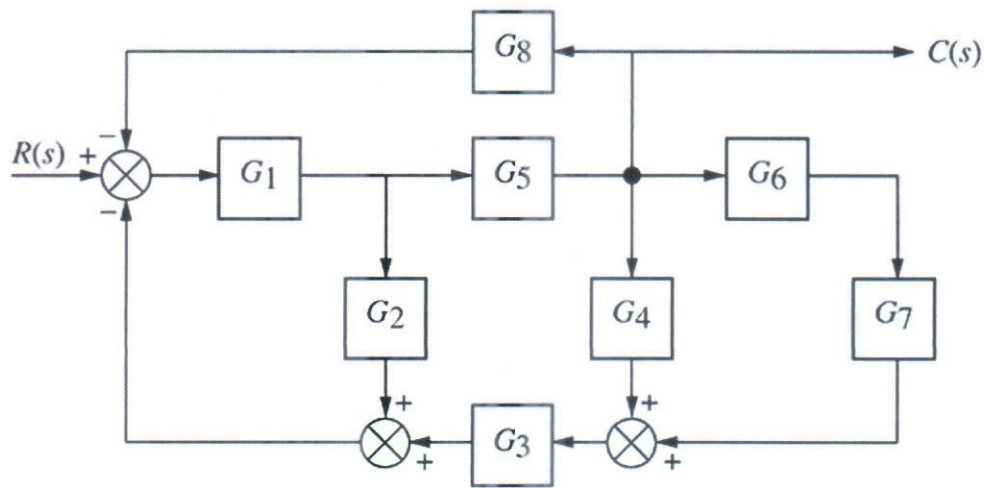


Fig. 3(a)

- b) A system has a transfer function, $G(s)=50/(s+50)$. Find the time constant, T_c , settling time, T_s , and rise time, T_r . (08)
- Or
- 4.a) Using Mason's rule, find the transfer function, $T(s) = C(s)/R(s)$, for the system shown in Fig. 4(a). (15)

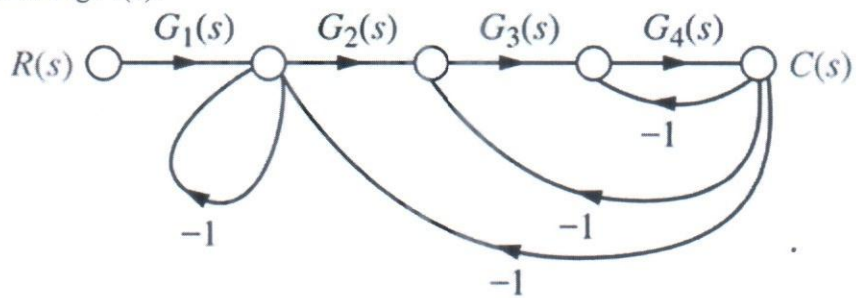


Fig. 4(a)

- b) For each of the second-order systems that follow, find ζ , ω_n , T_s , T_p , T_r , and %OS. (10)

$$T(s) = \frac{16}{s^2 + 3s + 16}$$

ISLAMIC UNIVERSITY OF TECHNOLOGY (IUT)
ORGANISATION OF ISLAMIC COOPERATION (OIC)

DEPARTMENT OF ELECTRICAL AND ELECTRONIC ENGINEERING

Mid-Semester Examination
Course No.: EEE 4793
Course Title: Advanced Electronics I

Winter Semester, A.Y. 2021-2022
Time: 90 Minutes
Full Marks: 75

There are 3 (three) questions. Answer 3 (three) questions. All questions carry equal marks. Marks in the margin indicate full marks. Do not write on this question paper. Symbols carry their usual meanings.

