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**APRIL-MAY 2019 EXAMINATION
II B.E. (4YDC) INFORMATION TECHNOLOGY
IT 28502: COMPUTER ORGANIZATION**

TIME: 3 HRS

**Max Marks: 70
Min Pass Marks: 22**

TOTAL NO. OF QUESTIONS IN THIS PAPER : 5

Note: Attempt all five questions. Each Question has 4 sub parts A, B, C, and D. Attempt any one part from A & B and similarly any one from C & D.

- Q.1. A** i Explain the main difference between computer organization and computer architecture with suitable example of each. 3
 ii How Von Neumann Model differ from Harward Model with respect to following points : 4
 i. Basic structure Model
 ii. Main aspect feature
 iii. Limitation
 iv. Working with a suitable example.

OR

- B** i Define Performance equation with its specification? Enlist the factor affecting the performance of computer system? 3
 ii Briefly describe the All generation of computer with respect to following points:
 • Technology support
 • Main Feature
 • Limitation-
 • Application 4

- C** i Draw the hardware level diagram of computer including all internal and external bus with their use. 4
 ii Write down the name of different type of Instruction supported by 8086 microprocessor with suitable example 3

OR

- D** i Explain different addressing mode used by processor with suitable example
 ii Write an assembly program for comparing given three numbers from user input with proper comments. 4 3

- Q.2. A** i Describe following terms (any three):
 i. Cache hit and cache miss
 ii. Page fault and page hit
 iii. Locality of reference
 iv. Inclusion and Coherence 7

- B** A computer has a 256 K Byte, 4-way set associative, write back data cache with block size of 32 Bytes. The processor sends 32 bit addresses to the cache controller. Each cache tag directory entry contains, in addition to address tag, 2 valid bits, 1 modified bit and 1 replacement bit. The number of bits in the tag field of an address is? 7

- C** A system employing with 2 level memory. The average access time without level 1 is 150 ns and with level 1 is 30 ns. The level 1 access time is 20 ns.
 1) Find Hit Ratio? 2) Find access time of L1 & L2 memories if Hit ratio is made 100%. 7

OR

- D Consider a cache has 4 frame for following memory reference string
5,12,13,17,4,12,13,17,2,13,19,13,43,16,19

Find Hit ratio for FIFO Page Replacement Algorithm and LRU Page Replacement Algorithm?

- Q.3. A What is the need of virtual memory or Significance of Virtual Memory?
A system is employing with 3 level cache, the access time of L1,L2,& L3 memories is 100 ns/words, 150 ns/words & 500 ns/words. The L2&L3 memories are divided into a block of 5 words. When a page fault occurs in L1 or L2, The processor must read L3 memory only. The H1 & H2 are 80% & 90% find average Time?

OR

- B Explain different page replacement algorithm with suitable example of each.

- C What is control hazard? A hard disk with a transfer rate of 10 Mbytes/ second is constantly transferring data to memory using DMA. The processor runs at 600 MHz, and takes 300 and 900 clock cycles to initiate and complete DMA transfer respectively. If the size of the transfer is 30 Kbytes, what is the percentage of processor time consumed for the transfer operation?

OR

- D Explain the hardware solution of data hazard.

The size of the data count register of a DMA controller is 16 bits. The processor needs to transfer a file of 29,154 kilobytes from disk to main memory. The memory is byte addressable. The minimum number of times the DMA controller needs to get the control of the system bus from the processor to transfer the file from the disk to main memory is?

- Q.4. A Why DMA is better than program interrupt IO for the IO data transfer? Explain the working of DMA controller with diagram.

OR

- B What is the role of daisy chain in DMA? Explain the data transfer modes of DMA.

- C What is control unit? Explain the working of hardwired control unit with diagram.

OR

- D What is control memory? Give the difference between RISC and CISC computer architecture.

- Q.5. A The instruction pipeline of a RISC processor has the following stages: Instruction Fetch (IF), Instruction Decode (ID), Operand Fetch (OF), Perform Operation (PO) and Write Back (WB). The IF, ID, OF and WB stages take 1 clock cycle each for every instruction. Consider a sequence of 100 instructions. In the PO stage, 40 instructions take 3 clock cycles each, 35 instructions take 2 clock cycles each, and the remaining 25 instructions take 1 clock cycle each. Assume that there are no data hazards and no control hazards. Calculate the number of clock cycles required for completion of execution of the sequence of instruction. Justify your answer mathematically.

OR

- B What is speedup ratio? Explain the working of a pipeline processor, which is having five pipeline stages, with proper space time diagram. Under which conditions this computer's speedup can be 5? Explain mathematically how it is so.

C

A 5-stage pipelined processor has Instruction Fetch (IF), Instruction Decode (ID), Operand Fetch (OF), Perform Operation (PO) and Write Operand (WC) stages. The IF, ID, OF and WC stages take 1 clock cycle each for any instruction. The PO stage takes 1 clock cycle for ADD and SUB instructions, 3 clock cycles for MUL instruction, and 6 clock cycles for DIV instruction respectively. What is the number of clock cycles needed to execute the following sequence of instructions without Operand forwarding?

Instruction

I0 :MUL R2 ,R0 ,R1

R2 → R0 * R1

I1 :DIV R5 ,R3 ,R4

R5 → R3/R4

I2 :ADD R2 ,R5 ,R2

R2 → R5+R2

I3 :SUB R5 ,R2 ,R6

R5 → R2-R6

Meaning of instruction

OR

Draw the segment diagram of arithmetic pipelining and explain the working of it with suitable example.

**APR-MAY 2018 EXAMINATION
II B.E. (4YDC) INFORMATION TECHNOLOGY
IT 28502: COMPUTER ORGANIZATION**

TIME: 3 HRS

45

Max Marks: 70
Min Pass Marks: 22

TOTAL NO. OF QUESTIONS IN THIS PAPER : 5

Note: Attempt all five questions. Each Question has 4 subparts A, B, C, and D. Attempt any one part from A & B and similarly any one from C & D.

- Q.1. A**
1. Explain the organization of Von Neumann Model with respect to following points : 4
 - i. Basic structure Model
 - ii. Main aspect feature
 - iii. Limitation
 - iv. Working with a suitable example.
 2. What are the main factors effecting the performance of computer system? Define the 3 performance equation.

OR

- B**
1. Briefly describe the All generation of computer with respect to following points: 4
 - i. Technology used
 - ii. Main Feature
 - iii. Limitation
 - iv. Application
 2. The following measurements are recorded on the two machines running a given set of benchmarks 3 program : 400 MHz

Instruction Type	Instruction Mix (%)	Cycle per Instruction
Machine A		
Arithmetic & Logic	50	2
Data Transfer	15	3
Control transfer	15	4
Others	20	2
Machine B		
Arithmetic & Logic	65	1
Data Transfer	15	4
Control transfer	10	3
Others	10	2

Determine the effective CPI, MIPS rate for both machine and compare both and find most effective machine performance.

- C**
1. Why are peripherals not connected directly to the system bus or processor? 4
 2. Why are different type of Memory level used in computer system? 3

OR

- D**
- Enlist the main I/O Interfacing Technique with their use. What are the difference between Memory mapped I/O and Port mapped I/O. 7

- Q.2. A**
- Describe following terms (any three): 7
- i. Cache hit and cache miss
 - ii. Page fault and page hit
 - iii. Locality of reference
 - iv. Inclusion and Coherence

OR

- B**
- What is the role of DMA module when the processor wishes to read or write a block of data? 7 Explain with suitable block diagram and instruction sequence.

- C** Enlist the different buses used in the system with their application use and also show their location using a level diagram of bus interfacing with main processor. 7
- OR**
- D** Explain different I/O Interfaces used computer system with respect to Speed and their application use. 7
- Q.3.** **A** 1. Draw the memory classification block diagram and explain different component and complete working of system . 4
 2. A system is employing with 2 level cache memory system, explain the working of such system . The average access time with out level -1 is 150 ns and with level 1 is 30ns. The level 1 access time is 20ns. What is the hit ratio of system, and if hit ratio is made to 100% than what is the access time of l1 and l2 memories? 3
- OR**
- B** 1. What are the need of memory mapping? Explain any mapping technique with their hardware implementation . 4
 2. Consider a cache with 256 blocks of 16 words each. The main memory is addressed with 16 bits. How the address is divided or what is the tag size in Direct mapping, Associative mapping and 2 way set associative mapping. 3
- C** What are the main difference between Direct mapping, Associative mapping and set associative mapping with the suitable example explain the advantage and drawback (if any) of each one? 7
- OR**
- D** What are the need of page replacement algorithm? Enlist the different page replacement algorithm and explain any one algorithm with suitable example. 7
- A** Write a short notes on following : 7
 i. Vector computation
 ii. Parallel Processor
 iii. Multi processing
- OR**
- B** Explain the concept of virtual memory. How it is implemented with suitable example? And what are advantage and drawback (if any) of such memory? 7
- C** Write down the complete life cycle of a instruction execution. 7
- OR**
- D** What are the difference between Hardwired Control and Micro Programmed control unit? 7
- A** Define Pipeline. How it effect the latency of a single task? Explain different types of pipelining. 7
- OR**
- B** What is pipelining Hazards? Explain the Structural Hazard, Data Hazard and Control Hazards with a suitable example of each. 7
- C** Explain the concept of Reduce Instruction Set computing (RISC) and Complex Instruction Set computing(CISC). 7
- OR**
- D** How RISC and CISC differ with each other with respect to following points : 7
 i. Memory Unit
 ii. Programming
 iii. Decoding
 iv. Execution time
 v. External Memory
 vi. Pipeline
 vii. Stalling
 viii. Code expansion
 ix. Disk space

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Q. 1.

Write a program to evaluate the expression

$$X = (A * B) + (C * D) \text{ for}$$

- a. Accumulator based CPU.
- b. Register based CPU.
- c. Stack based CPU.

OR

Explain briefly different generation of computers with example.

Consider two different machines with two different instruction sets both of which have a clock rate 200 MHz. The following measurement are recorded on the two machine running a given set of benchmark program.

For machine A	Instruction Type	Instruction Count	CPI
Arithmetic and Logic		8	1
Load and store		4	3
Branch		2	4
Others		4	3

For machine B

Instruction Type	Instruction Count	CPI
Arithmetic and Logic	10	1
Load and store	8	2
Branch	2	4
Others	4	4

Determine effective CPI, MIPS and execution time for each machine.

ii. Register R4 and R5 contains the decimal number 2000 and 3000 before each of the following addressing modes is used to access memory operands. What is the effective address in each case :

- a. 12(R4) ✓
- b. (R4,R5) ✓
- c. Z8(R4,R5) ✓
- d. (R4)+ ✓
- e. (R4)

OR

D i. A benchmark program is run on a 40 MHz processor. The executed program consists of 100,000 instruction executions, with the following instruction mix and clock cycle count:

Instruction Type	Instruction Count	CPI
Integer arithmetic	45000	1
Data Transfer	32000	2
Floating point	15000	2
Control transfer	8000	2

Determine the effective CPI, MIPS rate and execution time for this program.

ii. Explain different steps involve in instruction sequencing with example. Also draw suitable diagram. 4

Q.2. i. What are the different purpose of I/O interfacing?

ii. What's memory mapped I/O and peripheral mapped I/O? Explain briefly.

OR

B. What is interrupt? Explain different kind of interrupt. What are different method to handling interrupt? 7

C. i. Explain daisy chain mechanism briefly with suitable diagram.

ii. What is DMA transfer modes? Explain. 4

Q.3. i. Explain briefly programmed I/O and interrupt driven I/O. Also state the advantages and disadvantages of each. 4

ii. What are the different feature of USB?

A. 4. What are the differences among direct mapping, associative mapping and set associative mapping? 5

OR

B. i. A 8 way set associative cache is used. The cache size is 512 KB and the tag size is 7 bit. Find out the memory size. 4

ii. What is the distinction between spatial locality and temporal locality? 3

C. A system is employing cache with 2 levels. The average access time without level 1 is 150 ns and with level 1 is 30 ns. The level 1 access time is 20 ns.

a. What is hit ratio?

b. If hit ratio is made of 100%, what is access time of 1.1 and 1.2 memories?

c. If the average time is increased by 10%, what is the percentage change in hit ratio?

d. The width of the physical address on a machine is 40 bits. Find out the width of the tag field in a 512 KB 8-way set associative cache? 3

OR

i. Consider a disk pack with following specification : 4

16 surfaces, 128 tracks/surface, 256 sectors/tracks, and 512 bytes/sectors.

ii. What is the capacity of disk pack?

iii. The format overhead is 32 bytes/sector. What is the formatted disk space?

iv. The format overhead is 64 bytes/sector. How much amount of memory is lost due to formatting?

v. Let the diameter of innermost track is 21 cm. What is the maximum recording density?

vi. Assume that there are 3 page frame which are initially empty. If the page references string is $\frac{1}{2}, \frac{2}{3}, \frac{3}{4}, \frac{4}{5}, \frac{5}{6}, \frac{6}{7}, \frac{7}{8}$. The total number of page fault using :

a. First in first out page replacement algorithm

b. Least recently used page replacement algorithm

c. Optimal page replacement algorithm

- Q.4.** *A* i. Explain Booth's multiplication algorithm with suitable flow chart diagram.
ii. What is datapath in ALU? What is the purpose of control unit?

OR

B Multiply -52 * 59 using Booth's algorithm.

4
3

- C* i. Differentiate between hardwired control unit and microprogrammed control unit.
ii. Explain microinstruction format briefly.

7
3

- D* Draw flow chart of non restoring division algorithm. Perform division 163 by 11 using non restoring division.

7

- Q.5.** *A* i. Explain flynn's classification of multiprocessors.
ii. What is pipelining? Explain designing of pipelining.

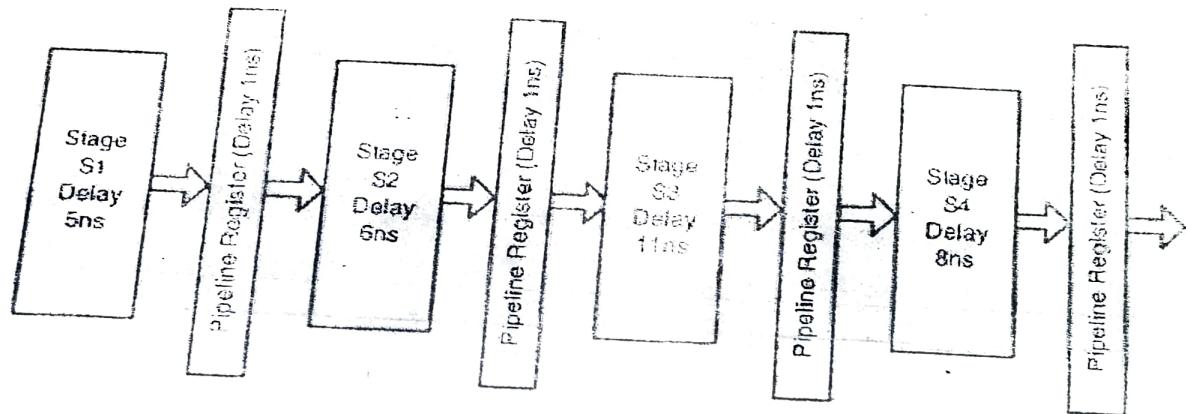
4
3

OR

B Write short note on CISC and RISC.

7
3

- C* i. Consider an instruction pipeline with four stages (S1, S2, S3 and S4) each with combinational circuit only. The pipeline registers are required between each stage and at the end of the last stage. Delays for the stages and for the pipeline registers are as given in the figure:



What is the approximate speed up of the pipeline in steady state under ideal conditions when compared to the corresponding non-pipeline implementation?

- ii. Consider 4 segment instruction pipelining where different instruction are taking different amount of time at different stage that tabulated below :

	S1	S2	S3	S4
I1	2	2	1	3
I2	1	2	2	2
I3	2	3	1	1
I4	1	2	3	2

What is the efficiency of the pipeline?

- D** What is pipelining hazard? Explain different kind of pipelining hazard with suitable example. How these hazard can be eliminate.

7

OR

MAY-JUN 2016 EXAMINATION
II B.E. (4YDC) INFORMATION TECHNOLOGY
IT 2856: COMPUTER ORGANIZATION AND MICROPROCESSOR

TIME: 3 HRS

Max Marks: 70
 Min Pass Marks: 22

TOTAL NO. OF QUESTIONS IN THIS PAPER : 5

Note: Attempt all five questions. Each Question has 4 subparts A, B, C, and D. Attempt any one part from A & B and similarly any one from C & D. Make Suitable assumptions wherever necessary and clearly state the same.

- Q.1.** **A** Describe the Von Neuman model and functioning of the following with neat architecture sketch 7
 i. Memory Buffer Register
 ii. Memory Address Register
 iii. Instruction Register
 iv. Program Counter
 v. Accumulator and multiplier quotient

OR

- B** **1.** The two word instruction at memory address 200 and 201 is a "load to AC" instruction with an address field equal to 500. The first word of the instruction specifies the operation code and mode and the second word specifies the address part. The following numbers are stored at different memory locations as shown below: 5

Memory location (address)	Memory contents
399	450
400	700
500	800
600	900
702	325
800	300

PC has the value 200 for fetching this instruction. The content of processor register R1 is 400, and the content of an index register XR is 100. If all the numbers and address are in decimal number, find out contents of AC and effective address for the following addressing modes.

- i. Direct address
 ii. Indirect address
 iii. Relative address
 iv. Register direct address
 v. Indexed address
 vi. Register indirect addressing mode

- 2.** What is interrupt? Explain different classes of interrupt. 2

- C** **1.** An instruction is stored at location 350 with its address field at location 301. The address field has the value 400. A processor register R1 contains the number 200. Evaluate the effective address if the addressing mode of the instruction is : 4
- i. Immediate addressing
 ii. Direct addressing
 iii. Register indirect
 iv. Relative addressing
 v. Index with R1 as the index register

350
 301

✓ 2. What is computer organization and how it will be different from computer architecture?

OR

D 1. What are different types of interrupts? How can we handle priority of interrupts?

4

2. Draw and explain Instruction cycle.

3

✓ Q.2. A 1. The width of the physical address on a machine is 40 bits. The width of the tag field in a 512 KB and 8 way set associative is used. What is the size of cache?

3

2. Consider a cache as Direct mapped with 8 words total cache data size and 2 words block size. A sequence of 8 memory read is performed in order shown from the following address :

4

0, 11, 4, 14, 9, 1, 8, 0

Calculate :

- Number of misses
- Number of compulsory misses
- Number of conflict misses
- Number of capacity misses

OR

✓ B 1. A system has cache, main memory and disk for virtual memory. If referenced word in cache have 30ns to access it. If it is not in cache 80 ns to load it in cache and reference is started again. If it is not in memory 22 ms to bring from disk to memory and 80 ns from memory to cache and start again. Cache hit ratio is 0.8 and memory hit ratio is 0.9. Calculate effective memory access time.

2

2. Consider a disk pack with following specification : 16 surfaces, 128 tracks/surface, 256 sectors/tracks, and 512 bytes/sectors.

5

i. What is the capacity of disk pack?

ii. What is the number of bits required to address the sector?

iii. The format overhead is 32 bytes/sector. What is the formatted disk space?

iv. The format overhead is 64 bytes/sector. How much amount of memory is lost due to formatting?

v. Let the diameter of innermost track is 21 cm. What is the maximum recording density?

3

What is the set-associativity if we have 128 KB cache, with 512 sets and a block size of 64 bytes?

2. Given the following data :

4

RAM Size = 2^{10}

Cache size = 2^{16}

Block Size = 64 B

4 way set associative is used.

i. How many bits are used for memory address?

ii. How many bits are used in offset field?

iii. How many bits are used in tag field?

iv. How many blocks are used in main memory?

v. How many blocks are there in cache?

