

B. TECH.

1

THEORY EXAMINATION (SEM-VI) 2016-17
INDUSTRIAL MANAGEMENT

Time : 3 Hours

Max. Marks : 100

Note : Be precise in your answer. In case of numerical problem assume data wherever not provided.

SECTION-A

1. Attempt all parts. All parts carry equal Marks. (10x 2=20)

- a) What are the applications of industrial management in engineering?
- b) Define Dayabhaga and Mitakshara system in joint Hindu family business.
- c) Differentiate between 'mass production and 'job production' systems.
- d) What are THERBLIG?
- e) Define the term 'Ergonomics'.
- f) Define Statistical Quality Control.
- g) Differentiate between production and productivity.
- h) What is TQM (total quality management)?
- i) Enlist any two symbols of process chart.
- j) What do you understand by 'J.I.T.' and 'Kanban System'?

**SECTION-B**

2. Attempt any five questions: (5x10=50)

- a) Write a detailed note on the development of industrial management.
- b) Is production management is different from operation management? Describe the intermittent and continuous production system.
- c) Define 'Work Study' and state its objectives. Differentiate between 'Method Study' and 'Work Measurement'.
- d) What are the basic principles of motion economy? Discuss these principles in relation to work area.
- e) Discuss the ISO certification norms. In what way can it help an organization to improve their internal efficiency?
- f) What are the different patterns of industrial ownership? Explain them with their advantages and disadvantages.
- g) What is Acceptance Sampling? Describe the single, double and sequential sampling plan procedure.
- h) Define the term Production Planning. State its objectives. What are the various steps involved in Production Planning and Control?

SECTION-C

Attempt any two questions: (15X2=30)

3. (a) Who is referred as the father of scientific management? What are the principles and goal of scientific management?
(b) Explain the various types of inventory control techniques.
4. (a) What is a control chart? Discuss the types of control charts for 'variables' (Mean chart and Range chart).
(b) What do you understand by 'Supply Chain Management'? Discuss the different components of supply chain?
5. (a) Describe the basic model of inventory control with its assumptions.
(b) The annual demand for an item is 3200 parts. The unit cost is Rs. 6 and the inventory carrying charges are estimated as 25% per annum. If the cost of one procurement is Rs. 150, find: (i) Economic order quantity, (ii) Numbers of order per year, (iii) The optimal cost.

B. TECH.

THEORY EXAMINATION (SEM-VI) 2016-17
PARALLEL ALGORITHM

2

Time : 3 Hours

Max. Marks : 100

Note : Be precise in your answer. In case of numerical problem assume data wherever not provided.

SECTION - A

1. Attempt all parts of the following question:

10 x 2 = 20

- (a) What is Speed-up?
- (b) What is SIMD?
- (c) What is a hyper cube connection?
- (d) How long does Bitonic sorting require on PRAM?
- (e) How long does the parallel version of Prim's minimum spanning tree finding algorithm require on a graph with n nodes using p processors
- (f) What is task-throughput?
- (g) What is the complexity of prefix sum in pram model?
- (h) What is common CRCW PRAM?
- (i) What is data-parallel computation?
- (j) Difference between permutation and combination.

SECTION - B

2. Attempt any five of the following questions:

5 x 10 = 50

- (a) Describe the Butterfly Model with suitable diagram
- (b) Explain PRAM Computational model. Along with brief explanation of EREW and CREW computational model.
- (c) What are the various performance measures of parallel algorithm? Discuss various performance measures with example.
- (d) Discuss Bitonic merge in detail with suitable example.
- (e) What do you mean by cost-optimality? Discuss any one cost optimal algorithm in detail.
- (f) Explain parallel Branch and Bound search?
- (g) Differentiate between the hypercube and Shuffle-Exchange network parallel computational model.
- (h) What do you mean by parallel sorting networks? Also discuss the enumeration sort algorithm?