-
1. a) Briefly explain direct and indirect semiconductors. From (E, k) diagram, describe direct and indirect electron transition semiconductors. 8
 - b) Define fermi-dirac distribution function. What will be the shape of Fermi-dirac distribution function at T = 0 K and also at higher temperatures for the following cases. 8
 - (i) $E < E_F$
 - (ii) $E > E_F$
 - (iii) $E = E_F$
 - c) A Si sample is doped with 10^{17} As atoms/cm³. What is the equilibrium hole concentration n_0 at 300 K? Where is E_F relative to E_i ? ($n_i = 1.5 \times 10^{10}$, assuming $n_0 = N_d$) 9
 2. a) What is Luminescence? Mention its important types according to the excitation mechanism. Discuss the mechanisms involved in case of excitation and recombination of carriers in photoluminescence when a trapping level for electrons is present. 8
 - b) Derive the expressions for concentration of electrons and holes in a semiconductor at equilibrium. 9
 - c) Show schematically electrons and holes at thermal equilibrium by using fermi-dirac distribution function, density of states and band diagram for 8
 - (i) Intrinsic semiconductors
 - (ii) N-type semiconductors
 - (iii) P-type semiconductors
 3. a) Briefly discuss the process of diffusion. Derive diffusion current density equations for electrons and holes. 8
 - b) Discuss the effect of recombination in diffusion process. Derive continuity equation and diffusion equation for holes and electrons. 7
 - c) In a very long p type Si bar with cross-sectional area, $A = 0.5 \text{ cm}^2$ and $N_a = 10^{17} \text{ cm}^{-3}$, we inject holes such that the steady state excess hole concentration is $5 \times 10^{16} \text{ cm}^{-3}$ at $x = 0$. What is the steady state separation between F_p and E_C at $x = 1000 \times 10^{-8} \text{ m}$? What is hole current there? How much is the excess stored hole charge? Assume, $\mu_p = 500 \text{ cm}^2/\text{V-s}$ and $\tau_p = 10^{-13} \text{ s}$ ($n_i = 1.5 \times 10^{10} \text{ cm}^{-3}$) 10

Program: MScTE 2 Year 1st Semester
Semester: Winter semester

Date: September 30, 2022 (Friday)
Time: 02:30 pm – 04:00 pm

ISLAMIC UNIVERSITY OF TECHNOLOGY (IUT)
ORGANISATION OF ISLAMIC COOPERATION (OIC)
DEPARTMENT OF TECHNICAL AND VOCATIONAL EDUCATION (TVE)

Exam: Mid Semester Examination
Course Number: TVE 6113
Course Title: Curriculum Development in TVE

Academic Year: 2021- 2022
Full Marks: 75
Duration: 90 minutes

There are 4 (four) questions. Answer any 3 (three).
Figures in the right margin indicate marks of the question.

- 1.
 - a) What are the main goals of education? **02**
 - b) Explain the meaning and scope of Curriculum in light of the definitions given by several authors in several ways. You should give reference to at least three such authors and summarize in your own words the common features they mention in their definitions. **20**
 - c) How does a curriculum differ from a Syllabus? **03**

- 2.
 - a) Describe different forms /or types of curriculum with specific example(s) according to the model given by Atherton (2009). **15**
 - b) Explain the distinctive features of TVET curriculum compared to general education curriculum. **10**

- 3.
 - a) What are the primary data sources you should consider when making curricular decision? **03**
 - b) Explain, with sketch, the different curriculum design models. **20**
 - c) How do you differentiate between curriculum and instructional systems? **02**

- 4.
 - a) Explain the factors Associated with the determination of curriculum content. **10**
 - b) Describe briefly the following strategies to determine curriculum development: **15**
 - i. The 'All Aspects' of industry approach;
 - ii. The Critical incident technique; and
 - iii. The Delphi technique.

Name of the Program: MSc.T.E. – 1st Semester

Date: 29 September (Thursday), 2022
Time: 2:30 pm – 04:00 pm

ISLAMIC UNIVERSITY OF TECHNOLOGY (IUT)
ORGANISATION OF ISLAMIC COOPERATION (OIC)
DEPARTMENT OF TECHNICAL AND VOCATIONAL EDUCATION (TVE)

Mid Semester Examination
Course Number: TVE 6125
Course Title: Advanced Methods and Techniques of Teaching

Summer Semester: 2021 - 2022
Full Marks: 75
Time: 90 min

There are **4 (Four)** questions. Answer **3 (Three)** questions. The symbols have their usual meaning.