OR

D 1. Consider the following page references in virtual memory :

4

2, 3, 1, 2, 5, 7, 6, 3, 2, 1, 4, 3, 1, 4, 7, 6, 5, 2

Find the number of page fault when we are using FIFO, LRU and Optimal page replacement algorithm. Assuming number of frames is 4.

2. Consider the following data :

3

Physical Address Size (PAS) : 22 bits

Cache address : 15 bit

Block size : 256 word

4-way set associative is used.

i. Show the direct mapping and the address bits that identify the tag field, the block number and the block offset.

ii. Show the fully associative mapping and the address bits that identify the tag field and block

- Q.3.** **A** **i.** Show the set associative mapping and the address bits that identify the tag field, the set number and the block offset.
ii. Explain the purpose of input output organization. Why we use I/O interfacing? Explain briefly. **OR**
B **1.** What is difference between memory mapped I/O and peripheral mapped I/O? **7**
2. Explain programmed I/O and interrupt driven I/O. **4**
- C** Write short note on DMA. **3**
- D** **1.** Differentiate between hard-wired control unit and microprogrammed control unit. **7**
2. Explain micro-instruction format. **4**
- 4.** **A** **1.** What is multiprocessor? Explain Flynn's classification of multiprocessor. **4**
2. Differentiate between RISC and CISC architecture. **3**
- B** **1.** Draw a space-time diagram for a six-segment pipeline showing the time it takes to process eight tasks. **4**
2. A nonpipeline system takes 50 ns to process a task. The same task can be processed in a six-segment pipeline with a clock cycle of 10 ns. Determine the speed up ratio of the pipeline for 100 tasks. What is the maximum speed up that can be achieved? **3**
- C** **1.** Consider a 4 segment instruction pipeline where different instruction are taking different amount of time at different stage that tabulated below. What is the efficiency of the pipeline? **4**
- | | S1 | S2 | S3 | S4 |
|----|----|----|----|----|
| I1 | 1 | 2 | 1 | 2 |
| I2 | 2 | 1 | 2 | 1 |
| I3 | 1 | 1 | 2 | 1 |
| I4 | 2 | 1 | 2 | 1 |
| | 6 | 5 | 7 | 5 |
- 2.** Consider two pipeline A and B where pipeline A is having 8 stage of uniform delay of 2ns. Pipeline B is having 5 stages with respective stage delay of 2ns, 3ns, 6ns, 1ns and 4ns. How many time is save when 100 instruction are pipeline using A instead of B? **3**
- 1.** Explain vector processing? What are the advantage of vector processing **4**
2. Briefly explain cache coherence. **3**
3. Write an assembly program to compare the string. **3**
4. Explain different flags used in 8086 microprocessor. **4**
- OR**
Explain different instruction used in 8086 microprocessor. **3**
Explain different addressing modes in 8086 microprocessor with example. **4**
Write short note on 8257 DMA controller. **7**
- OR**
Briefly explain architecture of 8086 microprocessor with neat sketch diagram. **7**

TIME: 3 HRS

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- Q.1.** **A** 1. What is interrupt? Explain different types of interrupt. 4
 2. What are the different methods for deciding the priority among interrupt? 3
 OR
 ✓ i. What is the decimal value of $(100100)_2$ 1
 ✓ ii. What is the hexadecimal value of $(1348)_8$ 1
 ✓ iii. What is the decimal value of $(8CE)_{16}$ 1
 ✓ iv. Compute the sum of 11000100 and 00110110 1
 ✓ v. Convert $(-64)_{10}$ decimal no. to 8 bit sign magnitude representation. 2
C 1. Explain with the help of instruction cycle set diagram, how an instruction get executed? 2
 2. Draw and explain expanded structure of IAS computer. 3
 OR
 ✓ 1. A computer employees RAM chips of $128*8$ bit and ROM chips of $512*8$ bit. The computer needs $2KB$ of RAM capacity and $4KB$ of ROM capacity. How many RAM and ROM chips will be needed? 2
 ✓ 2. How many lines of the address must be used to access $256K$ byte memory? 2
 ✓ 3. Explain following addressing modes :
 Implied mode, Register indirect mode, Direct assembling mode. 3

- Q.2.** **A** 1. There are following memory are specified by the number of words time the no of bits per word. 2
 How many address line and I/O data lines are needed in each case :
 i. $8K*32$.
 ii. $256K*64$
 iii. $32M*32$
 iv. $4G*8$
 2. Consider the following sequence of memory access :
 $12,8,13,5,12,5,9,5$ 2
 How many cache bit would be there? The number of blocks on cache is 8 and direct mapping is used.
 3. Consider a two way set associative cache of 128 KB with a word length of 4 bytes and block size of 8 words. What are the tag field, set number and block number of capacity for 32 bit physical address space? 3

OR

- B** 1. A two level memory system has eight virtual pages on a disk to be mapped into four page frame in the main memory. A certain program generated the following page trace: 4
 $1,0,2,2,1,7,6,7,0,1,2,0,3,0,4,5,1,5,2,4,5,6,7,6,7,2,4,2,7,3,3,2,3$
 i. Show the successive virtual page residing in the four page frames with respect to the above page trace using the LRU replacement policy. Compute the hit ratio in the main memory. Assume the page frames are initially empty.
 ii. Repeat part (i) for Optimal page replacement policy.
 2. A CPU has $4GB$ of main memory and $4 MB$ of cache memory capacity. The cache is organized as 4 way set associative cache with block size of $1KB$. Calculate: 3
 i. No. of blocks on RAM

iv) No. of block on Cache

Q.1. If size of Tag, Set no. and offset field.

- Consider the sequence of block address of memory is 3, 8, 38, 1, 27, 41, 6, 52, 9, 11, 2 is direct mapped with 8 cache blocks. After fulfilling all the request, what are the final content in block no 1st and 3rd respectively

2. The main memory of a computer is organized as 64 blocks, with a block size of 8 words. The cache has 8 block frames.
- Show the Direct mapping and the address bits that identify the tag field, the block number, and the word number.
 - Show the fully associative mapping and the address bits that identify the tag field and the word number.
 - Show the two-way set associative mapping and the address bits that identify the tag field and the set number, and the word field.

OR

- D 1. Explain memory hierarchy with the help of suitable diagram 3
2. What is virtual memory system? Explain address space and memory space in a virtual memory system. 4

- Q.3. A Why input-output interface are required in computer system? Differentiate between I/O mapped I/O and memory mapped I/O. 7

OR

- B 1. Explain following modes of data transfer : 4
 - Programmed I/O
 - Interrupt driven I/O
 2. Differentiate between Hard wired control unit and micro programmed control unit. 3

 C 1. What is the drawback of programmed I/O and interrupt driven I/O? How DMA handles this drawback? 7

OR

- D Explain briefly microinstruction format. How it will work? Explain with the help of suitable diagram. 7

- Q.4. A Define pipelining? Explain different hazards of pipelining with example? 7

OR

- B 1. Consider a four segment pipeline with respective stage delay of 2 ns, 8 ns, 12 ns and 4 ns. What is the speed up factor and efficiency when the very large no of instruction are pipeline? 3
2. Consider 4 segment instruction pipeline where different instruction are taking different amount of time at different stage that tabulated below: 4

	S1	S2	S3	S4
I1	2	2	1	3
I2	1	2	2	2
I3	2	3	1	1
I4	1	2	3	2

C 1. What is the efficiency of pipeline?

- Consider a 4 stage pipeline with respective stage delay of 15ns, 12ns, 16ns and 14ns. The interface register is used between the stages has the delay of 5ns. What is the performance gain when the large number of instructions are pipelined? 2

2. What do you mean by parallel processing? Explain Flynn's classification of parallel processing? 5

- D 1. What do you mean by cache coherence? 2
2. What is vector processing? 2
3. Distinguish between RISC and CISC processor? 3

- Q.5. A 1. Write an assembly program to find largest number for given three input. 3
2. Draw and explain the pin diagram of 8086. 2

- B 1. Write an assembly program to find out factorial of a number. 5
2. List the four categories of 8085 instructions that manipulate the data. 3

- C Explain the flag registers of 8086 microprocessor. 4

- D Write short note on IC 8257. 7

OR

MAY-JUN 2014 EXAMINATION
II B.E. (4YDC) EXAM
IT2856: COMPUTER ORGANIZATION & MICROPROCESSOR
[Max. Marks : 70]

Time : 3 Hrs.]

TOTAL NO. OF QUESTIONS IN THIS PAPER: 5

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and (d). Attempt any one from (a) and (b), similarly attempt any one from (c) and (d).

Q.1 (a) Explain with an example, how effective address is calculated in different types of addressing modes? 7

OR

(b) A computer employs RAM chips of 128×8 and ROM chips of 512×8 . The computer needs 2kB of RAM and 4kB of ROM. How many RAM and ROM chips will be needed? 7

(c) What do you mean by interrupt? Explain the various techniques for deciding priority among interrupt. 7

OR

(d) Explain synchronous and asynchronous data transfer. 7

Q.2 (a) What are the write-through and write-back methods in cache organization and also explain the principle of locality. 7

OR

(b) What is content addressable memory? Describe by means of block diagram how matched words can be read out from an associative memory. 7

(c) Consider a direct mapped cache containing 16B of data storage grouped in 2B blocks then: 7

- i) How many rows would be there in cache?
- ii) If memory address were 16 bit how many bits would be in the tag for each data block?
- iii) What block would be associated with an access to memory location 22?
- iv) How many tag would be associated with an access to memory location 22?

OR

(d) Consider the following page reference string: 7

1, 2, 3, 4, 2, 1, 5, 6, 2, 1, 2, 3, 7, 6, 3, 2, 1, 2, 3, 6

How many page fault would occur for the following page replacement algorithms, assuming 4 frames?

- i) LFU
- ii) LRU
- iii) OPTIMAL

Q.3 (a) Draw and explain the flow chart of DMA process and also explain data transfer mode of DMA. 7

OR

(b) i) Why input-output interface are required in computer system? Differentiate between I/O mapped I/O and memory mapped I/O. 5

ii) How distinction is made between a memory transfer and I/O transfer when one common bus is used to transfer information between CPU to memory and CPU to I/O? 2

(c) Draw a block diagram of a control memory and associated hardware needed for selecting the next instruction. 7

OR

(d) Explain the function of various signals of IC 8257. 7

Q.4 (a) Time delay of the 4 segment in the pipeline processor are as follows: 7

$$t_1=40\text{ns} \quad t_2=25\text{ns} \quad t_3=85\text{ns} \quad t_4=55\text{ns}$$

The interface register delay time $t_i=5\text{ns}$

- i) How long would it take to add 75 pairs of no. in the pipeline?
- ii) How can we reduce the total time calculated above?

OR

(b) i) Draw and explain the pipeline for floating point addition and subtraction. 4

ii) Determine the number of clock cycle that it takes to process 200 tasks in a six segment pipeline. 3

(c) Distinguish between RISC and CISC processors. 7

OR

(d) How pipelining improve system performance? What are the various hazzard which effect the performance of pipeline processor? 7

Q.5 (a) Write an assembly program for reading and writing in the array. 7

OR

(b) Write an assembly program to identify largest number between two given numbers. 7

(c) Draw and explain the pin diagram of 8085 microprocessor. 7

OR

(d) List the four categories of 8085 instructions that manipulate data. 7



TOTAL NO. OF QUESTIONS IN THIS PAPER : 5

Note : Attempt all the questions. Each question carries equal marks. Each question has four subpart (a), (b), (c) and (d). Attempt any one from (a) and (b), similarly attempt any one from (c) and (d).

Q.1 (a) What is instruction cycle? Explain different phases of instruction cycle. 7

OR

(b) Explain various addressing modes with the help of suitable example. 7

(c) Describe the Von-Neumann model and explain the function of its component. 7

OR

(d) Elaborate the function of the following:

- Program counter
- MAR
- Instruction Register
- MBR
- Accumulator

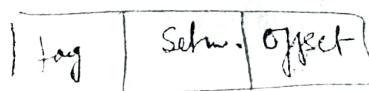
Q.2 (a) What is meant by a Cache memory? What general principles are used to make effective use of cache memory? How it is organized by set-associative mapping? 7

OR

(b) What is associative memory? Explain the concept of match-logic for associative memory? 7

(c) A CPU has 22 bits memory address and 15 bits cache memory address. The cache is organized as 4 way set-associative cache with block size of 256 words. Calculate:

- No. of blocks on RAM
- No. of blocks on cache
- Size of tag, set no, offset field



7 7 8

OR

(d) Consider the following page reference string:

2, 3, 1, 2, 5, 7, 6, 3, 2, 1, 4, 3, 1, 4, 7, 6, 5, 2

How many page fault would occur for the following page replacement algorithms assuming 4 frames?

- FIFO
- LRU ✓
- OPTIMAL ✓

Q.3

(a) With a neat block diagram, explain the working principle of microprogram sequencer. 7

OR

- (b) Describe a typical microinstruction format.
- (c) What do you mean by interrupt? Explain various types of interrupt and methods for deciding priority among interrupts.

OR

- (d) Explain with suitable diagram the working principle of DMA controller.

Q.4

- (a) What do you mean by parallel processing? Explain Flynn's classification of parallel processing?

OR

- (b) Distinguish between RISC and CISC processors.

- (c) Consider a pipelined processor with the following 4 stage:

IF : Instruction fetch

ID : Instruction decode

EX : Execution

WB : Write back

The IF, ID, WB stage take one clock cycle each to complete the operation. The no. of clock cycle for the EX stage depends on the instruction. The ADD and SUB instruction need 1 clock cycle and MUL instruction need 3 clock cycle in EX stage, data forwarding is used in the pipelined processor. What is the no. of clock cycle taken to complete the following sequence of instruction:

$$\text{ADD } R_2, R_1, R_0 [R_2 \leftarrow R_1 + R_0]$$

$$\text{MUL } R_4, R_3, R_2 [R_4 \leftarrow R_3 * R_2]$$

$$\text{SUB } R_6, R_5, R_4 [R_6 \leftarrow R_5 - R_4]$$

OR

- (d) What is pipeline? What is need of pipelining? Write the advantages and limitations of pipelining.

Q.5

- (a) Draw and explain the architectural diagram of 8085 microprocessor.

OR

- (b) Write an assembly program to find out prime numbers up to the given limit.

- (c) Discuss the instruction set of 8085.

OR

- (d) Write an assembly program to find out factorial of a given number.

Department of Information Technology**BE II year, Mid Term-II (Session: Dec-April 2018)****Discrete Structures (IT 28501)****Max Marks: 25****hr.****All questions are compulsory.**

	Prove that $1^2 + 3^2 + 5^2 + \dots + (2n+1)^2 = (n+1)(2n+1)(2n+3)/3$ whenever n is a nonnegative integer.	5
2	Answer these questions for the poset $(\{3, 5, 9, 15, 24, 45\},)$.	8
3	<ol style="list-style-type: none"> Find the maximal elements. Find the minimal elements. Is there a greatest element? Is there a least element? Find all upper bounds of $\{3, 5\}$. Find the least upper bound of $\{3, 5\}$, if it exists. Find all lower bounds of $\{15, 45\}$. Find the greatest lower bound of $\{15, 45\}$, if it exists. 	5
4	<p>Express each of these statements using quantifiers. Then form the negation of the statement, so that no negation is to the left of a quantifier. Next, express the negation in simple English. (Do not simply use the phrase "it is not the case that".)</p> <ol style="list-style-type: none"> Some old dogs can learn new tricks. No rabbit knows calculus. Every bird can fly. There is no dog that can talk. There is no one in this class who knows French and Russian. 	2
5	Show that $(p \rightarrow q) \wedge (q \rightarrow r) \rightarrow (p \rightarrow r)$ is a tautology.	2
6	Show that $p \leftrightarrow q$ and $(p \rightarrow q) \wedge (q \rightarrow p)$ are logically equivalent.	2
7	Define the following terms.	3
	Countable set, uncountable set, countably infinite	

1. *Time: 1 hr*

Time: 1 hr

MAX MARKS : 20

1. Among 18 students in a room, 7 study mathematics, 10 study science, and 10 study computer programming. Also, 3 study mathematics and science, 4 study mathematics and computer programming, and 5 study science and computer programming. We know that 1 student studies all three subjects. How many of these students study none of the three subjects?

2. For each of these relations on the set $\{1, 2, 3, 4\}$ decide whether it is reflexive, whether it is symmetric, whether it is antisymmetric, and whether it is transitive.

- a) $\{(2, 2), (2, 3), (2, 4), (3, 2), (3, 3), (3, 4)\}$
 b) $\{(1, 1), (1, 2), (2, 1), (2, 2), (3, 2), (4, 2)\}$
 c) $\{(2, 4), (4, 2)\}$
 d) $\{(1, 2), (2, 3), (3, 4)\}$
 e) $\{(1, 1), (2, 2), (3, 3), (4, 4)\}$

- f) $\{(1, 3), (1, 4), (2, 3), (2, 4), (3, 1), (3, 4)\}$

3. Which of these collections of subsets are partitions of $\{1, 2, 3, 4, 5, 6\}$?

- a) $\{\{1, 2\}, \{2, 3, 4\}, \{4, 5, 6\}\}$ b) $\{\{1\}, \{2, 3, 6\}, \{4\}, \{5\}\}$
 c) $\{2, 4, 6\}, \{1, 3, 5\}$ d) $\{1, 4, 5\}, \{2, 6\}$

4. Answer these questions for the poset $(\{1\}, \{2\}, \{4\}, \{1, 2\}, \{1, 4\}, \{2, 4\}, \{1, 2, 4\})$.

- a) Find the maximal elements.

- b) Find the minimal elements.

- c) Is there a greatest element?

- d) Is there a least element?

- e) Find all upper bounds of $\{\{2\}, \{4\}\}$.

- f) Find the least upper bound of $\{\{2\}, \{4\}\}$, if it exists.

- g) Find all lower bounds of $\{\{1, 3, 4\}, \{2, 3, 4\}\}$.

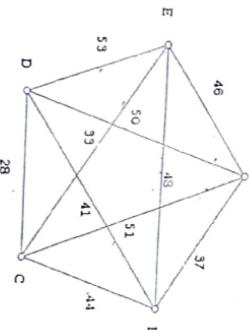
- h) Find the greatest lower bound of $\{\{1, 3, 4\}, \{2, 3, 4\}\}$, if it exists.

5. Prove that for every positive integer n ,

$$1 + 2 + 3 + \dots + n(n+1) = n(n+1)(n+2)/3.$$

6.

3



Find Minimum spanning tree for the given graph. Provide the list of edges in the order as they are added to the MST tree and the weight of tree.

DEPARTMENT OF INFORMATION TECHNOLOGY
 II YEAR B.E. MIDTERM-II (JULY-DEC. 2015)
DISCRETE STRUCTURE (IT2806)

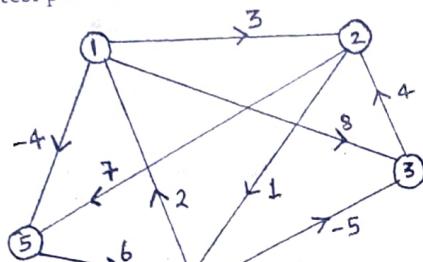
Max. Mark : 20

Time : 1 Hour

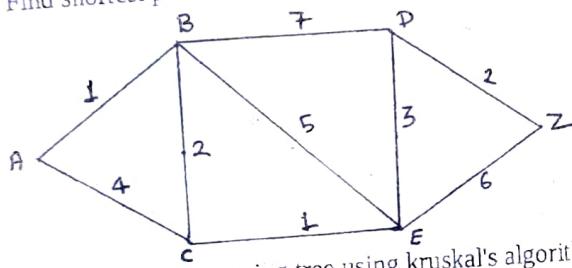
Note: Answer all Questions.

Assume suitable missing data, if any.