SECTION - C

Attempt any two of the following questions:

2 x 15 = 30

- 3 (i) What is Amdahl Effect? Explain. Also discuss Amdahl's Law.
(ii) Depth and Breadth first search algorithm for graph
- 4 Parallel Alpha Beta search.
- 5 What is data parallelism? Explain difference between Data Parallelism Vs Task Parallelism and Data Parallelism and Model Parallelism

B.TECH.

3

THEORY EXAMINATION (SEM-VI) 2016-17

COMPILER DESIGN

Time : 3 Hours

Max. Marks : 100

Note : Be precise in your answer. In case of numerical problem assume data wherever not provided.

SECTION - A

1. Attempt the following:

10 x 2 = 20

- (a) State any two reasons as to why phases of compiler should be grouped.
- (b) Write regular expression to describe a language consist of strings made of even numbers a & b.
- (c) Write a CF grammar to represent palindrome.
- (d) Why are quadruples preferred over triples in an optimizing compiler?
- (e) Give syntax directed translation for case statement.
- (f) What is a syntax tree? Draw the syntax tree for the following statement: $c\ b\ c\ b\ a - * + - * =$
- (g) How to perform register assignment for outer loops?
- (h) List out the criteria for code improving transformations.
- (i) Represent the following in flow graph $i=1; sum=0; while (i<=10)\{sum+=i;i++\}$
- (j) What is the use of algebraic identities in optimization of basic blocks?

SECTION - B

2. Attempt any five of the following questions:

5 x 10 = 50

- (a) Explain in detail the process of compilation. illustrate the output of each phase of compilation of the input $a=(b+c)*(b+c)*2$.
- (b) Construct the minimized DFA for the regular expression $(0+1)^*(0+1)10$.
- (c) What is an ambiguous grammar? Is the following grammar ambiguous? Prove $EE+|E(E)|\epsilon$. The grammar should be moved to the next line ,centered.
- (d) Draw NFA for the regular expression ab^*/ab .
- (e) How names can be looked up in the symbol table? Discuss.
- (f) Write an algorithm to partition a sequence of three address statements into basic blocks.
- (g) Discuss in detail the process of optimization of basic blocks. Give an example
- (h) How to subdivide a run-time memory into code and data areas. Explain

SECTION - C

Attempt any two of the following questions:

2 x 15 = 30

3 Consider the following grammar

S-AS|b

A-SA|a.

Construct the SLR parse table for the grammar. Show the actions of the parser for the input string "abab".

- 4 How would you convert the following into intermediate code? Give a suitable example.
 - i) Assignment Statements. ii) Case Statements
- 5 Define a directed acyclic graph. Construct a DAG and write the sequence of instructions for the expression $a+a*(b-c)+(b-c)*d$.

THEORY EXAMINATION (SEM-VI) 2016-17
COMPUTER NETWORK

Time : 3 Hours

Max. Marks : 100

Note : Be precise in your answer. In case of numerical problem assume data wherever not provided.

SECTION - A

1. Explain the following:

10 x 2 = 20

- (a) Write about user access in ISDN.
- (b) List the advantages and disadvantages of star topology.
- (c) Compare ALOHA with slotted ALOHA.
- (d) State the requirements of CRC.
- (e) Provide few reasons for congestion in a network.
- (f) With the given IP-address, how will you extract its net-id and host-id?
- (g) What is piggybacking?
- (h) How does transport layer perform duplication control?
- (i) Mention the use of HTTP.
- (j) List out few email gateways.

SECTION - B

2. Attempt any five of the following questions:

5 x 10 = 50

- (a) Discuss the issues in the data link layer and about its protocol on the basis of layering principle.
- (b) Explain network topological design with necessary diagram and brief the advantages and disadvantages of various topologies.
- (c) Consider the use of 10 K-bit size frames on a 10 Mbps satellite channel with 270 ms delay. What is the link utilization for stop-and-wait ARQ technique assuming $P=10^{-3}$?
- (d) Brief about how line coding implemented in FDDI and describe its format.
- (e) Enumerate on TCP header and working of TCP and differentiate TCP and UDP with frame format.
- (f) Explain the three way handshaking protocol to establish the transport level connection.
- (g) Elaborate about TELNET and its working procedure.
- (h) How does FTP work? Differentiate between passive and active FTP.