-
- | | | | | |
|---|-----|--|----|-------------------|
| 1 | (a) | <i>“TVET is a master key which opens the door of success with innovations, technologies, and ideas” – Explain.</i> | 05 | CO ₁ |
| | (b) | Discuss how best will you teach? | 20 | CO _{1,2} |
| 2 | (a) | <i>“Knowledge comes with learning, Skills comes with practice, Attitude never comes, but changed” – Discuss the statement by pointing out the significant of learning domains.</i> | 05 | CO ₂ |
| | (b) | Derived the factors affecting learning. | 20 | CO ₂ |
| 3 | (a) | <i>“The teaching that achieved instructional outcomes and learning outcomes perfectly called effective teaching” – Derived the statement context of the outcome-based education (OBE).</i> | 15 | CO ₃ |
| | (b) | Discuss five theories of learning with examples. | 10 | CO ₂ |
| 4 | (a) | <i>“A lesson plan is defined as a plan of procedure developed by the teacher to be used as a guide in presenting content and one that provides a learning environment for students” – Narrate the statement in light of an effective planning of a lesson.</i> | 15 | CO ₂ |
| | (b) | Choose a topic from your field of specialization and design a lesson plan. | 10 | CO ₃ |

Program: M. Sc. T.E (2-year-1st Sem)
Semester: Winter

Date: October 05, 2022 (Wednesday)
Time: 2:30 pm – 4:00 pm

ISLAMIC UNIVERSITY OF TECHNOLOGY (IUT)
ORGANISATION OF ISLAMIC COOPERATION (OIC)
DEPARTMENT OF TECHNICAL AND VOCATIONAL EDUCATION (TVE)

Exam: Mid Semester Examination
Course No: TVE 6153
Course Title: Educational Research

Academic Year: 2021-2022
Full Marks: 75
Duration: 90 minutes

There are 4 (Four) questions. Answer 3 (three) questions. **Question 1 is mandatory.** You can choose any two from 2, 3, and 4.

1. a) Distinguish between *Positivist view* and *Interpretivist view* in technical educational research by using proper examples. Show how they are linked with qualitative and quantitative research. 13
 b) What are the eight qualities that you would recommend if you were a director of a research institute and was asked to identify the best researcher from your institute? 12
(CO1)
2. (a) Distinguish between basic research and applied research with example in relation to technical education research. 10
 (b) Provide your own understanding about the following three quantitative research and bring one example in each case: 15
(CO2)
 - Descriptive research
 - Correlational research
 - Experimental research
3. a) Name five types of qualitative research in education. 05
 b) Read the abstract and answer the following question: 10
Abstract: This study investigates the knowledge that engineering teachers should possess in order to effectively implement technology-enhanced instruction in their teaching practice using Technological Pedagogical Content Knowledge (TPACK) framework, although its (TPACK) use in HEIs is inadequate. The objectives of this investigation are to investigate what TPACK construct is using in engineering education (Eng. Ed) and to study how different attributes of a teacher affect their level of TPACK knowledge. In order to accumulate engineer teachers' knowledge, a descriptive self-assessment tool designed in a Google form was administered via email to 220 teachers from two different universities of Bangladesh located in the business district of Dhaka. Descriptive analysis, Pearson's correlation coefficient (r), Exploratory Factor Analysis, Cronbach Alpha test, ANOVA, and Levene test were carried out to analyse the collected data. The outcomes of this investigation confirmed the practicality of the framework and discovered significant differences regarding technological knowledge (TK), conventional knowledge (PK/PCK) in field of study of the teacher and a significant difference in technology-enhanced instructions in regard to age group of the teacher. The results support the previous argument that only availability of technology and teachers' technology knowledge in Eng. Ed may not accelerate technology-enhanced teaching. The findings add knowledge to prior research whose objective is to find ways of incorporating technology-enhanced instructions in HEIs and thus, provide recommendation to Eng. Ed towards formulating policies on incorporating TPACK components in their teaching.
 I. **Based on the features of Qualitative and Quantitative research, elaborate which type of research this abstract falls into?**
 II. **Identify four features that support your answer**
- c) Do you think methodology and method in educational research is same? Justify your answer with an appropriate example. 10
(CO2)
4. a) Provide your own understanding about **Independent, Dependent, and Confounding Variables.** 10
 b) Identify two examples from your own area that shows **Independent, Dependent variables.** 06
 c) Clarify the meaning of Ontology and Epistemology in choosing your research problem. 09
(CO1)