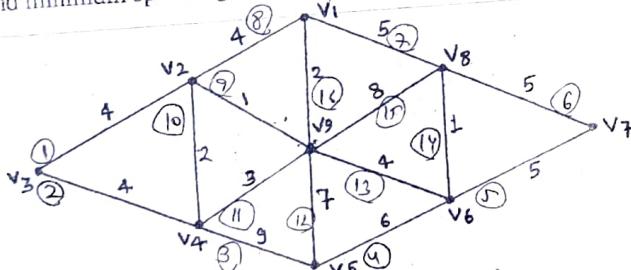
- Q:1 Explain relational model for database. (2)
 Q:2 Find shortest path between all pairs of vertices using warshall's algorithm. (4)



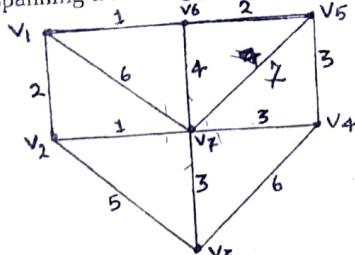
- Q:3 Find shortest path between A and Z using dijkstra algorithm. (2)



- Q:4 Find minimum spanning tree using kruskal's algorithm. (4)



- Q:5 Find minimum spanning tree using prim's algorithm. (4)



- Q:6 How many rows appear in the truth table for each of these compound propositions. (4)

$$(a) (q \vee p \vee r) \rightarrow (s \wedge t)$$

$$(b) (p \rightarrow q) \leftrightarrow (q \vee \neg p)$$

Also write the truth tables.

DEPARTMENT OF INFORMATION TECHNOLOGY
DISCRETE STRUCTURES - IT 2806 (JULY-DEC.'2013)

MAX MARKS : 20

TIME : 1 HR.

- Q.1 Justify whether following statements are true or false- (4)
 a) If A, B and C are three sets then $(B-A) \cup (C-A) = (B \cup C) - A$
 b) If $A = \{\}, \{\{\}\}$, then $\{\{\{\}\}\} \in P(A)$
 c) If $B = \{a, \{a\}\}$, then $\{\{a\}\} \subseteq P(B)$
 d) If C is a set then $\{C\} \cap P(C) = C$
- Q.2 Among 75 children, who went to an amusement park, where they could ride on merry-go-round, roller coaster and ferris wheel. It is known that 20 of them had taken all the three rides, and 55 had taken at least two of the 3 rides. Each ride costs Rs 0.50 and total receipt of park is Rs. 70. Determine the number of children who did not try any one of the rides. (2)
- Q.3 Show that $1^3 + 2^3 + \dots + n^3 = (1 + 2 + \dots + n)^2$ (2)
- Q.4 Using Cantor's diagonal argument, prove that real numbers between 0 and 1 is uncountable set. (2)
- Q.5 Draw Hasse diagram for following relations and find first element, last element, minimal element/s and maximal element/s (if any) (4)
 (i) $R = \{(1,1), (2,2), (3,3), (4,4), (5,5), (1,3), (1,4), (1,5), (2,3), (2,4), (2,5), (3,4), (3,5), (4,5)\}$
 (ii) $R = \{(1,1), (2,2), (3,3), (4,4), (5,5), (1,3), (1,4), (1,5), (2,3), (2,4), (2,5), (3,4), (3,5)\}$
- Q.6 Find Least upper bound and Greatest Lower bound for subsets $\{b,c\}$, $\{a,b,d\}$ and $\{b,c,d\}$ for relation $R = \{(a,a), (b,b), (c,c), (d,d), (a,b), (a,c), (a,d), (b,d), (c,d)\}$ (3)
- Q.7 Find whether relation R1 and R2 are equivalence or partial order or none (3)
 (i) $R1(a,b)$ if $(a+b)$ is even over the set of integers
 (ii) $R2(a,b)$ if $(a+b)$ is odd over the set of integers

Max. Marks: 20

TEST-I (Feb. - 17)
II-BE (IT)

Time: 1 hour

HU28515: Humanities, Environment and Engineering Economics

Note: Attempt all questions.

1. State and explain "Law of Demand". Discuss the Determinants of Demand. [5]
2. Explain the concept of price elasticity of demand. Discuss different degrees of price elasticity of demand? [5]
3. What are the difference between Microeconomics and Macroeconomics? [5]
4. Demand for the firm's product has been estimated to be
 $Q_d = 500 - 150P$
If the price of the product is Rs 2 per unit, find out the price elasticity of the demand at this price. [5]

TEST-II (MAR-17)

II-BE (IT)

Max Marks: 20

Time: 1 hour

HU28515: Humanities, Environment & Eng. Economics

Note: All questions are compulsory

1. What is democracy? Discuss essential conditions for the success of the democracy. [5]
2. Differentiate between social institution and social association. [5]
3. What is income consumption curve and price consumption curve? Draw ICC and PCC for normal goods and inferior goods. [5]
4. Explains consumer's equilibrium condition with the help of indifference curve approach. How will a change in consumer's income affect his equilibrium? [5]

Max. Marks: 15
Time: 01 hour

TEST-II(OCT - 14)
II-BE (EE)
IM 22XX: Humn. Env. and Engineering Economics

Note: All questions are compulsory. All carry equal marks.

1. Define ecosystem and environment. Discuss ecological imbalances and list its natural and man-made causes. (05)
2. Differentiate between Monopoly and monopolistic competition. (04)
3. Discuss following (ANY TWO):
 - (a) Rostov's stages of development
 - (b) Factors of economic development
 - (c) Price determination in perfect competition
 - (d) Equilibrium of a firm

Max. Marks: 20
Time: 01 hour

TEST-II (Oct. - 13)
II-BE EE
IM 2213: Humn. and Engineering Economics

Note: Attempt any two questions from first three. Question no.4 is compulsory

1. Define elasticity of demand? Discuss its determinants and importance. (06)
2. Discuss Law of returns to variable proportions. State cause behind their operation. (06)
3. What do you understand by Public opinion? Discuss factors affecting it? (06)
4. Discuss following (ANY TWO):
 - a) Political Parities in democracy
 - b) Relation between AC and MC
 - c) Isoquant and DMRTS (08)

II B.E Electrical
TEST-II
IM-2213: ENGINEERING ECONOMICS

Time: 1 Hr.

Max marks: 20

1.	What is equilibrium price? Explain the rationing and tax effect on the equilibrium.	04
2.	Explain break even point through proper sketch. Discuss the significance of break even point and margin of safety in production planning	06
3.	Differentiate monopolistic competition from perfect competition and monopoly.	04
4.	What do you understand by firm's equilibrium? How the equilibrium of a monopolist is different from that of a perfectly competitive firm? Explain.	06

M.B.E. (Electr.)

Max. Marks: 10
 Time: 01 hour

TEST-I (Aug. - 12)
II-BE (EE)
IM 2213: Humn. and Engineering Economics

Note: All questions are compulsory

1. What is indifference curve? Explain with its characteristics. (1+2)
2. What is law of demand? Why does demand curve slope downward from left to right? (1+2)
3. Explain the following (ANY TWO) (04)
 - a) Equilibrium price.
 - b) Consumer equilibrium
 - c) Price policy and elasticity of demand

II B.E Electrical
TEST-I
IM-2213: ENGINEERING ECONOMICS

Max marks: 25

Time: 1 Hr.

- | | |
|--|----|
| 1. Define Consumers Equilibrium | 02 |
| 2. Illustrate and explain expansion path and laws of return to scale | 05 |
| 3. How does income flow in a four sector economy? | 03 |
| 4. What is Law of Demand? Why does the demand curve slope downward? Explain. | 05 |
| 5. Explain & illustrate Returns to variable proportion. | 05 |
| 6. Explain Implicit and explicit Costs. | 05 |

II B.E Electrical
TEST-II (Sem A 2012-2013)
IM-2213: HUMN. AND ENGINEERING ECONOMICS

Max marks: 20

Time: 1 Hr.

Attempt any three (first question is compulsory)

	Question	Marks
1.	What is equilibrium price? Explain the tax effect on the equilibrium.	07
2.	Explain break even point through proper sketch. If the cost function of a firm is $C=50+20Q+Q^2$ and the demand function is $P=500-5Q$; then compute the break even quantities.	06
3.	Differentiate monopolistic competition from perfect competition and monopoly.	06
4.	Discuss Price Determination under Perfect Competition. How does time element affect it under perfect competition?	06

Max. Marks: 20
Time: 01 hour

TEST-II (Sept.. - 15)
II-BE (EE)
IM 2213: Humn., Env. and Engineering Economics

Note: Attempt all questions.

1. The market demand and supply functions of a product 'X' are $Q_d = 28 - 4P$ and $Q_s = -14 + P$. Then determine equilibrium price and effect of an indirect tax of Rs. 2/- per unit on this equilibrium price. (06)

OR

- Define Break Even? Discuss its importance in production planning.
2. State and illustrate law of return to scale and expansion path. Discuss Economies of scale (06)
3. Discuss following (ANY TWO): (08)
a) Relation between AC and MC
b) Social Institution
c) Organs of Government

SGSITS INDORE

TEST - I

Sub: IM 22XX, Environment, Economics & Humanities

MM:15

- Q1. Discuss in detail the role of humanities in modern engineering by giving suitable examples
Q2. Define demand. Discuss its various determinants.
Q3. Write short notes on any two:
(i) Determinants of elasticity of demand, (ii) three sector economic model, (iii) Applications of elasticity of demand

Note : Question 1 is compulsory. From Question 2 to Question 6 Attempt any one part from a and b and similarly one part from c and d.

Q.1 Do as directed.

1. Let set $A = \{1, 2\}$ and $B = \{3, 4\}$ then $A \times B$ (Cartesian product of set A and B) is 20
2. If set A has 3 elements then number of elements in $A \times A \times A$ are.....
3. If set A and B have 3 and 4 elements respectively then the number of subsets of set $(A \times B)$ is
 a) True b) False
4. The truth value of given statement is 'If 9 is prime then 3 is even'.
 a) True b) False
5. Let P: We should be honest., Q: We should be dedicated, R: We should be overconfident.
 Then 'We should be honest or dedicated but not overconfident' is best represented by:
 a) $\sim P \vee \sim Q \vee R$ b) $P \wedge \sim Q \wedge R$ c) $P \vee Q \wedge R$ d) $P \vee Q \wedge \sim R$
6. The compound propositions p and q are called logically equivalent if $p \leftrightarrow q$ is a tautology.
 a) True b) False
7. List the ordered pairs in the relation R from $A = \{0, 1, 2, 3, 4\}$ to $B = \{0, 1, 2, 3\}$, where $(a, b) \in R$ if and only if $a \mid b$.
8. Maximum number of edges in a bipartite graph with 12 vertices are
9. How many vertices and how many edges does graphs W_n have?
10. Let R be a symmetric and transitive relation on a set A. Then R is reflexive and hence an equivalence relation. a) True b) False
11. $(p \rightarrow q) \wedge (p \rightarrow r)$ is logically equivalent to:
 a) $p \rightarrow (q \wedge r)$ b) $p \rightarrow (q \vee r)$ c) $p \wedge (q \vee r)$ d) $p \vee (q \wedge r)$
12. The minimum number of edges in a connected graph with n vertices is
13. The set of rational numbers is an abelian group under addition. a) True b) False
14. $\neg(p \rightarrow q)$ is logically equivalent to:
 a) $p \rightarrow \neg q$ b) $\neg p \leftrightarrow q$ c) $\neg p \leftrightarrow \neg q$ d) $\neg q \leftrightarrow \neg p$
15. Which of the following statements is/are TRUE for undirected graphs?
 P: Number of odd degree vertices is even.
 Q: Sum of degrees of all vertices is even.
16. The set $\{1, 2, 3, 7, 8, 11, 13, 14\}$ is a group under multiplication modulo 15. the inverse of 4 and 7 are respectively:
 a) 3 and 13 b) 2 and 11 c) 4 and 13 d) 8 and 14
17. The number of equivalence relations on the set $\{1, 2, 3, 4\}$ is
 a) 15 b) 16 c) 24 d) 4
18. Consider the following sequence 3, 6, 12, 24, 48 ... define this sequence recursively.
19. The depth of complete binary tree with n nodes is
20. Let G be the non-planar graph with the minimum possible number of edges. Then G has
 a) 9 edges and 5 vertices b) 9 edges and 6 vertices
 c) 10 edges and 5 vertices d) 10 edges and 6 vertices

Q.2 Attempt any one part from a and b and similarly one part from c and d.

- A a) Prove that $1^2 + 3^2 + 5^2 + \dots + (2n+1)^2 = (n+1)(2n+1)(2n+3)/3$ whenever n is a nonnegative integer.

b)

Prove that for every positive integer n,

$$1 \cdot 2 + 2 \cdot 3 + \dots + n(n+1) = n(n+1)(n+2)/3.$$

OR

- B a) Among 10 students, 5 study mathematics, 6 study science, and 2 study both. How many of these students study neither mathematics nor science?

b) Among 18 students in a room, 7 study mathematics, 10 study science, and 10 study computer programming. Also, 3 study mathematics and science, 4 study mathematics and computer programming, and 5 study science and computer programming. We know that 1 student studies all three subjects. How many of these students study none of the three subjects? 5

C Answer these questions for the poset $(\{1\}, \{2\}, \{4\}, \{1, 2\}, \{1, 4\}, \{2, 4\}, \{1, 3, 4\}, \{2, 3, 4\}, \subseteq)$.

- Find the maximal elements.
- Find the minimal elements.
- Is there a greatest element?
- Is there a least element?
- Find all upper bounds of $\{\{2\}, \{4\}\}$.
- Find the least upper bound of $\{\{2\}, \{4\}\}$, if it exists.
- Find all lower bounds of $\{\{1, 3, 4\}, \{2, 3, 4\}\}$.
- Find the greatest lower bound of $\{\{1, 3, 4\}, \{2, 3, 4\}\}$, if it exists.

OR

D For each of these relations on the set $\{1, 2, 3, 4\}$, decide whether it is reflexive, whether it is symmetric, whether it is antisymmetric, and whether it is transitive 5

- $\{(2, 2), (2, 3), (2, 4), (3, 2), (3, 3), (3, 4)\}$
- $\{(1, 1), (1, 2), (2, 1), (2, 2), (3, 3), (4, 4)\}$
- $\{(2, 4), (4, 2)\}$
- $\{(1, 2), (2, 3), (3, 4)\}$
- $\{(1, 1), (2, 2), (3, 3), (4, 4)\}$
- $\{(1, 3), (1, 4), (2, 3), (2, 4), (3, 1), (3, 4)\}$

Q.3 Attempt any one part from a and b and similarly one part from c and d. 5

A Translate each of these statements into logical expressions using predicates, quantifiers, and logical connectives.
 a) No one is perfect.
 b) Not everyone is perfect.
 c) All your friends are perfect.
 d) At least one of your friends is perfect.
 e) Everyone is your friend and is perfect.

OR

B Consider the conditional proposition $p \rightarrow q$. Find the converse, inverse, and contrapositive of the conditional $p \rightarrow q$. Which if any of these propositions are logically equivalent to $p \rightarrow q$? 5

C a) Verify that the proposition $p \vee \neg(p \wedge q)$ is a tautology.
 b) Show that the propositions $\neg(p \wedge q)$ and $\neg p \vee \neg q$ are logically equivalent. 5

D a) Determine the validity of the following argument: $p \rightarrow q, \neg p \vdash \neg p$.
 b) Let $A = \{1, 2, 3, 4, 5\}$. Determine the truth value of each of the following statements:
 i) $(\exists x \in A)(x + 3 = 10)$
 ii) $(\exists x \in A)(x + 3 < 5)$
 iii) $(\forall x \in A)(x + 3 < 10)$
 iv) $(\forall x \in A)(x + 3 \leq 7)$ 5

Q.4 Attempt any one part from a and b and similarly one part from c and d. 5

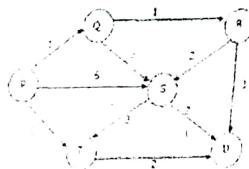
A Find spanning tree for each of the following graphs
 a) K_5 b) $K_{4,4}$ c) $K_{1,6}$
 d) Q_3 e) C_5 f) W_5

OR

B Explain Floyd Warshall's (All pairs shortest path) algorithm, take a graph with 3 vertices and take 5

random weight of edges and find the shortest distance from each vertex to each other vertex using all pairs shortest path algorithm.

- C Suppose we run Dijkstra's single source shortest-path algorithm on the following edge weighted directed graph with vertex P as the source. In what order do the nodes get included into the set of vertices for which the shortest path distances are finalized? 5



OR

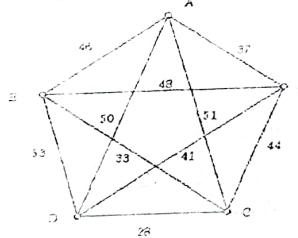
- D Give a brief definition of the following terms :
Euler Circuit, Hamilton Circuit, Bipartite Graph, Complete graph, Regular Graph

Q.5 Attempt any one part from a and b and similarly one part from c and d.

- A Explain Travelling salesman Problem .take a graph with 4 vertices assume each vertex as a city take random distance between 2 vertices ,distance from A to B need not be same as B to A apply travelling salesman problem in this graph by using dynamic programming technique and find the route which salesman should follow to visit all the cities. 5

OR

- B Find Minimum spanning tree for the given graph. Provide the list of edges in the order as they are added to the MST tree and the weight of tree. 5



added to the MST tree and the weight of tree.

- C Explain planar graph, Let G be a connected planar graph with 10 vertices. If the number of edges on each face is three, then the number of edges in G is 5

OR

- D Define Tree with an Example also explain binary tree and binary search trees with appropriate examples. 5

Q.6 Attempt any one part from a and b and similarly one part from c and d.

- A Explain the following terms 5

- a) Recurrence relation
- b) Initial condition
- c) A solution of the recurrence relation
- d) General solution
- e) Unique solution

OR

- B Consider the following third-order homogeneous recurrence relation: 5

$a_n = 11a_{n-1} - 39a_{n-2} + 45a_{n-3}$ Suppose we are also given the initial conditions $a_0 = 5$, $a_1 = 11$, $a_2 = 25$. find general and unique solution of this recurrence relation.

- C Define the following

- a) Algebraic Structure
- b) Semigroup
- c) Monoid
- d) Group
- e) Abelian Group

OR

- D Explain identity elements and inverse elements in groups? Explain each by the help of two examples. 5

$$a+b=0$$

$$a \cdot b$$

2

Time : 3 Hrs.]

50

TOTAL NO. OF QUESTIONS IN THIS PAPER:6

20

Do as directed.

1. Translate $\exists x(C(x) \rightarrow F(x))$ into English, where $C(x)$ is "x is a comedian" and $F(x)$ is "x is funny" and the domain consists of all people.
2. Determine whether each of these pair of set is equal $\{1,3,3,3,5,5,5,5\}$, $\{5,3,1\}$
3. Determine whether this statement is true or false $\{0\} \subset \emptyset$
4. How many elements $P(\{a,b,\{a,b\}\})$ have where a and b are distinct elements?
5. What is the cardinality of $\{a,\{a\},\{a,\{a\}\}\}$.
6. Determine whether $a^n = 3a^{n-1} + 4a^{n-2} + 5a^{n-3}$ is linear homogeneous recurrence relations with constant coefficients or not. Also, find the degree of this recurrence relations.
7. Let R be the relation represented by the matrix

$$MR = \begin{bmatrix} 0 & 1 & 1 \\ 1 & 0 & 1 \\ 1 & 0 & 1 \end{bmatrix}$$

Find the matrix representing R^{-1} .