SECTION - C

Attempt any two of the following questions:

2 x 15 = 30

- 3 (i) Explain functionalities of every layer in OSI reference model with neat block diagram.
- (ii) Illustrate the performance issues for GO-BACK-N data link protocol.
- 4 (i) Describe the problem of count to infinity associated with distance vector routing technique.
- (ii) Enumerate how the transport layer ensure that the complete message arrives at the destination and in the proper order.
- 5 Explain the SNMP protocols in detail.

B. TECH.

5

**THEORY EXAMINATION (SEM-VI) 2016-17
SOFTWARE ENGINEERING**

Time : 3 Hours

Max. Marks : 100

Note : Be precise in your answer.

SECTION - A

1. Attempt all parts of the following questions:

10 x 2 = 20

- (a) What is the software crisis?
- (b) Write major software characteristics.
- (c) Write the methods of requirements elicitation.
- (d) Write the differences between software and software engineering.
- (e) What is the difference between Verification and Validation?
- (f) How software design can be classify?
- (g) Write major software Design Tools.
- (h) Write the names of design principles.
- (i) Write the differences between Top-downs and bottom-up approaches.
- (j) What is software quality?

SECTION - B

2. Attempt any five parts of the following questions:

5 x 10 = 50

- (a) What is meant by "Formal Technical Review"? Should it assess both programming style as well as correctness of software? Give reasons.
- (b) Compare ISO and SEE-CMI model.
- (c) What is Risk management? How are project risks different from technical risks?
- (d) What is a data flow diagram? Explain rules for drawing good data flow diagrams with the help of a suitable example.
- (e) Explain software quality assurance (SQA) with life cycle.
- (f) Explain software development life cycle. Discuss various activities during SDLC.
- (g) List five desirable characteristics of good SRS document. Discuss the relative advantages of formal and informal requirement specifications.
- (h) What are the characteristics of a software process?

SECTION - C

Attempt any two parts of the following questions:

2 x 15 = 30

3. What do you understand by coupling and cohesion? What roles they play in software design? Describe the properties of best coupling and cohesion giving examples of each.
4. What is a Structure Charts? Explain rules for drawing good Structure Charts diagrams with the help of a suitable example.
5. Define the following:
 - (i) Water fall Model
 - (ii) Spiral Model

B.TECH.

THEORY EXAMINATION (SEM-VI) 2016-17
DATA WAREHOUSING & DATA MINING

Time : 3 Hours

Max. Marks : 100

Note : Be precise in your answer. In case of numerical problem assume data wherever not provided.

SECTION - A

1. Explain the following:

10 x 2 = 20

- (a) How is the data warehouse different from a database?
- (b) Distinguish the snowflake model from the fact constellation model.
- (c) Mention the characteristics of a data warehouse.
- (d) State the use of meta data in the context of data warehousing.
- (e) Give a precise definition of the term 'concept hierarchy'.
- (f) Why data cleaning routines are needed?
- (g) Give the definition of the terms 'frequent itemset', 'support' and 'confidence'.
- (h) Represent a decision tree for a student record database.
- (i) Classify OLAP tools.
- (j) Bring out any two points with respect to spatial mining.

SECTION - B

2. Attempt any five of the following questions:

5 x 10 = 50

- (a) "A data warehouse can be modeled by either a star schema or a snowflake schema". With relevant examples discuss the two types of schema.
- (b) Enumerate the steps involved in mapping the data warehouse to a multiprocessor architecture.
- (c) Describe challenges to data mining regarding data mining methodology and user interaction issues.
- (d) Summarize the smoothing techniques followed in data cleaning process.
- (e) How data mining systems are classified? Describe each classification with example.
- (f) Discuss issues that are important to consider when employing a decision tree - based classification algorithm. Explain the decision tree induction algorithm with appropriate examples. Discuss the disadvantages of this approach? What is over fitting, and how can it be prevented for decision trees?
- (g) Diagrammatically illustrate and discuss the architecture of MOLAP and ROLAP.
- (h) What is web mining? Differentiate between web content mining, web structure mining and web usage mining.