Program: PhD TE 1st Sem & MScTE 2 Year 3rd Sem
Semester: Winter semester

Date: September 28, 2022 (Wednesday)
Time: 02:30 pm – 04:00 pm

ISLAMIC UNIVERSITY OF TECHNOLOGY (IUT)
ORGANISATION OF ISLAMIC COOPERATION (OIC)
DEPARTMENT OF TECHNICAL AND VOCATIONAL EDUCATION (TVE)

Exam: Mid Semester Examination
Course Number: TVE 6173
Course Title: Adult Education

Academic Year: 2021- 2022
Full Marks: 75
Duration: 90 minutes

There are 3 (three) questions. Answer all of them.
Figures in the right margin indicate marks of the question.

1.
 - a) Illustrate the conceptual framework of education, particularly you should focus on the changing concept of education, the adult education and the education of adults, continuing education, community education, and lifelong learning. 15
 - b) “TVET is the major producer of the future workforce”. Explain in light of the ‘New Model for Lifelong Learning (Kanwar & Carr 2019)’ why adult education (lifelong learning) is important for 21st Century TVET graduates. 10
2. “Adults learn and behave differently than others”. In light with this statement, explain the following terms: 25
 - i. Learning prerequisites,
 - ii. Learning behavior, and
 - iii. Learning design.
3. Describe briefly the work of the following theorists, which are related to teaching adults: 25
 - i. Jerome S. Bruner,
 - ii. John Devey,
 - iii. Paulo Freire,
 - iv. Ivan Illich, and
 - v. Malcolm Knowles.

ISLAMIC UNIVERSITY OF TECHNOLOGY (IUT)
ORGANISATION OF ISLAMIC COOPERATION (OIC)

Department of Computer Science and Engineering (CSE)

MID SEMESTER EXAMINATION
DURATION: 1 HOUR 30 MINUTES

WINTER SEMESTER, 2021-2022
FULL MARKS: 75

CSE 6197: Distributed and Parallel Computing

Programmable calculators are not allowed. Do not write anything on the question paper.

Answer all 3 (three) questions. Marks of each question are written in the right margin with brackets. The symbols have their usual meanings.

- 1. a) What is a three-tiered client-server architecture? Consider a chain of processes P_1, P_2, \dots, P_n implementing a multitiered client-server architecture. Process P_i is client of process P_{i+1} , and P_i will return a reply to P_{i-1} only after receiving a reply from P_{i+1} . What are the main problems with this organization when taking a look at the request-reply performance at process P_i ? 8
- b) Why is event-based coordination referentially decoupled but temporally coupled system? What architecture is used to implement even-based coordination? 7
- c) Recently, there has been a strong trend to move away from the configurations shown in Figure 1. (d) - (e). Figure 1. (d) - (e) shows a *fat client* organization, while Figure 1(a) - (c) illustrates a *thin client* organization. 10
 - i. What are the reasons for moving from a *fat client* to a *thin client* organization?
 - ii. Does this mean the end of fat clients? Explain with proper example.