8. Let R be the relation on the set $\{0,1,2,3\}$ containing the ordered pairs $(0,1)$, $(1,1)$, $(1,2)$, $(2,0)$, $(2,2)$, and $(3,0)$. Find the reflexive closure of R.
9. Let $A = \{a, b\}$. Describe the language $L(r)$ where: $r = abb^*a$.
10. How many different elements does A^n have when A has m elements and n is a positive integer.
11. Represent W_4 graph with an adjacency matrix.
12. What is the sum of entries in a row of the adjacency matrix for an undirected graph? for a directed graph?
13. Show that $p \rightarrow q$ and $p \rightarrow q$ are logically equivalent.
14. How many edges must be removed from a connected graph with n vertices and m edges to produce a spanning tree.
15. What is context free grammar.
16. Let $A = \{a, b\}$. Describe verbally the following languages over A (which are subsets of A^*):
 $L = \{(ab)^m \mid m > 0\}$
17. List the member of $\{x \mid x$ is the square of an integer and $x < 100\}$
18. Define pigeon hole principle.
19. Represent the expression $(x+xy) + (x/y)$ using binary tree and write this express in postfix notation.
20. List the ordered pairs in the relation R from $A = \{0,1,2,3,4\}$ to $B = \{0,1,2,3\}$ where $(a, b) \in R$ if and $a > b$.

Attempt any one part from a and b and similarly one part from c and d.

Determine whether each of these sets is finite, countably infinite, or uncountable. For those that are countably infinite, exhibit a one-to-one correspondence between the set of positive integers and that set.

- a) the negative integers
- b) the even integers
- c) the real numbers between 0 and 1
- d) the positive integers less than 1,000,000,000
- f) the integers that are multiples of 7

OR

For each of these relations on the set $\{1,2,3,4\}$, decide whether it is reflexive, whether it is symmetric, whether it is antisymmetric, and whether it is transitive.

- a) $\{(2,2), (2,3), (2,4), (3,2), (3,3), (3,4)\}$

- b) $\{(1,1), (1,2), (2,1), (2,2), (3,3), (4,4)\}$
 c) $\{(2,4), (4,2)\}$ d) $\{\cancel{(1,1)}, \cancel{(2,1)}, \cancel{(3,1)}\}$
 d) $\{(1,1), (2,2), (3,3), (4,4)\}$
 e) $\{(1,3), (1,4), (2,3), (2,4), (3,1), (3,4)\}$

- C Answer these questions for the poset $(\{3, 5, 9, 15, 24, 45\}, |)$.
- Find the maximal elements.
 - Find the minimal elements.
 - Is there a greatest element?
 - Find all upper bounds of $\{3, 5\}$.
 - Find the least upper bound of $\{3, 5\}$, if it exists.
 - Find all lower bounds of $\{15, 45\}$.
 - Find the greatest lower bound of $\{15, 45\}$, if it exists.

OR

- D State the converse, contrapositive, and inverse of each of these conditional statements.
- If it snows today, I will ski tomorrow.
 - I come to class whenever there is going to be a quiz.
 - A positive integer is a prime only if it has no divisors other than 1 and itself.

- Q.3 A Attempt any one part from a and b and similarly one part from c and d.
- Let $S(x)$ be the predicate "x is a student," $F(x)$ the predicate "x is a faculty member," and $A(x,y)$ the predicate "x has asked y a question," where the domain consists of all people associated with your school. Use quantifiers to express each of these statements.

- Every student has asked Professor Gross a question.
- Every faculty member has either asked Professor Miller a question or been asked a question by Professor Miller.
- There is a faculty member who has never been asked a question by a student.
- Some student has asked every faculty member a question.
- There is a faculty member who has asked every other faculty member a question.

OR

- B Let M be the automaton with the following input set A , state set S with initial state s_0 , and accepting

("yes") state set Y : $A = \{a, b\}$, $S = \{s_0, s_1, s_2\}$, $Y = \{s_2\}$

Suppose nextstate function F of M is given by the table

- Draw the state diagram $D = D(M)$ of M .
- Describe the language $L = L(M)$ accepted by M .

	a	b
s_0	s_1	s_0
s_1	s_0	s_2
s_2	s_1	s_2

- C Determine the type of grammar G which consists of the following productions:

- $S \rightarrow aA, A \rightarrow aAB, B \rightarrow b, A \rightarrow a$
- $S \rightarrow aAB, AB \rightarrow bB, B \rightarrow b, A \rightarrow aB$
- $S \rightarrow aAB, AB \rightarrow a, A \rightarrow b, B \rightarrow AB$
- $S \rightarrow aB, B \rightarrow bA, B \rightarrow b, B \rightarrow a, A \rightarrow aB, A \rightarrow a$

OR

- D Let $P(x)$ be the statement "x spends more than five hours every weekday in class," where the domain for x consists of all students. Express each of these quantifications in English.

- $\exists x P(x)$
- $\forall x P(x)$
- $\exists x \neg P(x)$
- $\forall x \neg P(x)$

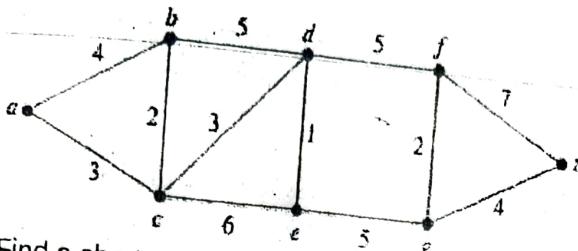
- Q.4 A Attempt any one part from a and b and similarly one part from c and d.

How many vertices and how many edges do these graphs have?

- K_n
- C_n
- W_n
- $K_{m,n}$
- Q_n

OR

B



5

Find a shortest path between a and z using dijkstra algorithm.

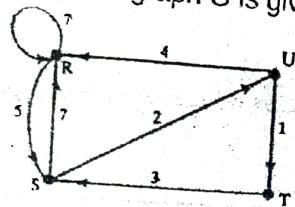
C

What is binary search tree. Using alphabetical order, construct a binary search tree for the words in the sentence "The quick brown fox jump over the lazy dog."

5

D

Weighted graph G is given. Apply warshall algorithm and find Q0, Q1, Q2, Q3 and Q4.
OR

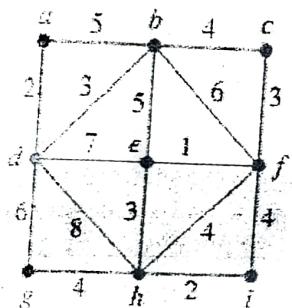


5

Q.5
A

Attempt any one part from a and b and similarly one part from c and d.

5

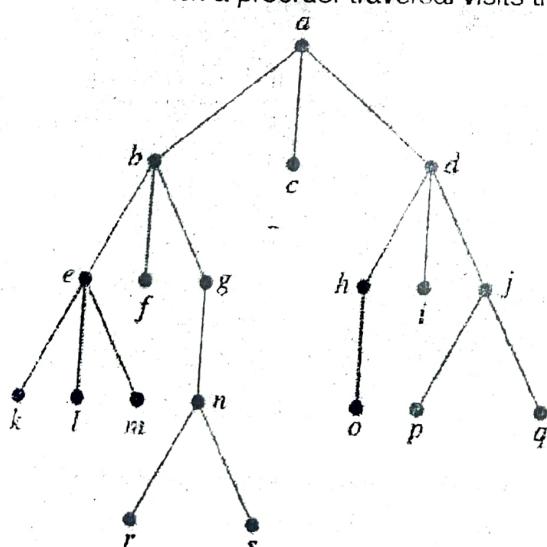


Use kruskal's algorithm to find a minimum spanning tree for the weighted graph.

OR

B What are different tree traversal order. For the given ordered rooted tree determine the order in which a preorder traversal visits the vertices.

5

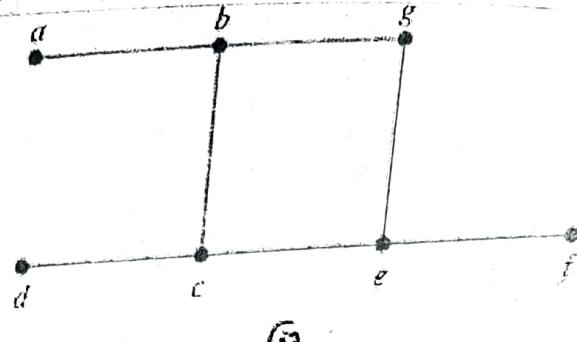
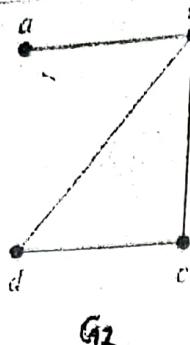
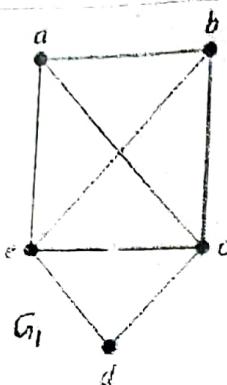


C

What is Hamilton circuit and euler circuit. Which of the simple graphs in Figure have a

5

Hamilton circuit or, if not, a Hamilton path? give explanation.



OR

- D Use Huffman coding to encode the following symbols with the frequencies listed: A: 0.08, B: 5
0.10, C: 0.12, D: 0.15, E: 0.20, F: 0.35. What is the average number of bits used to encode a character?

Q.6 Attempt any one part from a and b and similarly one part from c and d.

- A Consider the third-order homogeneous recurrence relation $a_n = 6a^{n-1} - 12a^{n-2} + 8a^{n-3}$ 5
 (a) Find the general solution.
 (b) Find the solution with initial conditions $a_0 = 3, a_1 = 4, a_2 = 12$.

OR

- B Consider the set Q of rational numbers, and let * be the operation on Q defined by
 $a * b = a + b - ab$
 (a) Find: (i) $3 * 4$; (ii) $2 * (-5)$; (iii) $7 * (1/2)$.
 (b) Is $(Q, *)$ a semigroup? Is it commutative?
 (c) Find the identity element for *.
 (d) Do any of the elements in Q have an inverse? What is it?

- C Prove that $1^2 + 3^2 + 5^2 + \dots + (2n+1)^2 = (n+1)(2n+1)(2n+3)/3$ whenever n is a nonnegative integer. 5

- D Define rings, integral domains, and fields.

Time : 3 Hrs.]

[Max. Marks : 70

TOTAL NO. OF QUESTIONS IN THIS PAPER : 6

Note : Question 1 is compulsory. From Question 2 to Question 6 Attempt any one part from A and B and similarly one part from C and D.

Q.1 Do as directed.

1. The number of elements in the power set $P(S)$ of the set $S = \{\{\emptyset\}, 1, \{2, 3\}\}$ is _____.
2. Power set of empty set has exactly _____ subset.
3. Let A be a finite set of size n , the number of element in power set of $A \times A$ is _____.
4. Let $A = \{1, 2, 3, 4, 5\}$. Determine the truth value of the following statements: $\exists x \in A)(x + 3 = 10)$.
5. Identify the correct translation into logical notation of the following assertion. "Some boys in the class are taller than all the girls". Note : $\text{taller}(x, y)$ is true if x is taller than y .
6. What is the equivalent of $\neg \forall x(P(x))$.
7. Let $f(x) = x^2 + x$ and $g(x) = x + 1$ then $f \circ g$ is _____.
8. List the ordered pairs in the relation R from $A = \{0, 1, 2, 3, 4\}$ to $B = \{0, 1, 2, 3\}$, where $(a, b) \in R$ if and only if $a | b$.
9. Suppose $R = \{(1, 3), (1, 4), (2, 3), (2, 4), (3, 1), (3, 4)\}$ is a relations on the set $\{1, 2, 3, 4\}$, decide whether it is reflexive, symmetric, antisymmetric, transitive.
10. How many vertices and how many edges do this graphs W_n have?
11. How can the matrix representing a relation R on a set A be used to determine whether the relation is irreflexive?
12. $\{\emptyset\} \subseteq \{\emptyset\}$ is true or false.
13. The minimum number of edges in a connected graph with n vertices is _____.
14. A graph is planer if and only if it does not contain subgraphs homomorphic to _____ or _____.
15. The total number of edges in a complete graph of n vertices is _____.
16. The number of binary trees with 3 nodes which when traversed in postorder gives the sequence A, B, C is _____.
17. Traversal techniques list the nodes of binary search tree in ascending order.
18. $a_n = 2a_{n-1} a_{n-2} + n^2$
This recurrence relation is _____(linear/not linear) and _____(homogeneous/nonhomogeneous relation). Define this sequence recursively.
19. Consider the following sequence 3, 6, 12, 24, 48 Define this sequence recursively.
20. The depth of complete binary tree with n nodes is _____.

Q.2

Attempt any one part from A and B and similarly one part from C and D.
A. Prove that $1^2 + 3^2 + 5^2 + \dots + (2n + 1)^2 = (n + 1)(2n + 1)(2n + 3)/3$ whenever n is a nonnegative integer.

OR

B. A survey on a sample of 25 new cars being sold at a local auto dealer was conducted to see which of three popular options, air-conditioning (A), radio (R), and power windows (W), were already installed. The survey found: 15 had air-conditioning (A), 12 had radio (R), 11 had power windows (W), 5 had A and P, 9 had A and R, 4 had R and W, 3 had all three options. Find the number of cars that had: (a) only W; (b) only A; (c) only R; (d) R and W but not A; (e) only one of the options; (f) at least one option; (h) none of the options.

C. Consider the following five relations on the set $A = \{1, 2, 3\}$:

$$R = \{(1, 1), (1, 2), (1, 3), (3, 3)\},$$

$$S = \{(1, 1)(1, 2), (2, 1)(2, 2), (3, 3)\},$$

$$T = \{(1, 1), (1, 2), (2, 2), (2, 3)\}$$

\emptyset = empty relation

$A \times A$ = universal relation

Determine whether or not each of the above relations on A is: (a) reflexive; (b) symmetric; (c) transitive; (d) antisymmetric.

OR

D. Draw the Hasse diagram for inclusion on the set $P(S)$, where $S = \{a, b, c, d\}$.

E. Attempt any one part from A and B and similarly one part from C and D.

Consider the following propositional statements: $P_1 : ((A \wedge B) \rightarrow C) \equiv ((A \rightarrow C) \wedge (B \rightarrow C))$ and

P2 : $((A \vee B) \rightarrow C) \equiv ((A \rightarrow C) \vee (B \rightarrow C))$. Check whether P1 and P2 are both tautologies or not.
 OR

(B) Translate each of these statements into logical expressions using predicates, quantifiers, and logical connectives.

- No one is perfect.
- Not everyone is perfect.
- All your friends are perfect.
- At least one of your friends is perfect.
- Everyone is your friend and is perfect.

(C) (i). A logical binary relation \square is defined as follows:

A	B	$A \square B$
True	True	True
True	False	True
False	True	False
False	False	True

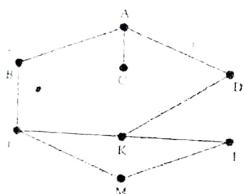
Let \sim be the unary negation (NOT) operator, with higher precedence than \square . Show that the $\sim(\sim A \square B)$ is equivalent to $\sim A \wedge B$.

(ii). Determine the validity of the following argument: $p \rightarrow q, \neg p \vdash \neg p$.
 OR

(D) Consider the conditional proposition $p \rightarrow q$. Find the converse, inverse, and contrapositive of the conditional $p \rightarrow q$. Which if any of these propositions are logically equivalent to $p \rightarrow q$?

Attempt any one part from A and B and similarly one part from C and D.

(i). Consider the graph G (where the vertices are ordered alphabetically). Find the order in which the vertices of G are processed using a DFS (depth-first search) and BFS (breadth first search) algorithm beginning at vertex A.



(ii). Suppose the six weights 4, 15, 25, 5, 8, 16 are given. Find a Huffman coding tree T with the given weights, and with a minimum path length P.

(B) Find spanning tree for each of the following graphs

- | | | |
|----------|--------------|--------------|
| a) K_5 | b) $K_{4,4}$ | c) $K_{1,6}$ |
| d) Q_3 | e) C_5 | f) W_5 |

OR

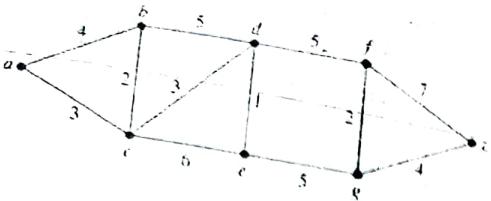
C Explain pruning algorithm for graphs.

D Give a brief definition of the following terms (any FIVE):

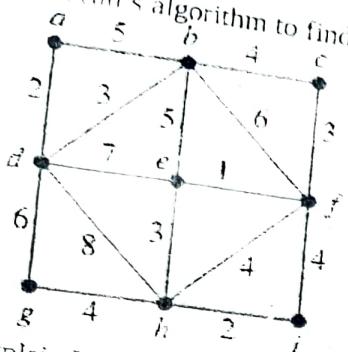
Euler Circuit, Hamilton Circuit, Bipartite Graph, Complete Graph, Regular Graph

Q5
A

Attempt any one part from A and B and similarly one part from C and D.
 Find the length of a shortest path between a and z in the given weighted graph.



Use Prim's algorithm to find a minimum spanning tree for the given weighted graph OR



Explain Warshall's algo for graphs

D

(i). Describe three different methods that can be used to draw a graph.
(ii). Draw a simple graph.

(i). Describe three different methods that can be used to represent a graph.
(ii). Draw a simple graph with at least five vertices and eight edges. Use the methods you described in (i).

Attempt any one part.

Q.6

Attempt any one part from A and B and similarly one part from C and D.
 Consider the celebrated Fibonacci sequence:
 $a_n = a_{n-1} + a_{n-2}$, with

$$a_n = a_{n-1} + a_{n-2} \quad \text{with} \quad a_0 = 0, a_1 = 1$$

(i) Find the next three terms of the sequence.
(ii) Find the general solution.

(iii) Find the general solution.
 (iv) Find the unique solution with the given initial conditions.

OR

Explain the following terms

OR

Recurrence Relation, Initial Condition, Solution of The Recurrence Relation, General Solution, Unique Solution.
State whether or not

State whether or not each of the following five subsets of the positive integer N is closed under the operation of multiplication:

(i). $A = \{0, 1\}$

(ii). $B = \{1, 2\}$

(iii). $B = \{1, 2\}$

(iv) $D = \{2, 4, 6, 8, \dots\}$

$$(V). \quad D = \{2, 4, 6, 8, \dots\} = \{x : x \text{ is even}\}$$

(V). $E = \{1, 3, 5, \dots\} = x : x \text{ is odd } \}$

OR

OR
Explain the following terms: Semigroup, Monoid, Field, Group, Ring.

**NOV-DEC 2015 EXAMINATION
II B.E.(4YDC) INFORMATION TECHNOLOGY
IT-2806: DISCRETE STRUCTURE**

Time: 3 Hrs.]

**Marks : 70
Pass Marks : 22**

TOTAL NO. OF QUESTIONS IN THIS PAPER : 5

Note: Attempt all the questions. Each question has four subparts A, B, C, and D. Attempt any one part from A and B and similarly any one from C and D. Make suitable assumptions wherever necessary and clearly state the same.

Q.1 A 1. Explain with example. (03)

- (i) Countable infinite set
- (ii) Multi set

2. Prove following algebraic properties. (04)

- (i) $A \cup B = B \cup A$
- (ii) $A \cap (B \cap C) = (A \cap B) \cap C$

OR (04)

B Prove the following by principle of mathematical induction (PMI). (04)

(i) If $P_n = x^n - y^n$ show that $(x-y)$ is always a factor of P_n . Where $n \geq 1$.

(ii) Verify that 6 divides $19^n - 13^n$, where $P_n = 19^n - 13^n$ and $n \geq 1$. (03)

C (i) If a relation $R = \{(x, y) : x, y \in N \text{ & } x + y = 8\}$ then find the domain and range of R. (03)

(ii) If $A = \{1, 2, 3, 4, 5, 6, 7, 8\}$ let $x R y$ whenever y is divisible by x . Is R equivalence relation? Also draw diagram for relation R on A . (04)

OR (07)

D A class has 175 students the following description showing the number of students studying one or more of the following subject in this class , mathematics 100,physics 70 ,chemistry 46, mathematics and physics 30, mathematics and chemistry 28, physics and chemistry 23 and none of three subjects 22. find

(i) How many students study all three subjects?