SECTION - C

3. Attempt any two of the following questions:

2 x 15 = 30

- (a) Suppose that a data warehouse for a University consists of the following four dimensions: student, course, semester and instructor, and two measures such as count and avg_grade.
When at the lowest conceptual level (e.g., for a given student, course, semester and instructor combination) the avg_grade measure stores the actual course grade of the student. At higher conceptual levels, avg_grade stores the average grade for the given combination.
 - (i) Draw a snowflake scheme diagram for the data warehouse.
 - (ii) Starting with the base cuboid [student, course, semester, instructor], what

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specific OLAP operations (e.g. roll-up from semester to year) should one perform in order to list the average grade of CS courses for each student of the University

- 4. Consider five points $(X_1, X_2, X_3, X_4, X_5)$ with the following coordinates as a two-dimensional sample for clustering: $X_1=(0,2.25)$; $X_2=(0,0.25)$; $X_3=(1.25,0)$; $X_4=(4.5,0)$; $X_5=(4.5,2.5)$, illustrate the K-means partitioning algorithm (clustering algorithm) using the above data set.
- 5. Compare and contrast spatial, temporal mining with relevant examples.

Time : 3 Hours
Note : Be precise in

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B. TECH.

THEORY EXAMINATION (SEM-VI) 2016-17
DIGITAL COMMUNICATION

Time: 3 Hours

Max. Marks: 100

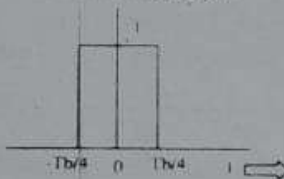
Note: Be precise in your answers, because of narrow margins you assume data wherever not provided.

SECTION - A

1. Attempt all parts of the following questions: 10 x 2 = 20
- In an experiment a trial consists of four successive with draw of playing cards from a pack of 52 cards. if we define $R_N(X)$ as number of king appearing in a trial. Find $E(X)$
 - Calculate the autocorrelation for White noise.
 - What is the condition to justify the orthogonality of two signals?
 - What is essential bandwidth for polar NRZ long codes?
 - Explain the difference between slow hopping and fast hopping
 - Compare the spectrum occupancy of PSK and FSK schemes
 - Explain the Bay's rule of probability
 - Explain the advantages of Manchester coding
 - Draw the Manchester representation for the sequence 1010101001111
 - Discuss BPSK modulator.

SECTION - B

2. Attempt any five parts of the following questions: 5 x 10 = 50
- Find the PSD $S_y(f)$ for a polar random signal use a basic pulse as shown in fig. below. The digits are 1 and 0 equally likely and digits are transmitted every T seconds. Each digit is independent of the remaining digits.



- Explain the working of frequency hopping spread spectrum system. Discuss its applications in detail. A slow FH/MFSK system has following parameters.
 - The number of bits per MFSK symbol = 4
 - The number of MFSK symbols per hop = 5
 - Calculate the processing gain of the system in decibels.
- What is the probability of error in presence of white noise for BPSK system? We are required to transmit 2.08×10^6 binary digits per second with $P_b \leq 10^{-7}$. The channel noise PSD is $S_n(f) = 10^{-8}$. Determine the transmission bandwidth and signal power required in binary.
- A binary communication channel, the receiver detects the pulse with an error probability P_e . What is the probability that out of 100 received digits, no more than four digits are in error?
- A source emits one of the four messages randomly every microsecond. The probabilities of these messages are 0.4, 0.3, 0.2 and 0.1. Messages are generated independently.