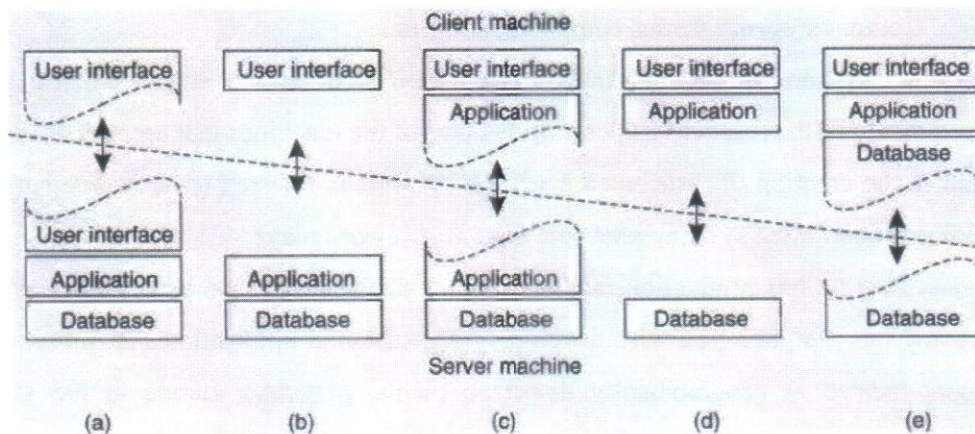


Figure 1: Alternative client-server organizations (a)–(e) for question 1 (c)

2. a) Consider a parallel execution of an MPI-coded C program in SPMD (single program and multiple data streams) mode on a server cluster consisting of n identical Linux servers. SPMD mode means the same MPI program is running simultaneously on all servers but over different data sets of identical workloads. Assume that 30% of the program execution is attributed to the execution of MPI commands. For simplicity, assume that all MPI commands take the same amount of execution time. Answer the following questions: 10
- i. Given that the total execution time of the MPI program on a four-server cluster is T minutes, what is the speedup factor of executing the same MPI program on a 256-server cluster, compared with using the four-server cluster? Assume that the program execution is deadlock free and ignore all other runtime execution overheads in the calculation.
 - ii. Suppose that all MPI commands are now enhanced by a factor of 2 by using active messages executed by message handlers at the user space. The enhancement can reduce the execution time of all MPI commands by half. What is the speedup of the 256-server cluster installed with this MPI enhancement, computed with the old 256-server cluster without MPI enhancement?
- b) Why are virtual machines and virtual clusters suggested in cloud computing systems? What are the impacts of cloud platforms on the future of the HPC and HTC industry? 8
- c) Briefly define the following basic techniques and technologies that represent recent related advances in computer architecture and distributed system: 7
- i. High-performance computing (HPC) system
 - ii. Computer cluster versus computational grid
3. a) Distributed systems are often arranged to have a different layer of software that is logically placed on top of the respective operating systems of the machines that are part of the system to aid in the creation of distributed applications. This is referred to as *middleware*. When building a distributed system, what role does *middleware* play? 7
- b) Nuvista Pharma has production facilities in five distinct locations across the world. Your company has assigned you with developing a distributed application that monitors many sensors located at geographically dispersed plants, generates alarms in the event that anything goes wrong, and notifies other users. What false assumptions should you avoid while designing a distributed application for the first time? 8
- c) i. What is an overlay network? Who is participating in forming an overlay network? 5+5
- ii. Not every peer-to-peer network node should become a superpeer. What are the acceptable prerequisites for a superpeer?

ISLAMIC UNIVERSITY OF TECHNOLOGY (IUT)
ORGANISATION OF ISLAMIC COOPERATION (OIC)

DEPARTMENT OF ELECTRICAL AND ELECTRONIC ENGINEERING

Mid-Semester Examination
Course No.: EEE 6199
Course Title: Solid State Devices

Winter Semester, A.Y. 2021-2022
Time: 90 Minutes
Full Marks: 75

There are 4 (four) questions. Answer any 3 (three) questions. All questions carry equal marks. Marks in the margin indicate full marks. Do not write on this question paper.