(ii) How many students study exactly one subject out of three?

Q.2 A How many rows appear in the table for these compound propositions? Write a truth table for given propositions. (07)

(i) $(q \vee p \vee r) \rightarrow (s \wedge t)$

(ii) $(p \rightarrow q) \leftrightarrow (q \vee \neg p)$

(iii) $\sim(p \wedge q) \vee (p \rightarrow q)$

OR

B In the following let $\{A,B,C,S\}$ be the set of non-terminal with S being the starting symbol let $\{a,b\}$ be the set of terminal describe the language specification by the set of production either verbally or in set theoretic notation. (07)

$$S \rightarrow AB, A \rightarrow aA, A \rightarrow a, B \rightarrow bB, B \rightarrow b$$

C Find the truth table of the given proposition and check whether it is tautology, contradiction or contingency. (07)

$$((a \vee b) \vee c) \leftrightarrow (a \vee (b \vee c))$$

OR

D 1. Define the following term with suitable example. (03)

(i) Tautology

(ii) contradiction

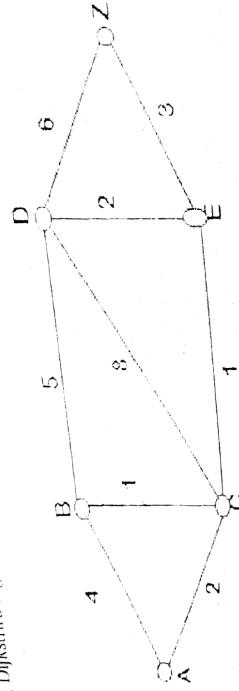
(iii) contingency

2. Explain Russell's paradox with example. (04)

Q.3 A Define the following with example.

- (i) Euler path & Euler circuits
- (ii) Euler Graph and its applications
- (iii) Hamiltonian path & circuits

B Write Dijkstra's algorithm and
Using Dijkstra's algo., find the shortest path between A to Z in given graph (07)

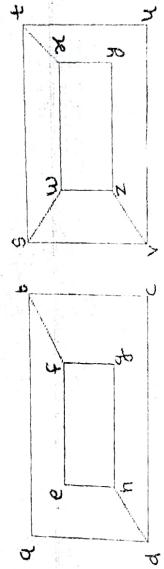


(04)

C 1. Define the following with example.

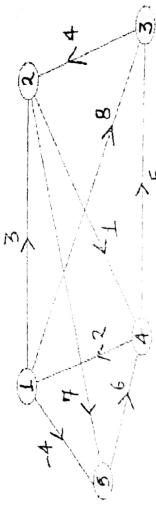
- (i) Weighted graph
- (ii) Digraph
- (iii) connected graph
- (iv) component

2. find isomorphism between given graphs.

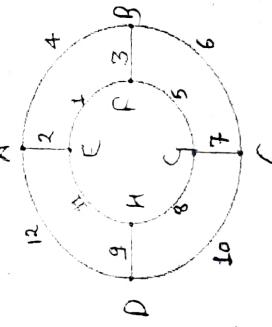


OR

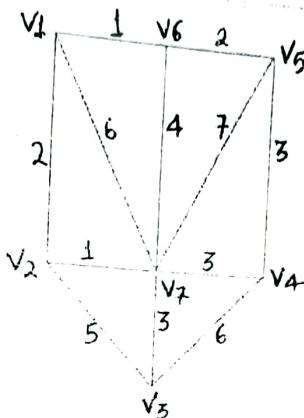
D Find shortest path between all pairs of vertices using Warshall's algorithm. (07)



E A Write Kruskal's algorithm & find minimum spanning tree using Kruskal's algorithm in given graph. (07)



- B Write Prim's algorithm & find minimum spanning tree using Prim's algorithm given (07)



- C A salesman has to visit five cities A, B, C, D and E, the distance (in KM) between the cities are as follows in the matrices form. Find Shortest path using traveling sales man algorithm. (07)

	A	B	C	D	E
A	-	7	6	8	4
B	7	-	8	5	6
C	6	8	-	9	7
D	8	5	9	-	8
E	4	6	7	8	-

OR

- D Define prefix code and write a binary tree of prefix code for given expression. (07)

$$(((a + b * c) d - e) / (f + g)) + h * i * j$$

- Q.5 A Define following with example. (07)

- (i) Generating function
- (ii) Integral Domain
- (iii) Ring

OR

- B What is the total solution of recurrence relation. Find recurrence relation for given expression: (07)

$$u_x = C_1 \cdot 2^x + C_2 \cdot x$$

- C What is Ordered set ? Explain n-tuple ordered sets. (07)

OR

- D Determine the numeric function corresponding to each of the following generating function: (07)

i. $A(z) = \frac{2+3z-6z^2}{1-2z}$

ii. $A(z) = \frac{z^4}{1-2z}$

TOTAL NO. OF QUESTIONS IN THIS PAPER : 5

Note: Attempt all five questions. Each Question has 4 subparts A, B, C and D. Attempt any one part from A & B and similarly any one from C & D.

- Q.1** A 1. Explain with examples- i) Operations on Relations ii) Uncountably Infinite set (2)
 2. What is dual of an expression? Find the dual of $A \cap (B \cup C) = (A \cap B) \cup (A \cap C)$ (2)
 3. Using Venn diagram, find out which of the options (conclusions) are true for the following statements - (3)

i. Some jackfruits are lilies.

ii. No lily is a canoe.

iii. All canoes are oceans.

Conclusions-

a. Some jackfruits are oceans.
 d. Some lilies are jackfruits.

b. Some oceans are canoes.

c. Some oceans are jackfruits.

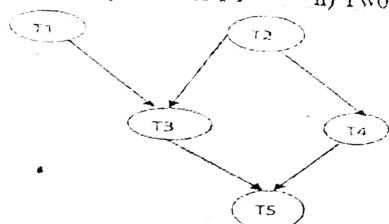
Options-

1. Only a and c 2. Only b and c 3. Only b and d 4. All the conclusions are valid
 5. None of the above conclusions is valid

OR

- B 1. What is a Database? Explain the terms Relational database and primary key. (3)
 2. Prove by Mathematical Induction, the formula for the sum of the first n terms of a geometric progression $a + ar + ar^2 + \dots + ar^{n-1} = a(1-r^n)/(1-r)$ (where r is not equal to 1) (2)
 3. Among 18 students in a room, 7 study maths, 10 study science, and 10 study computer programming. 3 study maths and science, 4 study maths and computer programming, and 5 study science and computer programming. 1 student studies all three subjects. How many students study none of the three subjects? (2)

- C 1. For the following Job Scheduling problem, draw timing diagram for the following scenarios - (2)
 i) Single processor P1 ii) Two processors P1 and P2

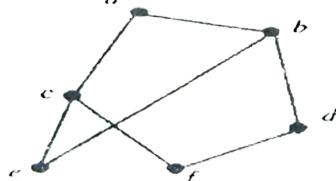


Task	T1	T2	T3	T4	T5
Execution time	3	4	2	1	5

2. Explain chain, maximal chain and maximum chain by taking suitable example. (3)
 3. What is extended pigeon hole principle? Prove that having 100 whole numbers, one can choose 15 of them so that the difference of any two is divisible by 7. (2)

OR

- D 1. Explain by example – (i) Function Composition (ii) One to one onto function (2)
 2. Consider a poset S as shown below - (3)



Answer the following –

- i) Find all the upper bounds between the elements (c,e,f), if any.
 ii) Find all the lower bounds between the elements (b,c), if any.
 iii) Does this partial order relation represent a lattice?
 3. Explain equivalence class by taking example. What are the characteristics of equivalence class? (2)

- A 1. Using truth table, find $\neg((p \rightarrow (q \rightarrow r)) \rightarrow ((p \rightarrow q) \rightarrow (p \rightarrow r)))$ is a tautology or not? (5)
 2. Explain ordered set by taking suitable example. (2)

OR

- B** 1. What is Barber's paradox? Explain Russell's paradox by taking example. (4)
 2. Explain along with the truth tables a) Modus Tollen Rule b) Inverse c) Disjunctive Syllogism (3)

- C** 1. Explain Phrase Structure Grammar and types of Phrase Structure Grammar by taking examples. (5)
 2. Find whether the strings ppqqp and qpqpq are generated by following grammar or not? (S is the starting symbol, P and Q are non terminals, p and q are terminals). (2)

$$S \rightarrow PQ \mid ppQ$$

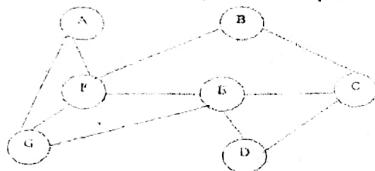
$$P \rightarrow p \mid pQ \mid qP$$

$$Q \rightarrow qpq$$

OR

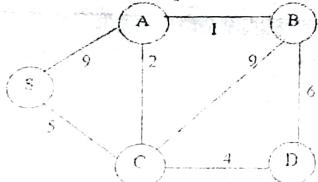
- D** 1. What is predicate logic? Express the statements using predicates and quantifiers - (4)
 (i) All birds are beautiful (ii) All beautiful objects are precious (iii) Some birds are not precious
 2. Let P, Q, R be the proposition where P = It is raining, Q = Mary is Sick, R = Paris is capital of France. Write the English sentences for following - (i) $P \wedge Q$ (ii) $\neg R \wedge \neg P$ (iii) $(Q \wedge P) \rightarrow R$ (3)

- Q.3** **A** 1. i) If there are 21 edges in a 3 regular graph, then number of vertices in the graph will be _____ (4)
 ii) Number of edges in a complete asymmetric graph of 6 vertices is _____
 iii) Explain with example - a) Mixed graph b) Isomorphic graph
 2. For the given graph, find (i) Distance matrix (ii) Diameter (iii) Radius (iv) vertex connectivity (v) edge connectivity (vi) complement of the graph (3)



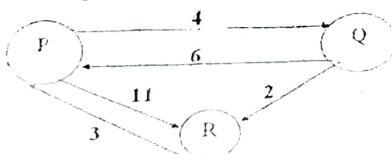
OR

- B** 1. Find the shortest path from vertex "S" to vertex "D" using Dijkstra's Algorithm. (5)



2. What is bipartite graph? Is Complete bipartite graph $K_{3,4}$ planar? (2)

- C** 1. Find all pair shortest path using Warshall's algorithm. (5)

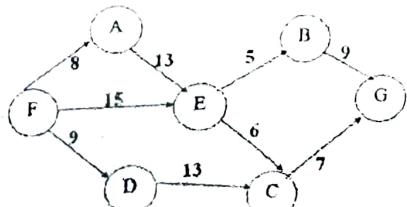


2. What is Konigsberg bridge problem? Find a euler path/circuit for the following graph (if any) - (2)



OR

- D** 1. Find shortest path from vertex "F" to all other vertices using Pruning Algorithm. (5)



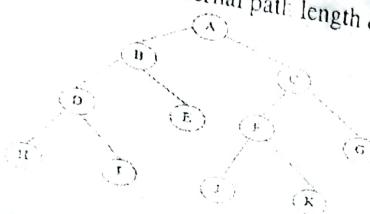
2. Draw the graph and also write the degree sequence of the graphs - i) C_5 ii) $K_{2,6}$ (2)

Q.4 A

What is prefix code? What is the usage of prefix code? For the following string construct a rooted tree and find prefix code for each character using Huffman Coding. Also find the average number of bits used to encode a symbol. Input string is DATA COMPRESSION IS COOL

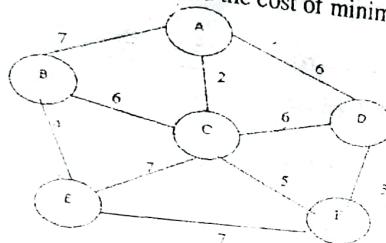
OR

- B 1. Explain the terms by taking examples - i) Forest ii) M-ary tree and full M-ary tree
2. What is the relation between internal and external path length of a rooted tree? For the following tree, calculate internal path length & external path length and verify the relation.



C

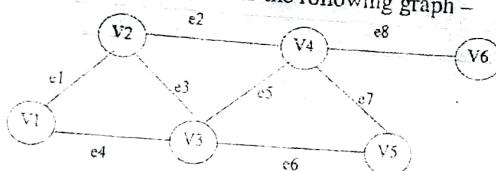
Construct Minimum Spanning tree of the following graph using i) Prim's algorithm ii) Kruskal's algorithm. Also find the cost of minimum spanning tree from both the approaches.



D

1. What is the usage of Binary search tree? Construct a binary search tree for the words in alphabetic order - mathematics, physics, geography, zoology, meteorology, geology, psychology, chemistry
2. Explain Euler's formula for planar graph with example.
3. Find any four cut sets for the following graph -

OR



Q.5

- A 1. Find homogeneous solution for recurrence relation $a_n = 8a_{n-1} - 16a_{n-2}$ where $a_2 = 16$ and $a_3 = 80$.
2. Find the particular solution for the recurrence relation $a_n - 2a_{n-1} = 3 \cdot 2^n$
3. What is Tower of Hanoi problem? What is the recurrence relation for Tower of Hanoi problem?

OR

- B Find total solution of $a_n = 2^n + n2^n + 4a_{n-1} - 4a_{n-2}$ for $n \geq 2$ where $a_0 = 1$ & $a_1 = 3$.

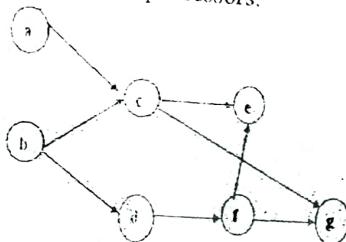
- C Find out whether $(C, +, X)$ is Ring, field or Integral domain, or none of these algebraic systems. Here C is a set of complex numbers of the form $a+ib$, where a and b are real numbers.

- D 1. Find out whether the Algebraic System $S = \{1, 3, 7, 9, 11, 13, 17, 19\}$ under multiplication modulo 20 (i.e. remainder of $(a*b)/20$) is abelian group or not.
2. Explain the terms with example i) Ring ii) Field

(4)

Note: Attempt all five questions. Each Question has 4 subparts A, B, C and D. Attempt any one part from A & B and similarly any one from C & D.

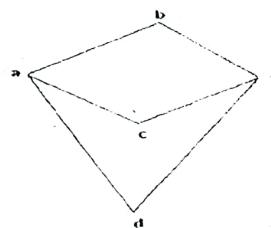
- Q.1.**
- A 1. Explain with example (i) Principle of Extension (ii) Countably Infinite Set (4)
 - 2. Using Venn Diagram, find whether two sets are equivalent or not (2)
 - 3. Find the dual of $p \vee \neg p \equiv T$
- B 1. Explain with example (i) Antichain (ii) Multisets (1)
2. Draw Venn Diagram of $A^c \cap B^c \cap C^c$ (4)
3. What is Cantor's diagonal argument? (1)
- C 1. Using Mathematical Induction, prove that $1+2+2^2+2^3+\dots+2^N = 2^{N+1}-1$ (3)
2. If there are 2 processors, draw the timing diagram for the jobs and find the total elapsed time and total idle time of processors. (4)



Job	a	b	c	d	e	f	g
Time	4	2	3	2	8	2	8

OR

- D 1. Find the number of onto functions from A to B if A contains 4 elements and B contains 3 elements (1)
2. What is an equivalence class? What are its characteristics? (2)
3. Using the concept of Least Upper bound and Greatest lower bound between every two pair of vertices, find whether following is a lattice or not. (4)



- Q.2.**
- A 1. Define the terms with example - (i) Language (ii) Modus Tollen Rule (iii) Contra positive (3)
2. What is Russell's Paradox? Also explain Barber's Paradox. (4)

OR

- B Find whether the following propositions are tautology, contradiction or contingency? Also check whether (i) and (ii) propositions are equivalent or not. (7)
- (i) $p \vee (q \wedge r)$ (ii) $[(p \rightarrow q) \wedge (q \rightarrow r)] \rightarrow (p \rightarrow r)$

- C 1. Explain - (i) Disjunctive Syllogism (ii) Ordered Set (2)
2. Explain Phrase structure grammar and types of phrase structure grammar. (5)

OR

Find the validity of following argument. (4)

- D 1. Explain Modus ponen rule and Hypothetical syllogism.

$$(a \wedge b) \rightarrow c$$

$$c \rightarrow d$$

$$\neg d \rightarrow (\neg a \vee \neg b)$$

2. Find whether the following strings abbbab and babbba are generated by following grammar or not? (S is the starting symbol, A and B are non terminals, a and b are terminals). Also show how you reached to the conclusion.

$$S \rightarrow aA \mid bS$$

$$A \rightarrow aB \mid bA \mid a$$

$$B \rightarrow aB \mid bB \mid b$$

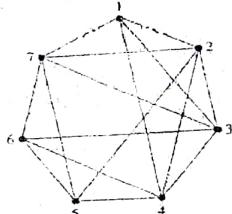
- Q.3. A 1. Define the terms with example (i) Edge cardinality of a graph (ii) Homeomorphic graph (3)

(iii) Bipartite graph

(2)

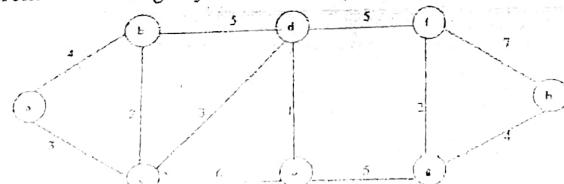
2. Draw a graph for the degree sequence 4, 4, 4, 3, 3, 2, 2. (2)

3. How many colors are required to color this graph (Graph coloring problem)? Is it planar?



OR

- B Find shortest path from a to h using Dijkstra's Algorithm.

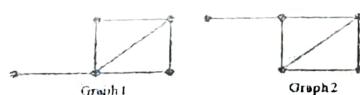


(7)

- C 1. Find the transitive closure of following using Warshall's Algorithm (4)

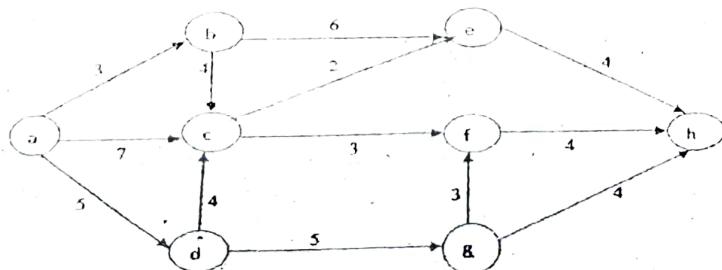


2. What are the steps to check graph isomorphism? Find whether the following graphs are isomorphic or not. (3)

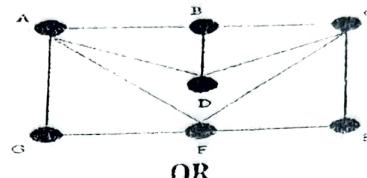


OR

- D Find shortest path from vertex a to h using Pruning Algorithm. (7)

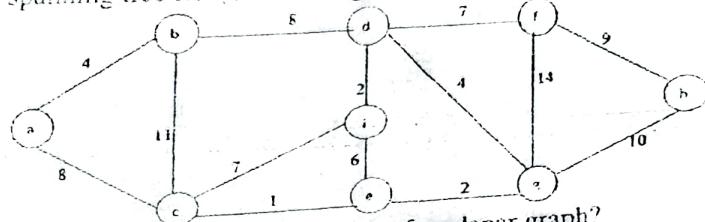


- Q.4.** **A** 1. Define (i) Rooted tree (ii) Spanning tree (iii) Binary search tree (3)
 2. What is the necessary and sufficient condition for Euler path and Euler circuit for a directed graph? (2)
 3. For the following graph, find whether there is (i) Euler circuit (ii) Hamiltonian Path. If yes, then also write the path. (2)



OR

- B** 1. Find the minimal spanning tree for the following using Kruskal's algorithm. (5)



(2)

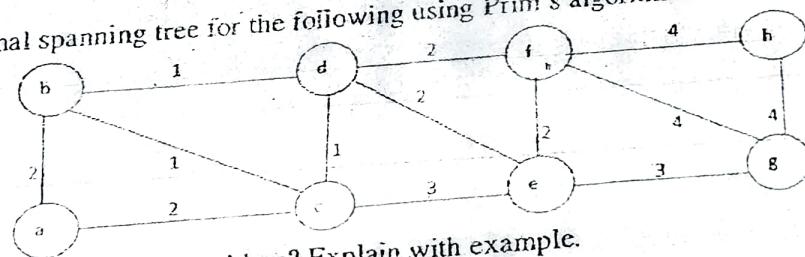
2. What is a planar graph? What is the Euler's formula for planar graph? (7)

- C** What is prefix code? Using Huffman Algorithm, create a rooted tree and find prefix code of each item. (5)

A	B	C	D	E	F	G
21	20	50	35	70	10	65

OR

- D** 1. Find the minimal spanning tree for the following using Prim's algorithm. (5)



(2)

2. What is travelling salesperson problem? Explain with example. (7)

- Q.5.** **A** What is total solution of a recurrence relation? Find the total solution of the following recurrence relation $a_n = 5a_{n-1} + 6a_{n-2} = 2^n + 3n$ (5)

OR

- B** 1. Define(i) Generating functions (ii) Abelian Group (iii) Integral Domain (iv) Ring (v) Monoid (2)
 2. If $a_r = a_{r-1} + a_{r-2}$, and $a_0=1$, $a_2=2$, what is the value of a_4 and a_5 ? (3)

2. If $a_r = a_{r-1} + a_{r-2}$, and $a_0=1$, $a_2=2$, what is the value of a_4 and a_5 ? (4)

- C** 1. For $A = \{1, 2, 3, 4, 5, 6\}$ find whether $(a \times b) \bmod 7$ is abelian group or not? (3)
 2. Solve the recurrence relation $a_{p-2} + a_{p-1} - a_p = 0$, where $a_0=2$ and $a_1=3$ (4)

OR

- D** Justify $(R, +, \times)$ is ring, integral domain as well as field, where R is set of real numbers and operations are addition and multiplication. (7)

Department of Information Technology
MID TERM II (Dec 2016 - Apr 2017)
IT-28502 Computer Organization

TIME : 1 HR

Max Marks : 20

Note : Attempt all question. Q 1 to Q 6 has 3 Marks and Q 7 has 2 Marks. Make suitable assumption if necessary

Q 1. Consider a machine with a byte addressable main memory of 2¹⁶ bytes and block size of 8 bytes. Assume that a direct mapped cache consisting of 32 lines is used with this machine.

- How is a 16-bit memory address divided into tag, line number, and byte number?
- Into what line would bytes with each of the following addresses be stored?

0001 0001 0001 1011
1100 0011 0011 0100
1101 0000 0001 1101
1010 1010 1010 1010

Q 2. The width of a physical address on a machine is 40 bits. The width of the tag field in a 512 KB 8 way set associative. What is the cache size in bits?

Q 3. Consider a machine with the cache size is 4K words, block size is 64 words and the set size is 4 blocks. Find out the number of bits in set, tag and block offset.

Q 4. A disk unit has 24 recording surfaces. It has a total of 14000 cylinders. There is an average of 400 sectors per track. Each sector contains 512 bytes of data. What is the maximum number of bytes that can be stored in this unit.

Q 5. Consider a direct mapped cache with 8 cache blocks. If the memory block request are in the order : 3,5,2,8,0,6,3,9,16,20,17,25,18,30,2,2,6,5,82,17,24. How many cache hit wouls be there?

Q 6. Calculate 24/5 using non restoring division algorithm.

Q 7. Define interrupts? Explain different classes of interrupt.

IT-4sem

Department of Information Technology
Computer Organization (IT-28502)-Session Jan 18-April18
BE II Yr (Mid Test- II)

Time :1 hr

Marks:20

Q:1 Why are peripherals not connected directly to the system bus or processor ? [2]

OR

Why are different type of Memory level used in computer system ? [2]

Q:2 Enlist the main I/O Interfacing Technique with their use. What are the difference between Memory -mapped I/O and Port mapped I/O . [5]

Q:3 Describe following terms (any three): [3]

- Cache hit and cache miss
- Page fault and page hit
- Locality of reference
- Inclusion and Coherence

Q:4 What is the role of DMA module when the processor wishes to read or write a block of data? Explain with suitable block diagram and instruction sequence. [5]

Q:5 Enlist the different buses used in the system with their application use and also show their location using a level diagram of bus interfacing with main processor . [5]

DEPARTMENT OF INFORMATION TECHNOLOGY
IT-2856 : COMPUTER ORGANIZATION AND MICROPROCESSOR
MID TERM-II (Session : Dec-April 2014-15)

Time : 1 hr

Max Marks : 20

Note : Attempt all question.

Q 1. Explain different Addressing modes with example. 4

Q 2. Differentiate between

- a. Memory mapped I/O and I/O mapped I/O
- b. Hard wired control unit and Micro programmed control unit

2
2

Q 3. a. A computer employs RAM chips of 128×8 and ROM chips of 512×8 . The computer needs 2K bytes of RAM and 4K bytes of ROM. How many RAM and ROM chips will be used. 2

b. How many lines of the address must be used to access 256K byte memory. 2

Q 4. Consider 4 segment instruction pipeline where different instruction are taking different amount of time at different stage that tabulated below. What is the efficiency of the pipeline? 4

	S ₁	S ₂	S ₃	S ₄
I ₁	1	2	1	2
I ₂	2	1	2	1
I ₃	1	1	2	1
I ₄	2	1	2	1

Q 5. a. A non pipelining system takes 100 nanoseconds to process a task. The same task can be processed in a six segment pipelining with clock cycle of 20 ns. Determine the speed up factor for 200 tasks. What is the maximum speed that can be achieved? 2

b. Consider a 4 segment pipeline with respective stage delay of 15, 12, 16 and 14 ns. The interface register used between the stages has the delay of 5 ns. What is the speed up factor when 100 instruction of pipeline used. 2

$$\begin{array}{l}
 \text{256} \\
 \text{p. } 4 \times 100 \times 8 \\
 \text{31218} \\
 \text{128} \\
 \text{56} \\
 \text{14} \\
 \text{128} \\
 \text{56}
 \end{array}$$

SHRI. G.S. INSTITUTE OF TECHNOLOGY AND SCIENCE

DEPARTMENT OF INFORMATION AND TECHNOLOGY

IT -2856: Computer Organization And Microprocessor

MID TERM-II (Session: Dec.-April 2013)

Max. Marks: 20

Time: 1 hr

Note: Attempt all the questions.

Q.1 Explain methods of I/O? (5)

Q.2 The content of AC and the extra bit E on the left of AC initially has hexadecimal 079C and 1 respectively. If a subroutine is executed to circulate E and AC four times to the right then

(i) What are the content of AC and E respectively in hexadecimal?

(ii) What is the content of AC after circulate shift left is performed on AC and E for the correct answer of above question? (5)

Q.3 Consider pipelined processor with the following four stage:

IF : Instruction Fetch

ID: Instruction Decode

EX: Execute

WB: Write back

The IF, ID and WB stage take one clock cycle for the operation. The number of cycle for EX stage depends on the instruction. The ADD and SUB instruction need 1 clock cycle and the MUL instruction need 3 clock cycle in EX stage. Data forwarding is used in the pipelined processor. Draw space time diagram and find the no. of clock cycle taken to complete the following sequence of instruction?

ADD R₂, R₁, R₀ [R₂ ← R₁ + R₀]

MUL R₄, R₃, R₂ [R₄ ← R₃ * R₂]

SUB R₆, R₅, R₄ [R₆ ← R₅ - R₄]

Q.4 Differentiate between Memory mapped and I/O mapped I/O? (5)

**SHRI G.S. INSTITUTE OF TECHNOLOGY AND SCIENCE
DEPARTMENT OF INFORMATION AND TECHNOLOGY**

IT -2856: Computer Organization And Microprocessor

MID TERM-II (Session: Dec.-April 2013)

Time:1hr

Max.Marks:20

Note: Attempt all the questions.

- Q.1 Explain methods of I/O? (5)**
- Q.2 The content of AC and the extra bit E on the left of AC initially has hexadecimal 079C and 1 respectively. If a subroutine is executed to circulate E and AC four times to the right then**
- What are the content of AC and E respectively in hexadecimal?**
 - What is the content of AC after circulate shift left is performed on AC and E for the correct answer of above question? (5)**
- Q.3 Consider pipelined processor with the following four stage : (5)**

IF : Instruction Fetch

ID: Instruction Decode

EX: Execute

WB:Write back

The IF, ID and WB stage take one clock cycle for the operation. The number of cycle for EX stage depends on the instruction. The ADD and SUB instruction need 1 clock cycle and the MUL instruction need 3 clock cycle in EX stage. Data forwarding is used in the pipelined processor. Draw space time diagram and find the no. of clock cycle taken to complete the following sequence of instruction?

ADD R₂,R₁,R₀ [R₂ <- R₁ + R₀]

MUL R₄,R₃,R₂ [R₄ <- R₃ * R₂]

SUB R₆,R₅,R₄ [R₆ <- R₅ - R₄]

- Q.4 Differentiate between Memory mapped and I/O mapped I/O? (5)**

APR 2018 EXMINISTRATION

1004

II B. E. EXAM

HU 21515/28515/29515/IM2156/IM2975: HUMANITIES, ENVIRONMENT AND ENGG. ECONOMICS

TIME: 3 Hrs.

50

[Max. Marks: 70]

[Mn. Pass. Marks: 22]

TOTAL NO. OF QUESTIONS IN THIS PAPER: 05

NOTE: Attempt all the five questions. Attempt one question from alternatives (a) and (b) and one question from alternatives (c) and (d). All questions carry equal marks. **Marks**

- Q. 1** (a) Describe term 'demand' and 'elasticity of demand'. Discuss the determinants of both. **(4+3)**
 (b) The elasticity coefficients of demand are given as follows: **(7)**

Coefficient	Price elasticity	Income elasticity	Cross elasticity (to each other)
Product X	2.5	1	+1.3
Product Y	0.42	3.6	+5.6

Answer the following:

1. Which product will give more revenue on increasing its price?
2. How do you categorize the products' nature?
3. Describe relation nature between X and Y.

- (c)** Define economics. Discuss central economic problems with the help of suitable diagram. **(2+5)**
(d) The demand function for a product is given by $Q_x = 200 - 0.01P_x + 0.008P_y + 0.005A_x$. Where P_x , P_y and A_x are respectively Price of X, Price of Y and Advertising expenses for X. Then find the price and income elasticity at $P_x = 50/-$, $P_y = 180/-$ and $A_x = 2000/-$. **(7)**
- Q. 2** (a) What is production function? Discuss laws of returns to variable proportions and stages of production. **(2+5)**
 (b) Considering short run production function $Q = 18L^2 - 1.2L^3$, Determine: **(7)**
 - (i) marginal production function,
 - (ii) labour when production is maximum and
 - (iii) Production where Average production is maximum.

(c) Define cost. Explain explicit, implicit and economic costs. Discuss the difference between economic and social cost with their application purpose. **(3+4)**
 (d) Given short-run cost function: $TC = 100 + 50Q - 12Q^2 + Q^3$ where TC is total cost and Q is level of output.

 - i) Determine: (a) total fixed cost function, (b) total variable cost function, (c) average variable cost function, (d) marginal cost function.
 - ii) Calculate total cost, ATC, AVC and MC when the firm produces 10 units of output.**(5+2)**

- Q. 3** (a) What do you understand by equilibrium price? Discuss effect of change in demand and supply on it with suitable sketch and one examples of each i.e., change in demand and supply. **(2+5)**
 (b) Define monopoly and discuss its sources. Explain and illustrate the equilibrium of the monopolist discriminating price in to markets of differently elastic demand for his product. **(4+3)**

P.T.O.

(c)) The demand function equation faced by HCL for its personal computer is given by:

$$P = 50000 - 4Q.$$

(7)

i) Write the marginal revenue equation.

ii) At what price and Quantity total revenue be maximised?

iii) From the demand function equation given, show that price elasticity of demand is equal to one when TR is maximum.

(d) Differentiate between oligopoly and monopolistic competition with two examples of each giving suitable rationale.

(7)

Q. 4 (a) Discuss family as a social institution with its essential and non-essential functions. Discuss the factors that are giving change to this family institution in context to its functions.

(4+3)

(b) What are social and ethical values? Discuss the role of social and ethical values in the field of engineering

(2+5)

(c) "Democracy provides equality and freedom" - Explain. Discuss critically the democracy in context to India like country of diverse population.

(3+4)

(d) What do you understand by Government? Discuss the organs of the government.

(1+6)

Q. 5 (a) Differentiate between economic development and growth. Discuss critically their relative importance for a nation.

(4+3)

(b) Discuss Kuznet's Curve. Discuss reasons that are responsible for the relation between environment and economic development.

(3+4)

(c) Explain Rostow's stages of economic development. Discuss take-off stage in context to India.

(4+3)

(d) Short notes (Any two):

- i. Sustainable development
- ii. Environmental degradation
- iii. Climate change.

(7)

APR-MAY 2017 EXMINISTRATION

II B. E. EXAM

HU29515/28515/21515/2156/2975: HUMANITIES, ENVIRONMENT AND ENGG. ECONOMICS

TIME: 3 Hrs.

[Max. Marks: 70]

[Mn. Pass. Marks: 22]

TOTAL NO. OF QUESTIONS IN THIS PAPER: 05

NOTE: Attempt all the five questions. Attempt one question from alternatives (a) and (b) and one question from alternatives (c) and (d). All questions carry equal marks.

Q. 1	(a)	Suppose utility function of an individual is given by $U = X^{3/4} \cdot Y^{1/4}$. Price of commodity X is Rs. 6 per unit and price of commodity Y is Rs. 3 per unit and income of the individual is equal to Rs. 120. Find out the optimal quantities of the two goods that consumer will purchase to maximize his utility in given income.
	(b)	Explain the law of Equi-marginal utility? How does it explain consumer's equilibrium? Discuss with the help of schedule and graph.
	(c)	Using the indifference curve analysis explain how price effect (Normal good and price falls) of a commodity is decomposed into income effect and substitution effect.
	(d)	Describe term 'elasticity of demand' and its determinants? Discuss importance of price and income elasticity in distinguished economic decision making.
Q. 2	(a)	Given the following production function. Find out which one represents constant return, increasing return and decreasing return to scale and why? a) $Q = AK^{0.5} \cdot L^{0.7}$ b) $Q = AK^{0.25} \cdot L^{0.75}$ c) $Q = AK^{0.3} \cdot L^{0.6}$
	(b)	Consider the following short run production function. $Q = 18L^2 - 1.2L^3$ Determine the values of Labour for three stages and returns to variable proportions.
3	(c)	How is breakeven point different than profit maximizing point? Explain through proper sketch using non-linear cost function.
	(d)	Given the production function $Q = 100\sqrt{K} \sqrt{L}$ and planned budgeted cost (C) = Rs 2400, with wage rate (w) = 30 and interest rate (r) = 40. Determine the producer's equilibrium.
Q. 3	(a)	What is price discrimination? Distinguish between first, second and third degree of price discrimination with example of each.
	(b)	A monopolist firm faces the demand function: $P = 304 - 2Q$ and cost function: $TC = 500 + 4Q + 8Q^2$. Determine the equilibrium quantity and price he will charge to maximise profits.
	(c)	Explain with the help of graph, that firm working under short run perfect competitive market may face i) supernormal Profit ii) Normal profit iii) Loss.
	(d)	Compare contrast different competitive market situation with proper examples.
4	(a)	What is social stratification? Explain. Discuss features of caste and class based social stratification.
	(b)	What are social and ethical values? Discuss the role of social and ethical values in the field of engineering
	(c)	Differentiate between Democracy and Dictatorship. Explain how Democracy provides equality and freedom.
	(d)	Compare critically presidential system and parliamentary system of government.

A	
Q. 5 c	(a) What do you understand by economic development? Discuss factors of economic development. (b) Explain and discuss the Schumpeter's model of development. (c) What is environmental economics? Explain the types of the environmental degradation. (d) Short notes (Any two): i. Sustainable development ii. Growth and Development iii. Human development Index
6	

**NOV-DEC 2016 EXAMINATION
II B. E. EXAM**

HU22015/24015/25015/27015/ IM2216/2416/2516/2716: HUMANITIES, ENVIRONMENT AND ENGG. ECONOMICS

TIME: 3 Hrs.

TOTAL NO. OF QUESTIONS IN THIS PAPER: 05

[Max. Marks: 70
[Mn. Pass. Marks: 22]

NOTE: Attempt all the five questions. Attempt one question from alternatives (a) and (b) and one question from alternatives (c) and (d). All questions carry equal marks.

Q. 1 (a) Define Engineering Economics. Discuss its role in product and process designing with an example.
(b) Describe the demand function and demand law? The utility function of a consumer is $U=X^{1.5}Y$ then Derive demand function for product 'X', if the price of product Y is Rs. 4/- per unit and the budget of the consumer is Rs. 100/-.

(c) What is Production possibility curve? Discuss central economic problems using it.
(d) Describe term 'elasticity of demand' and its determinants? Discuss importance of price and income elasticity in distinguished economic decision making.)

Q. 2 (a) What are ridge lines? Draw an isoquant map showing ridge lines. Why does a rational producer does not operate outside the ridge lines? Indicate in the isoquant map the area where a rational producer will possible operate.

(b) What are three stages of short run production function? Why does it not make any economic sense to produce in stage 1 or in stage 3.

(c) How is breakeven point different than profit maximizing point? Explain through proper sketch using non-linear cost function.

(d) The revenue and cost functions for a firm are given by $R=60Q$ and $TC=10+5Q^2$, then determine break even quantity and profit maximizing output of the firm.

(a) What is perfect competition? Discuss its features and price determination under it. Also give one example in light of market features.

(b) The cost function of the monopolist firm is $TC = 60 + 0.05Q^2$. Determine the equilibrium output and total profit if the monopolist is facing demand $Q=360-20P$.

(c) What is price discrimination? Distinguish between first, second and third degree of price discrimination with example of each.

(d) Differentiate between monopolistic and oligopoly market situation with proper examples.

(a) "A social institution is the set of rules and regulation governing a society". Explain. Differentiate it from social institution. Association

(b) What do you understand by social change? Discuss technological and biological factors determining social change.

(c) Differentiate between Democracy and Dictatorship. Explain how Democracy provides equality and freedom.

(d) Write short notes on following:

1. Social stratification
2. Indian Legislature

(a) Differentiate between economic growth and economic development. Discuss factors of economic development.

(b) What do you understand by biophysical environment? Discuss its relation with economic development.

(c) What is environmental degradation? Discuss its types and their causes and effects.

(d) Discuss Rostow's stages of economic development in brief. Where does India stands in them? Explain.

TOTAL NO. OF QUESTIONS IN THIS PAPER:05

NOTE: Attempt all the five questions. Attempt one question from alternatives (a) and (b) and one question from alternatives (c) and (d). All questions carry equal marks.

- Q. 1 (a) Define Economics. Discuss its scope in Engineering.
 (b) Define demand. Discuss its determinants and Law.
 (c) What is an indifference curve. Discuss convexity of indifference curve in brief.
 (d) The utility function of a consumer is $U=X^a Y^b$; and the prices of goods X and Y are Rs. 3/- and Rs. 4/- respectively. Assuming consumer's budget of Rs. 1000/-, determine consumer's equilibrium and allocation of budget.