- 1. a) Briefly describe the Reverse Recovery Time for a diode. 06
- b) What are the equivalent models available for *p-n* junction diode? Draw the equivalent circuit and sketch the forward characteristics for each model. 09
- c) What are the majority and minority carriers? Describe the differences between *n*-type and *p*-type semiconductor materials. 05
- d) Draw the diode *I-V* characteristics curve for Si, Ge and GaAs on the same graph. 05
- 2. a) In solid-state device fabrication, what is the purpose of Lithography? With proper diagrams describe the steps of Lithography process needed to form the following pattern in the SiO₂ layer as shown in Fig. 1. 15

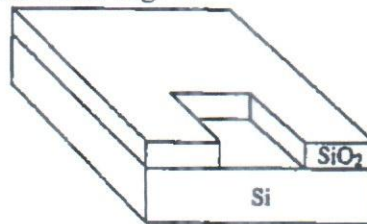


Fig. 1

- b) What do you understand by dry and wet oxidation? For both dry and wet oxidation, show the variation of oxide thickness with respect to oxidation time in case of (100) silicon surface on the same graph. 10
- 3. a) With neat diagrams describe the steps involved in the fabrication of a *p-n* junction diode. 15
- b) With neat diagrams describe the working principle of *p-n* junction photodiode. Also draw its *I-V* characteristics graph for different photogeneration rate. 10
- 4. a) Write the advantages of ion implantation process over diffusion. 05
- b) With neat diagrams discuss the working principle of a light emitting diode (LED). Draw the cross-sectional sketch of the standard LED package and briefly discuss the structure of the LED package. 10
- c) Write some applications of optoelectronic diodes. 05
- d) What do you understand by spectral response and frequency response of an optoelectronic device? 05

Program: M. Sc./PhD (ME) / M.Sc.TE
Semester: Winter

Date: 30 September, 2022
Time: 02:30 pm – 04:00 pm

ISLAMIC UNIVERSITY OF TECHNOLOGY (IUT)
ORGANISATION OF ISLAMIC COOPERATION (OIC)
DEPARTMENT OF MECHANICAL AND PRODUCTION ENGINEERING

Mid Semester Examination
Course Number: MCE 6231
Course Title: Technology Management

Winter Semester: 2021 - 2022
Full Marks: 75
Time : 1.5 Hours

There are 3 (Three) questions. Answer all 3 (Three) questions. The symbols have their usual meanings. Marks of each question and corresponding CO and PO are written in the brackets.

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1. (a) Briefly write down your understanding about technology management and explain any two types of technology that you think are crucial for the development of your country. Here provide reasons for considering them as crucial. (20+5)
(CO1)
(PO6)
 - (b) If you were a CEO of a car manufacturing factory, would you go for the technology leadership? Explain with relevant reasons.
 2. (a) Write down typical components of technology with examples. (5+15+5+15)
(b) Briefly describe degree of sophistication of *infoware*. If you were asked to add another stage of sophistication for *infoware*, mention that one with explanation. (CO1)
(PO6)
 - (c) Among the R & D approaches, select one citing reasons if you were the Managing Director of a pump manufacturing company.
 - (d) What do you understand by innovation? Select any two stages for management of innovation that you think are the most prominent ones and briefly describe their features along with the reasons for selecting them.
 3. Define intellectual property rights. Imagine that you have invented a bicycle generator. Now mention which aspects of your invention are patentable and which are not with reasons. (10)
(CO2)
(PO8)

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Program: MScTE (3rd Semester)
PhD (1st Semester)

Date: 6 October 2022, Thursday, Afternoon
2.30 pm to 4.00 pm

ISLAMIC UNIVERSITY OF TECHNOLOGY (IUT)
ORGANISATION OF ISLAMIC COOPERATION (OIC)
DEPARTMENT OF TECHNICAL AND VOCATIONAL EDUCATION (TVE)

Mid Term Examination
Course No: TVE 6355
Course Title: Quantitative Research and Advanced Statistics

Winter Semester (AY 2021-2022)
Time: 1 hours 30 minutes
Full Marks: 75

There are 3 (three) questions. Answer all questions.
Figures in the right margin indicate marks of the questions.