- Q. 2 (a) The production function of a firm is given by $Q=L^3-15L^2+10$. Determine production ranges for increasing returns to variable proportions and diminishing returns to variable proportions.
 (b) Explain and illustrate break even analysis? Discuss its importance in production planning.
 (c) What do you understand by cost and its various concepts? Discuss with some examples.
 (d) Write short notes on following:
 i) Economies of scale
 ii) Stages of Production

- Q. 3 (a) What is monopoly? Determine the equilibrium for monopolist working with cost function $TC=50+5Q^2$, is facing market demand curve $P=80-5Q$. Also determine his profit.
 (b) What do you understand by firm's equilibrium in market? Discuss the equilibrium of a profit-making perfectly competitive firm with suitable sketch.
 (c) Compare and contrast Monopoly, perfect competition and monopolistic competition.
 (d) What do you mean by the equilibrium price? Explain and illustrate the effect of following events on equilibrium price:
 1. Increase in sales tax.
 2. Increase in price of substitute.
 3. Increase in consumer's real income.

- Q. 4 (a) "Family is the basic social institution". Explain. Discuss essential and non-essential functions of family institution.
 (b) What is social stratification? Explain. discuss features of caste based social stratification.
 (c) Discuss various organs of government. Discuss the functions of 'Legislature organ' in context to Indian government.
 (d) What is presidential system of governance? Discuss how it is better than parliamentary system of governance.

- (a) Explain Rostow's Stages of economic Development with its critics.
 (b) What do you understand by biophysical environment? Discuss Oxyzen and Nitrozen cycles.
 (c) Discuss various causes and consequences of environmental degradation.
 (d) Write short notes on following:
 i) Factors of sustainable development
 ii) Kuznet's curve

[Max. Marks: 70]

[Min pass. Marks: 22]

TOTAL NO. OF QUESTIONS IN THIS PAPER: 05

Note: Attempt all the five questions. Attempt either (a) or (b); and either (c) or (d) from each question. All questions carry equal marks.

- Q. 1 (a) "Economics is the Science of Choice". Explain. Discuss various central economic problems.
 ✗ (b) What is elasticity of demand? Explain. Discuss its determinants.
 ✓ (c) State demand law. Derive demand function using Price Consumption Curve (PCC).
 2 (d) The utility function of a consumer is $U = X^{15}Y$, and the prices of goods X and Y are Rs. 3/- and Rs. 4/- respectively. Assuming consumers budget of Rs. 1000/-, determine consumer's equilibrium. Also compute Price effect (P.E.) and substitution effect (S.E.) on consumption of 'X', if price of product 'X' decreases from its current level to Rs. 2/- per unit.

- Q. 2 (a) State the Law of return to scale. Discuss economies of scale.
 ✗ (b) Explain and illustrate break even analysis? Discuss its importance in production planning.
 (c) Define cost. Discuss relation between AC and MC.
 Write short notes on following:
 i) Implicit and explicit cost
 ii) Law of return to variable proportions

- Q. 3 (a) What is monopoly? Determine the equilibrium for monopolist working with cost function $50 + 10Q$, is facing market demand curve $P = 80 - 5Q$. Also determine his profit.
 (b) Explain and illustrate price determination in Perfect Competition and role of time element in this price determination.
 (c) Compare and contrast oligopoly and monopolistic competition.
 ✗ (d) The market demand and supply functions for a perfectly competitive market are $Q_d = 140 - 2P$ and $Q_s = -40 + P$. Determine following:
 1. Price determined in the market
 2. Effect of an indirect tax of Rs. 9/- per unit on price
 3. Tax burden per unit on buyer and seller

- Q. 4 (a) Differentiate between social institution and social association.
 (b) Define cast and class based social stratification? Explain. Which, according to you, is best fit to Indian society and why?
 (c) What is democracy? Comment on its suitability in Indian context.
 (d) What is presidential system of governance? Discuss how it is better than parliamentary system of governance.

- Q. 5 (a) What do you understand by sustainable development? Discuss role of ecological balance in it.
 (b) What do you understand by biophysical environment? Discuss various causes and consequences of environmental degradation.
 (c) Describe interrelations between environment and development using block diagram and environment kuznet's curve.
 (d) Write short notes on following:
 i) Determinants of economic development
 ii) Climate change

TOTAL NO. OF QUESTIONS IN THIS PAPER: 05

NOTE: Attempt all the five questions. Attempt one question from alternatives (a) and (b) and one question from alternatives (c) and (d). All questions carry equal marks.

- Q. 1**
- (a) State law of demand. Define elasticity of demand and discuss its determinants.
 - (b) The utility function of a consumer is $U=X^{1/2}Y$, and the prices of goods X and Y are Rs. 3/- and Rs. 4/- respectively. Assuming consumer's budget of Rs. 1000/-, determine consumer's equilibrium. Also compute Price effect (P.E.) and substitution effect (S.E.) on consumption of 'X', if price of product 'X' increases from its current level to Rs. 4/- per unit.
 - (c) What is indifference curve? Explain and illustrate PCC and ICC with the help of it.
 - (d) Discuss laws of Diminishing Marginal Utility and Equi Marginal Utility with suitable sketch.
- Q. 2**
- (a) What do you understand by production? Discuss production function in short run and long run with respect to various factors of production.
 - (b) State law of return to variable proportions. Explain and illustrate the stages of production.
 - (c) What is break even analysis? Discuss firm's break even quantity if the cost function of a firm is $TC=Q^2-3Q+16$ and it is facing the demand $Q=10-2P$.
 - (d) Differentiate between opportunity and economic cost. Describe relation average and marginal cost through suitable sketch.
- Q. 3**
- (a) Compare various market situations - perfect competition, monopoly and monopolistic competition and oligopoly in brief with examples.
 - (b) What is firm's equilibrium? Explain. Compute the firm's equilibrium under perfect competition. If its cost function is $TC=Q^2-3Q+10$. The market demand function is $Q_d=20-1.5P$ and Market Supply function is $Q_s=50+P$.
 - (c) Explain and illustrate price determination in Perfect Competition and role of time element in this price determination.
 - (d) Identify competition situations in following markets and support your decision with suitable reasons: i) mobile service, ii) washing powder, iii) food grain, iv) Indian rail and v) tea.
- Q. 4**
- (a) What is social change? Explain. Discuss factor of social change.
 - (b) What do you understand by family and marriage institutions? Explain. Describe that the family is the basic institution of the society.
 - (c) What is social stratification? Comment, which one out of class based social stratification and caste based social stratification is better in context to India.
 - (d) "A social institution is the set of rules and regulation governing a society". Explain. Discuss the role of humanities in engineering.
- Q. 5**
- (a) What do you understand by political parties? Discuss role of political parties in success of democracy.
 - (b) What do you understand by public opinion? Discuss various factors determining it.
 - (c) Which one of democracy and autocracy is best according to you? Support your answer with reasons.
 - (d) What is government? Discuss its organs and their functions.

Department of Electronics & Telecommunication Engineering

B.E. II Year (IT Engineering)

Test -II

Max Marks: 20

Duration: 1 Hr.

Subject Code: EC-28553

Subject Name: Communication Engineering

Session: Dec 2018 to April 2019

Semester: B

Q1. Determine the expression for Power and Efficiency of AM wave. (04)

Q2. Consider an angle-modulated signal

$$X_c(t) = 10\cos [(10^8)\pi + 5 \sin 2\pi(10^3)t]$$

Find the maximum phase deviation and the maximum frequency deviation. A 20-MHz carrier is frequency-modulated by sinusoidal signal such that the maximum frequency deviation is 100 KHz. Determine the modulation index and the approximate bandwidth of FM signal if frequency of the modulating signal is 1KHz. (06)

Q3 Dérive and sketch the frequency spectrum for WBFM. Calculate the bandwidth required to transmit an FM signal with modulation index β such that 98% information can be transmitted successfully. (05)

In an Armstrong type FM generator the crystal frequency is 200 kHz, the message frequency is 50 Hz and modulation index is 0.2, the mixer frequency is 9.28 MHz The carrier frequency at the output is 108 MHz, and the frequency deviation is 75 KHz. Select the multiplier constants. (05)

Department of Electronics & Telecommunication Engineering

B.E. II Year (Elec.& Telecom. Engg.)

Test-II

Date: 10/03/18

2018

Max Marks:20

Subject Code and Name: **EC 28553 & Communication Engg.**

Session: DEC.17/APR.18

Note: - Attempt all questions. Assume suitable data wherever needed.

Semester: B

- Q1.** An A.M. signal is given by $4 \cos 2800\pi t + 10 \cos 3400\pi t + 4 \cos 4000\pi t$. Find Bandwidth, Carrier Power, Sideband Power, Total Power and efficiency of system. Also Plot the spectrum. 05

- Q2.** Derive standard form of SSB-SC amplitude modulation. 05

- Q3.** Discuss the need for modulation. Compare AM, DSB-SC and SSB-SC communication systems. 05

- Q4.** A Sinusoidal carrier of 10MHz, 20V is frequency modulated by sinusoidal message of 10V, 100Khz. If it is given by 50Khz/V. Calculate its Bandwidth, Frequency deviation, Modulation Index and power. 05

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SHRI G.S. INSTITUTE OF TECHNOLOGY AND SCIENCE INDORE-452003

Department of Electronics & Telecommunication Engineering

B.E. II Year (Information Technology)

Test-II

Date:31/03/2015

Max Marks:15

Subject Code and Name: EC 2853 Communication Engineering

Session: DEC'14-June15

Semester: **B**

Note:- Attempt all questions. Assume suitable data wherever needed.

- Q1.** Compare various Amplitude modulation schemes. Also discuss briefly the 05 VSB-SC Scheme. OR

Draw the block diagram and explain working of TRF Receiver. Also state its limitation.

- Q2.** Discuss Armstrong method of FM modulation. 05

A. Sinusoidal carrier of 10 MHz. 20V is frequency modulated by sinusoidal message of 10V, 100Khz. kf is given by 50 KHz /V. Find Bandwidth, Frequency deviation, Modulation Index, power.

- Q3.** Define random variable and its moments. Find the mean value and variance of random variable X which is uniformly distributed between x=2 to x=4. 05

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COMPULSORY: Tick (V) in appropriate boxes to indicate ATTEMPTED QUESTIONS and submit it along with Answer sheet.

Name of Student:

Enrollment No.:

ATTEMPTED QUESTIONS		
1	2	3

Note: Attempt all questions. All question carry equal marks.

Q.1 Prove the Time shifting Property of Fourier Transform & Also show that

$$g(t + T) + g(t - T) = 2 G(\omega) \cos \Theta.$$

Q.2 For a given figure m(t) band limited to the frequency f_m has a power of P_m

Find out the power of output signal Y(t) in terms of P_m .



Q.3

Consider the following AM signal find out modulation index (M), side band power & Power transmission efficiency(η) in %.

Q.4

By suitable derivation Generate the DSB-SC AM signal using ring modulator.

Q.5 (a)

The power transmitted by mobile phone is between 30 dBm to 36 dBm. Calculate the power in milliwatts and watts.

(b) The receiver sensitivity of a mobile phone is -85dBm calculate the sensitivity in terms of milliwatts, if the input impedance of receiver is 300 calculate the sensitivity in microwatt.

**APRIL-MAY 2019 EXAMINATION
II B.E.(4YDC) EXAM
EC-28553: COMMUNICATION ENGINEERING**

[Time: 3 Hrs.]**444****[Max. Marks: 70]****TOTAL NO. OF QUESTIONS IN THIS PAPER : 5**

Note: Attempt all the questions. Answer (a) OR (b) & (c) OR (d) parts in each question. All questions carry equal marks.

Q.1 (a) Find the Fourier transform

$$(i) x(t) = e^{-at} u(t), a > 0$$

$$(ii) x(t) = \frac{1}{1+t^2}$$

OR

(b) Determine whether the following signal is an energy signal, power signal or neither

$$(i) x(t) = e^{-at} u(t), a > 0$$

$$(ii) x(t) = t u(t)$$

(c) State and prove (i) Time-shifting property (ii) Time convolution property

OR

(d) State and explain Sampling Theorem. Derive the expression of the sampled signal and draw its spectrum. How the message signal is recovered.

Q.2 (a) Derive the power content of an AM modulated wave. Also calculate the efficiency for an AM system.

OR

(b) Explain the demodulation technique of AM signal using Envelope Detector with necessary conditions

(c) Discuss the problem arise at receiver of DSB-SC signal when the carrier is not synchronized with the one used at transmitter.

OR

(d) Show that a synchronous demodulator can demodulate an AM signal $[A + m(t)] \cos\omega_ct$, regardless of the value of A.

Q.3 (a) Derive the expression for narrowband FM signal and discuss its generation.

OR

(b) Prove mathematically why theoretical Bandwidth of wideband FM is infinity.

(c) Draw and explain each block of a Super heterodyne receiver.

OR

(d) Explain the generation of a PM signal by Frequency modulator and vice-versa.

3

Consider an angle-modulated signal

$$X(t) = 10 \cos[\omega_ct + 3\sin(\omega_mt)]$$

Assume FM and $f_m = 1\text{KHz}$. Calculate the modulation index and find the bandwidth.

- Q.4 (a) A coin is tossed three times. Let a random variable X be defined which is equal to the number of heads occurred during the tossing of coin. Find the probability function for the random variable X . 7

OR

- (b) Find the constant C such that the Probability density function is given as: 7 6

$$f(x) = C(x-1) \quad ; \quad 1 < x < 4 \\ = 0 \quad ; \quad \text{otherwise}$$

Also find $P(2 < x < 3)$.

- (c) Consider a random process $X(t)$ given by 7

$$X(t) = A \cos(\omega t + \theta)$$

where A and ω are constants and θ is a random variable over $[-\pi, \pi]$. Show that $X(t)$ is Wide Sense Stationary (WSS).

OR

- (d) Find the mean and variance of a random variable Z expressed as 7
 $Z = Z_1 + Z_2 + Z_3 + \dots + Z_N$ where $Z_1, Z_2, Z_3, \dots, Z_N$ are statistically independent random variables. What will be the PDF of random variable Z as $N \rightarrow \infty$.

- Q.5 (a) What is noise and what are the various sources of noise? 7

OR

- (b) Evaluate the thermal noise voltage developed across the resistor of 500 ohms. The bandwidth of the measuring instrument is 6 MHz and the ambient temperature is 25°C . 7

- (c) Define the following terms 7 3

(i) Equivalent Noise Temperature

(ii) Equivalent Noise Bandwidth for Linear Bandpass Systems

- (d) Explain the effect of Noise on Amplitude Modulated (AM) system. 7

APRIL-MAY 2018 EXAMINATION
 (II) B.E. EXAM

EC- 28553/2853: COMMUNICATION ENGINEERING.

Time: 3 Hrs.]

[Max. Marks : 70] 10

TOTAL NO. OF QUESTIONS IN THIS PAPER : 5

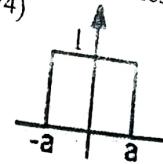
Note: Attempt all the questions. Answer (a) OR (b) & (c) OR (d) parts in each question. All questions carry equal marks.

Q.1

- (a) Determine coefficients of complex exponential Fourier Series:
 (i) $x(t) = \cos(\omega_0 t) + \sin^2 \omega_0 t$ (ii) $1 + \cos(2t + \pi/4)$

(b) Find Fourier transform of: a) $1/t$

OR
b)



- (c) For the given systems: 1.) $y_1(t) = dx(t)/dt$ 2.) $y_2(t) = x(2t)$
 determine whether the given system is : (i) Memoryless (ii) Linear (iii) Time invariant.

- (d) Define and Classify various types of signals.
 (i) Determine whether given signal is energy or power: $A[u(t+a) - u(t-a)]$
 (ii) Justify whether given signal is $\cos(\omega_0 t)$ is even or odd.

Q.2 (a) Discuss the need for modulation and compare various Amplitude modulation schemes.

OR

- (b) Draw the circuit diagram and explain working balanced modulator used for DSB-SC signal generation.

- (c) An A.M. signal is given by $4 \cos 2800\pi t + 10 \cos 3400\pi t + 4 \cos 4000\pi t$. Find Bandwidth, Carrier Power, Sideband Power, Total Power and efficiency of system. Also Plot the spectrum.

OR

- (d) Discuss the need of synchronous detector. Explain the working of Costas receiver.

Q.3 (a) Discuss the direct method of FM generation. Also discuss how we can generate stable FM signal with the help of this method.

OR

- (b) A 20 MHz carrier is frequency modulated by sinusoidal signal such that the maximum frequency deviation is 100 kHz. Determine the modulation index and approximated bandwidth of the FM signal if the frequency of the modulating signal is a) 1 kHz b) 100 kHz and c) 500 kHz.

- (c) Explain mathematically how a message signal is recovered from FM signal using phase lock loop (PLL) FM demodulator.

OR

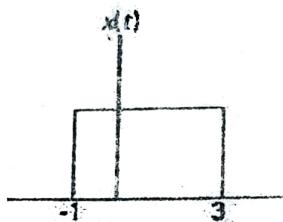
- (d) Explain mathematically how a message signal is recovered from FM signal using Dual slope FM detector.

Q.4 (a) Define following terms: a) Random variable b) Random process c) Stationary process d) Ergodic process. 7

OR

(b) State central limit theorem. Define Probability Density Function and Cumulative Distribution Function of a random variable and discuss their properties. 7

(c) Find Mean and Variance of a Random Variable X. Whose pdf is given by: 7



OR

(d) The pdf of a random variable is given as 7

$$f_x(x) = K e^{-x}, \text{ for } x \geq 0 \text{ and zero otherwise, where } K \text{ is constant,}$$

i) Determine value of K.

ii) Calculate $P\{0 < x \leq 5\}$

iii) $P\{-3 < x \leq 3\}$

Q.5 (a) Derive the expression for Signal to Noise power Ratio of DSB-SC system. 7

OR

(b) Discuss various sources of noise. Calculate the RMS noise voltage appearing at the output terminal of a $20 \text{ k}\Omega$ resistor at room temperature $T = 23^\circ \text{C}$ in 1 MHz bandwidth. 7

(c) Derive the generalize expression for noise equivalent temperature. 7

OR

(d) A receiver with 80 dB gain and an effective noise temperature of 3000°K is connected to an antenna that has noise temperature of 600°K . Find the receiver noise power output over a 40 MHz band. 7

**APRIL-MAY 2017 EXAMINATION
(II) B.E. EXAM
EC- 28553/2853: COMMUNICATION ENGINEERING.**

Exam. Code-515

Time: 3 Hrs.]

[Max. Marks : 70

TOTAL NO. OF QUESTIONS IN THIS PAPER : 5

Note: Attempt all the questions. Answer (a) OR (b) & (c) OR (d) parts in each question. All questions carry equal marks.

Q.1 (a) Describe various frequency bands used in communication and their typical applications. Convert 200 Watts into dBW & dBm. 7

OR 7

**(b) Find Fourier transform of: a) t
b) unit rectangular pulse ; (with duration $-1 \leq t \leq 1$)**

**(c) Define energy and power signal. Determine whether the following signals are energy signals or Power signals or neither
(a) $u(t)$ (b) $tu(t)$ (c) $A[u(t+a)-u(t-a)]$ 7**

OR 7

(d) Define and Classify Systems. Determine whether given systems with output $y(t)$ for input $x(t)$ are linear or not. (i) $y(t)=2x^2(t)+1$ (ii) $y(t)=x(5t)$ 7

Q.2 (a) Discuss the need for modulation. Define modulation index in AM. Draw AM waveform for $\mu < 1$, $\mu = 1$ & $\mu > 1$. 7

OR 7

(b) Draw the circuit diagram and explain working of envelop detector used for AM demodulation.