1. (a) Define moderating and mediating variable. Explain their differences with an example. (4) CO1
(b) Two groups of students were tested to compare their speed of solving math problems. Each group was given the same problems. One group used calculators and the other group computed without calculators. What are the dependent and independent variables? Identify the potential control, moderating and mediating variables in this example. (5) CO1
(c) What is the relationship between the level of significance and the probability of a Type I error? (4) CO1
(d) Read the following statement and answer the questions- (12) CO2
In a study of aggression, some preschool boys see cartoons with violent themes, while other boys see interesting but nonviolent cartoons. Later, the study would like to investigate what happens to the boys when a chance given to them to be aggressive. CO3
 - i) Identify the null hypothesis,
 - ii) Make your best guess about the alternative hypothesis—that is, what you would expect to happen in this study,
 - iii) Describe a research outcome that would be a Type I error
 - iv) Describe an outcome that would be a Type II error.

2. (a) The hypothetical example involving study time and GPA produced a Pearson's r of $+0.88$. What is the coefficient of determination in this case, and what does it mean? (5) CO3
(b) Among a group of 10-year-old children in a school, it is found that the correlation between IQ and reading achievement is $+0.25$. However, on a school-wide basis the correlation is $+0.70$. Given the large differences between the two correlations, what explanation do you suggest? (10) CO2
CO3
(c) A researcher finds that children who play lots of video games also tend to be aggressive with their peers at school. Explain the third variable problem (remember the concept of partial correlation) and how it could influence the interpretation of this correlation. (10) CO2
CO3

3. (a) Indicate the expected direction of the relationships between the two designated variables mentioned below. (Assume the population for the items *i, ii, iii* are studying in grade six) (10) CO2
 - i) X = height in inches, Y = weight in pounds
 - ii) X = age in years; Y = time in seconds required to run 100 meters
 - iii) X = interest in sports; Y = interest in politics
 - iv) X = total miles traveled by a car; Y = year in which the car was manufactured
 - v) X = maximum daily temperature; Y = amount of water used by residents
(b) The correlation of X with Y is $.60$; the correlation of X with Z is $-.80$. Is X more closely linearly related to Y or to Z ? Explain. (5) CO2
(c) A researcher demonstrated a correlation coefficient, $r = -.52$ between average teacher's salary (X) and the proportion of students who drop out of school before graduating (Y) across 120 high schools in her state. She concluded that increasing teachers' salaries would reduce the dropout rate. Comment on her conclusion. (10) CO3

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Programme: MScTE 2-Yr, 3rd Sem.
Semester: Winter

Date: 28 September 2022, Wednesday
Time: 02:30 PM – 04.00 PM

ISLAMIC UNIVERSITY OF TECHNOLOGY (IUT)
ORGANISATION OF ISLAMIC COOPERATION (OIC)
DEPARTMENT OF TECHNICAL & VOCATIONAL EDUCATION (TVE)

Exam: Mid Semester Examination
Course No: TVE 6371
Course Title: Systems approach in Technical Education

Academic Year: 2021-2022
Full Marks: 75
Duration: 90 Minutes

There are 4 (four) questions. Answer any 3 (three).
Figures in the right margin indicate marks of the questions.

1. (a) Explain briefly the concept of systems approach. How system approach helps the organization? 10
(b) Briefly describe the major steps involved in systems approach. 10
(c) State the essential characteristics of systems approach. 05
2. (a) 'Systems approach as an inter-disciplinary approach' - Explain. 05
(b) Write the common characteristics of an organization. Explain briefly the key elements of an organization. 10
(c) Explain with diagram the integration of systems concepts with in a systems approach. 10
3. (a) With a diagram explain how organization acts as a system with interrelated subsystem. 15
(b) Justify why educational institutes such as universities or schools must exit as an open system. 10
4. (a) Explain with a diagram the organization as a composite of 'strategic, coordinating, and operating subsystems'. 15
(b) Discuss briefly the functions of boundary-spanners or BRP with examples in the context of Technical Education. 10