(c) An AM wave has transmission power of 100 Watt, when it is modulated by a message signal of frequency 2 KHz. Find (i) P_c and P_{sb} for $M=0.707$. (ii) Peak Amplitude of carrier (iii) modulation efficiency (iv) Bandwidth of AM-wave. Assume antenna resistance to be 1Ω . 7

OR

(d) A diode detector load consists of $0.01\mu F$ capacitor in parallel with a $5k\Omega$ resistor. Find the maximum depth of modulation without diagonal clipping at modulating frequency of 1000Hz and 10 KHz. 7

Q.3 (a) Discuss the Indirect method of FM generation. State Carson's for calculating FM bandwidth. 7

OR

(b) Define angle modulation. Derive the standard expression for FM and PM. Also discuss advantages and disadvantages of angle modulation. 7

(c) Explain significance of Pre-emphasis, De-emphasis and AGC block in FM communication system. 7

OR

(d) What are the limitations of TRF receiver and how they are overcome by super heterodyne receiver? Does Super heterodyne too have any limitation. 7

4 (a) Define random variable and random process. State difference between wide sense stationary process and strict sense stationary process. 7

OR

(b) Define Probability Density Function and Cumulative Density Function of a random variable and discuss their properties. Give examples of some standard PDF. 7

- (c) For the given signal: $e^{-at} u(t)$, where $a > 0$
find auto correlation, ESD and energy.

7

OR

- (d) The pdf of a random variable is given as
 $f_x(x) = Kx^2$, for $0 < x < 2$ and zero otherwise, where K is constant,
i) Determine value of K .
ii) Calculate $p(1 < x < 2)$.

7

- Q.5 (a) Define following terms and specify there significance: (i) Random Process (ii) Auto-Correlation (iii) Power Spectral Density.

7

OR

- (b) Define following terms and specify there significance : (i) Signal to noise ratio (SNR) (ii) Noise Figure (F) (iii) Noise Equivalent Temperature (T_e).

7

- (c) For the given signal: $e^{-at} u(t)$, where $a > 0$. Find auto correlation, PSD and Power.

7

OR

- (d) A receiver with noise figure (F) of 12dB and consist of Pre-Amplifier with noise temperature T_e of 127 °K and gain of 20 dB. Calculate the overall noise figure and equivalent noise temperature of receiver. Assume a reference temperature of 290 °K.

7

MARCH-APRIL 2016 EXAMINATION

Exam. Code-432

(II) B.E. EXAM

EC- 2853: COMMUNICATION ENGINEERING.

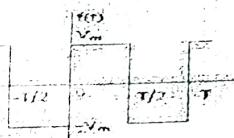
Time: 3 Hrs.]

[Max. Marks : 70

TOTAL NO. OF QUESTIONS IN THIS PAPER : 5

Note. Attempt all the questions. Answer (a) OR (b) & (c) OR (d) parts in each question. All questions carry equal marks.

- Q.1 (a) Consider the periodic square wave shown in figure:
A) Determine its complex exponential Fourier Series.
B) Determine its trigonometric Fourier Series representation.



OR

- (b) Find Fourier transform of: a) $\text{sgn}(t)$
b) $1/(a^2+t^2)$

(c) Define each of the following types of signals with example for each
(i) Periodic and Non-periodic Signals. (ii) Energy and Power Signals (iii) Causal and Non-causal Signals (iv) Deterministic and Random Signals (v) Even and Odd Signals.

OR

- (d) Determine whether given systems with output $y(t)$ for input $x(t)$ are linear or not.
(i) $y(t) = x(t) \cos 5t$ (ii) $y(t) = 3x(t) + 5$ (iii) $y(t) = dx(t)/dt$

- Q.2 (a) Derive the mathematical expression for SSB-SC signal. Briefly compare VSB-SC and SSB-SC modulation system.

OR

- (b) The message signal $m(t) = 2\cos 400t + 4\sin(500t + \pi/3)$ modulates the carrier signal $c(t) = A\cos(8000\pi t)$, using DSB-SC modulation. Find the time domain and frequency domain representation of the modulated signal and plot the spectrum (Fourier transform) of the modulated signal. What is the power content of the modulated signal?

- (c) Consider an AM signal $s(t) = 4\cos 1800\pi t + 10\cos 2000\pi t + 4\cos 2200\pi t$,
(i) Sketch the spectrum of $s(t)$.
(ii) Determine modulation index (μ), transmission efficiency (η) and bandwidth(B), P_e , P_{SB} and P_T .

OR

- (d) Explain TRF receiver and its limitation. Also define following terms for a Receiver
i) Selectivity ii) Fidelity iii) Sensitivity

- Q.3 (a) Show mathematically why Frequency Modulation have theoretical infinite bandwidth.

OR

- (b) Discuss the direct method of FM generation. Also explain how a stable output FM is generated using feedback system.

- (c) The message signal $m(t) = 10 \sin(400t)$ frequency modulates the carrier $c(t) = 100 \cos 2\pi f_c t$. The modulation index is 6. Write an expression for the modulated signal $u(t)$. Also calculate Δf_{max} , total power content in modulated signal and bandwidth of the modulated signal.

OR

- (d) Define following terms : (i) Threshold effect (ii) Capture effect (iii) Pre-emphasis
(iv) De-emphasis

- Q.4 (a) State Central Limit Theorem with its significance. Discuss briefly uniform & Gaussian probability density function.

OR

- (b) Discuss the relationship between PDF and CDF of a random variable and discuss their properties.

- (c) For a given PDF $f_x(x) = a e^{-bx}$ where a & b are constants, find $F_x(x)$ and relation between a & b. 7

OR

- (d) A random noise signal having Gaussian distribution with variance $\sigma^2 = 0.36$ and mean $\mu = 0$. Determine the probability that the magnitude of noise signal is larger than 1.2. (Given $Q(2) = 2.275 \times 10^{-2}$) 7

- Q5 (a) Describe Random Processes briefly. Discuss various types of random process. 7

OR

- (b) Define following terms : (i) Auto-Correlation (ii) Power Spectral Density 7

(iii) Signal to noise ratio (SNR) (iv) Noise Figure.

- (c) Define Noise in a communication system. Discuss various internal and external sources of noise in a communication system. 7

OR

- (d) Derive the expression for noise figure of Two port Cascade amplifier network. 7

Handwritten notes and calculations related to the derivation of noise figure for a two-port cascade amplifier:

Given $f_x(x) = a e^{-bx}$ (from part c)

For a Gaussian distribution, $a = \sqrt{\frac{2}{\pi}}$ and $b = \frac{1}{2\sigma^2}$

Given $\sigma^2 = 0.36$, so $b = \frac{1}{2 \times 0.36} = \frac{1}{0.72}$

Now, $a = \sqrt{\frac{2}{\pi}} \times \sqrt{\frac{1}{0.72}} = \sqrt{\frac{2}{\pi} \times \frac{1}{0.72}}$

Let's simplify this:

$$= \sqrt{\frac{2}{\pi} \times \frac{1}{0.72}} = \sqrt{\frac{2}{\pi} \times \frac{1}{\frac{36}{50}}} = \sqrt{\frac{2}{\pi} \times \frac{50}{36}} = \sqrt{\frac{2}{\pi} \times \frac{25}{18}} = \sqrt{\frac{25}{18\pi}}$$

Further simplification:

$$\sqrt{\frac{25}{18\pi}} = \sqrt{\frac{25}{18} \times \frac{1}{\pi}} = \sqrt{\frac{25}{18} \times \frac{1}{\pi}} = \sqrt{\frac{25}{18\pi}}$$

Final result:

$$a = \sqrt{\frac{25}{18\pi}}$$

(II)B.E.(4YDC) EXAM

EC-2853 : COMMUNICATION ENGINEERING

Time: 3 Hrs.

TOTAL NO. OF QUESTIONS IN THIS PAPER: 5

Note: Attempt all the questions. Answer (a) OR (b) & (c) OR (d) parts in each question. All questions carry equal marks.

Q.1 ✓(a) Distinguish between following :-

✓1) Continuous time signal and Discrete time signal

✓2) Periodic signal and Aperiodic signal

✓3) Deterministic and Random signal

✓4) Power and Energy signal

OR

(b) Find Fourier transform of: a) $\cos(\omega t)$

b) $\exp(-at|t|)$, where $a>0$

c) $1/(a^2 + t^2)$

(c) Define the term system and how they are classified.

OR

(d) Find energy and ESD of given signal :-
 $x(t) = \exp(-at)u(t)$, where $a>0$

7

Q.2 ✓(c) An A.M. signal is given by $4 \cos(800\pi t + 10) \cos 2000\pi t + 4 \cos 2200\pi t$. Find Bandwidth, Carrier Power, Sideband Power, Total Power and modulation efficiency of the system. Plot the spectrum of the given signal.

OR

(b) Explain the working of square law modulator used for AM generation.

7

(c) An AM transmitter transmit 50 Watts when the carrier is modulated by sinusoidal signal and the modulation index is 0.707. Determine the modulation efficiency, carrier power, sideband power and peak amplitude of carrier. Assume antenna resistance to be 1Ω .

OR

(d) Draw the block diagrams of super heterodyne receiver. Briefly explain the working of each block.

7

Q.3 (a) Discuss why Frequency Modulation have theoretical bandwidth Infinite.

OR

(b) Explain the working of dual slop detector used for FM detection.

7

(c) Explain significance of Pre-emphasis, De-emphasis and AGC block in FM communication system.

7

Max. Marks : 70

Oct 2018

OR

- (d) A angle modulated signal with carrier frequency ($2\pi * 10^5$) is described by the equation $S(t) = 10 \cos (w_c t + 5 \sin 3000t + 10 \sin 2000t)$. Find the frequency deviation, the deviation ratio. Find the bandwidth.

- Q.4 (a) Define Following terminology: i) Random Variable ii) Mean iii) Variance iv) PDF and v) CDF.

OR

- (b) State the properties of the CDF and PDF of a random variable.

- (c) State Central Limit theorem. Draw PDF of standard random variables and explain it briefly.

OR

- (d) The pdf of a random variable is given as

$$f_x(x) = \begin{cases} K, & a \leq x \leq b \\ 0, & \text{elsewhere} \end{cases}, \text{ where } K \text{ is constant,}$$

Sketch the pdf and determine value of K.

ii) If $a=-1$ and $b=2$, calculate $p(|x| \leq 1/2)$.

- Q.5 (a) Define noise in a communication system. What are its sources.

OR

- (b) Define following terms: i) Noise Figure ii) Noise Equivalent Temperature
iii) Noise Equivalent Bandwidth iv) Thermal noise.

- (c) Derive generalize expression for noise figure and noise equivalent temperature of cascade amplifiers.

OR

- (d) Discuss noise performance of DSB-SC system. Also outline underling assumption.

EXAM.
EC-2853
COMMUNICATION ENGINEERING

Time : 3 Hrs.]

[Max. Marks
[Min. Pass Marks

: 70
: 40

TOTAL NO. OF QUESTIONS IN THIS PAPER : 5

Note : All questions carry equal marks. All questions are compulsory. Attempt any one from (a) or (b) and similarly any one from (c) or (d) in each question.

- Q.1 (a) Classify various types of systems which are used in communication systems. Find whether the signal $y(t) = x(2t)$ is (i) linear or non-linear and (ii) Time invariant or time variant. Justify your answer.
OR
 (b) Determine the trigonometric Fourier series of a square wave of time period T with its maximum value as +A and minimum value as -A. Sketch its waveform.
 (c) State and prove time shifting property, frequency shifting property and convolution property of Fourier transform.
 (d) Describe various frequency bands in which the signals are classified in communication systems. What are their corresponding wavelengths? For a signal of 900 MHz, what is its band and wavelength?

- Q.2 (a) Derive an expression for a AM signal with sinusoidal modulating frequency. What is the power in its sidebands?
OR
 (b) What are the various techniques employed in detection of AM wave? Explain any one of them in detail using circuit diagram and suitable waveforms.
 (c) Describe the working of a High level and low level AM transmitter with the help of block diagram.
OR
 (d) What are various types of AM systems? Compare them on the basis of transmission power, bandwidth and ease in detection.

- Q.3 (a) Derive an expression for narrow-band FM. Sketch its waveform and frequency spectrum. What is the difference between the narrow-band FM and wideband FM?
OR
 (b) Describe the working of a direct FM generation system. What are its limitations? Discuss the feedback scheme used for frequency stabilization in a FM system.
 (c) What are the various techniques used in detection of a FM wave. Describe any one of them in detail using block diagram and mathematical equations.
OR
 (d) What is the need of pre-emphasis and de-emphasis in a FM system? Explain the working of pre-emphasis and de-emphasis circuits.

Q.4 (a) Define the terms (i) random variable (ii) probability density function (pdf) and (iii) cumulative distribution function (cdf). State the properties of pdf and cdf.

OR

(b) Define the terms 'mean' and 'variance' of a random variable X. Find the mean of a random variable $f(x) = 2 e^{-2x} u(x)$.

(c) Explain the terms (i) white noise (ii) Equivalent Noise temperature and (iii) Signal to noise ratio. What are the ideal values of (ii) and (iii)?

OR

(d) Define the term Noise figure of an amplifier. Derive an expression of noise figure of a system of amplifiers in cascade.

Q.5 (a) State and prove Nyquist sampling theorem. What do you understand by Quantization error? How can it be reduced?

OR

(b) What are the advantages of digital modulation techniques over analog modulation techniques? Explain them using suitable examples.

(c) What is PAM, PPM and PWM? Describe any two of them.

OR

(d) Write a short note on quantization and companding.

Time: 3 Hrs.]

[Max. Marks : 70

[Min. Pass Marks : 22]

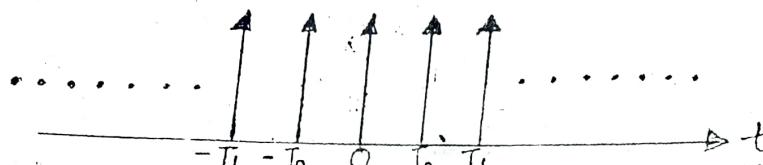
TOTAL NO. OF QUESTIONS IN THIS PAPER : 5

Note: Attempt all the questions. Attempt any one from any one a and b & any one from c and d

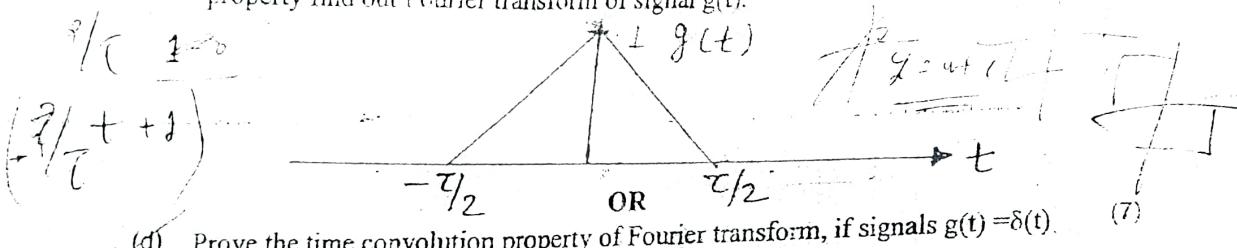
- Q.1 (a) (i) Find out the given signals are energy or power signals, if it is then find out corresponding energy or power. (a) $e^{-at} u(t)$ (b) $\text{Acos}\omega_0 t$
 (ii) If a signal $f(t)$ has energy E, prove that energy of the signal $f(2t)$ is $E/2$. (7)

OR

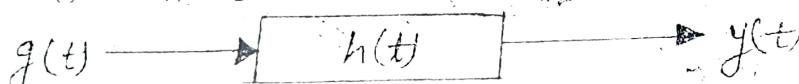
- (b) Explain the Dirichlet conditions for existence of Fourier series & also find out exponential Fourier series for given signal (7)



- (c) Prove the time differentiation property of Fourier transform and using this property find out Fourier transform of signal $g(t)$. (7)



- (d) Prove the time convolution property of Fourier transform, if signals $g(t) = \delta(t)$ & $h(t) = e^{-at} u(t)$ for given system then find out $Y(\omega)$. (7)



- Q.2 (a) For a Double side band with carrier amplitude modulated system prove that $\eta = \mu^2/(2+\mu^2)$ (7)

If modulation index (μ) is changed from 0 to 1 then find out change in transmitted power in %.

OR

- (b) A message signal is given by $m(t) = 0.5\cos\omega_1 t + 0.5\sin\omega_1 t$ is amplitude modulated with a carrier(ω_c) to generate $S_{am}(t) = [1 + m(t)]\cos\omega_c t$ then find out, (i) modulation index(μ) (ii) side band power (iii) transmission efficiency(η) (7)

- (c) Draw the block schematic of radio frequency receivers and explain its working, also describe the concept of image frequency. (7)

OR

- (d) (i) If sensitivity of receiver is -127 dBm calculate the sensitivity of receiver in terms of watts, milliwatts & microwatts. Assume the input impedance of receiver to be 50Ω .
 (ii) Draw the table of the range of frequencies in MF, HF, VHF & UHF with corresponding wavelengths. (7)

- Q.3 (a) Derive the formula for wide band frequency modulated (WBFM) signal .Also prove that ideal bandwidth of WBFM is infinity. (7)

OR

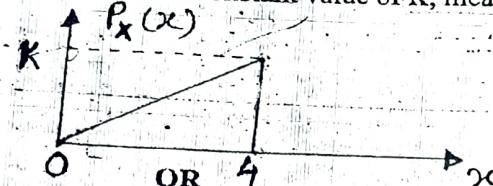
- (b) Explain the working of PLL(phase locked loop), how it is used to demodulate FM signals? (7)

(c) Consider an FM modulated signal $X_c(t) = 10 \cos(\omega_c t + 3 \sin \omega_m t)$ calculate the modulation index, bandwidth & transmitted power of given signal assume that f_m is 1 KHz. (7)

(d) A signal bandwidth 2 KHz is FM modulated resulting maximum frequency deviation of 5 KHz find out. (7)

(i) Band width of modulated signal (ii) if the amplitude of modulating signal is increased by factor 3 & its frequency is lowered by 1KHz.find out new max. Frequency deviation and bandwidth.

Q.4 1(a) List out the property of probability density function (pdf) & cumulative distribution function (cdf) also find out constant value of K, mean & variance for a given pdf. (7)



(b) (i) Derive the mathematical expression of cumulative distribution function (cdf) for Gaussian distribution. (7)
 (ii) Prove that first central moment of random variable is always zero.

shallow build
 (c) Prove that output signal to noise ratio(S/N) for DSB-SC amplitude modulated system in presence of white noise is given by: (7)

$$(S/N)_o = \gamma$$

OR

shallow build
 (d) Prove that output signal to noise ratio(S/N) for frequency modulated(FM) modulated system in presence of white noise is given by: (7)

$$(S/N)_o = 1.5\beta^2 \gamma$$

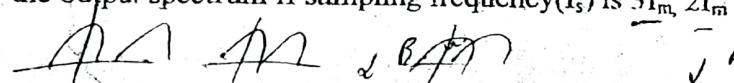
Q.5 1(a) For pulse code modulation technique (PCM) prove that: (7)

$$S/N = (1.76 + 6n) \text{ dB}$$

If no. of encoded bit (n) is changed from 6 to 8 then signal to noise ratio (S/N) is increased by?

OR

(b) (i) How non-uniform quantization provided the constant SNR. (7)
 (ii) If a message signal having bandwidth (f_m) Hz is passed through ideal sampler, draw the output spectrum if sampling frequency(f_s) is $3f_m$, $2f_m$ & f_m .



PCM
 (c) Bandwidth of TV video & audio signal is 4.5 MHz & peak amplitude is 5V. If this signal is converted into pcm with 1024 quantization level. Assume that signal is sampled at 20% above the nyquist rate then find out: (7)

$2^n = 1024$ (i) no. of encoded bit(n) (ii) step size(Δ) (iii) transmission bandwidth (bits/sec) (iv) SNR.

OR

(d) The T-1 carrier system used in digital telephony multiplexes 24 voice channels based on 8 bit pcm each voice signal having bandwidth of 3.4KHz, if the signal is sampled at 8 KHz calculate (i) duration of each bit (ii) resultant bandwidth (bits/s) (iii) channel bandwidth (Hz) (7)

→ PCM 5(a) → PCM - block diag., aliasing to diff.

→ Quantisat → uniform / non-uniform Quantizer

→ PAM, 5(c) → Nyquist Sampling theorem