- (f) Explain the construction codes. It is advantage and disadvantage.
- (g) Explain the Chebyshev's inequality.
- (h) What is a PN sequence? Draw the PN sequence generator and define its autocorrelation function. A PN sequence is generated using linear feedback shift register with number of stages equal to 10. The chip rate is 10⁷ per second. Find the following:
 - (i) PN sequence length
 - (ii) chip Duration
 - (iii) period of PN sequence

SECTION - C

Attempt any two parts of the following questions:

2 x 15 = 30

- 3. Explain the principle of OFDM.
- 4. (i) Write a short note on Matched Filter.
(ii) Find the probability of error for a matched filter? Explain how a matched filter works as correlator receiver.
- 5. Write short notes on :
 - (i) Central limit theorem
 - (ii) Error Correcting codes

Time : 3 Hours

Note : Be precise

1. Attempt

- (a)
- (b)
- (c)
- (d)
- (e)
- (f)
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- (j)

2. Attempt

- (a)
- (b)
- (c)
- (d)
- (e)
- (f)
- (g)

THEORY EXAMINATION (SEM-VI) 2016-17
DIGITAL SIGNAL PROCESSING

Time : 3 Hours

Max. Marks : 100

Note : Be precise in your answer. In case of numerical problem assume data wherever not provided

SECTION - A

1. Attempt the following questions:

10 x 2 = 20

- Define digital signal processing
- Draw the block diagram of digital signal processing.
- Explain the basic elements required for realization of digital system.
- Define linear convolution and its physical significance.
- What is the fundamental time period of the signal $x(t) = \sin 15\pi t$.
- Draw a transformation matrix of size 4×4 and explain the properties of twiddle factor
- Differentiate between IIR and FIR filters
- Enumerate the Advantages of DSP over ASP.
- Write the expression for computation efficiency of an FFT.
- Calculate the DFT of the sequence $s(n) = \{1, 2, 1, 3\}$

SECTION - B

2. Attempt any five of the following questions:

5 x 10 = 50

- Obtain the Parallel form realization for the transfer function $H(z)$ given below:

$$H(z) = \frac{2 + z^{-1} + \frac{1}{4}z^{-2}}{\left(1 + \frac{1}{2}z^{-1}\right)\left(1 - \frac{1}{2}z^{-1}\right)}$$

- Calculate the L.T of $x(n) = \cos an$
- Drive and draw the flow graph for DIF FFT algorithm for $N=8$.
- Determine $H(z)$ using the impulse invariant technique for the analog system function

$$H(s) = \frac{1}{(s+0.5)(s^2+0.5s+2)}$$

- Determine $H(z)$ for a Butterworth filter satisfying the following constraints

$$\begin{aligned} \sqrt{0.5} &\leq |H(e^{j\omega})| \leq 1 & 0 \leq \omega \leq \frac{\pi}{2} \\ |H(e^{j\omega})| &\leq 0.2 & \frac{3\pi}{4} \leq \omega \leq \pi \end{aligned}$$

with $T=1$ sec Apply impulse invariant transformation

- Given $x(n) = 2^n$ and $N=8$ find $X(K)$ using DIT FFT algorithm. Also calculate the computational reduction factor.
- Design a low-pass filter with the following desired frequency response

$$H_d(e^{j\omega}) = \begin{cases} e^{-j2\omega}, & -\frac{\pi}{4} \leq \omega \leq \frac{\pi}{4} \\ 0, & \frac{\pi}{4} < \omega < \pi \end{cases} \quad \text{and using window function}$$

$$w(n) = \begin{cases} 1, & 0 \leq n \leq 4 \\ 0, & \text{otherwise} \end{cases}$$

- (b) Convert the analog filter with system function $H(s) = \frac{s+0.1}{(s+0.1)^2 + 9}$ into digital filter with a resonant frequency of $\omega_r = \frac{\pi}{4}$ of using bilinear transformation.

SECTION - C

Attempt any two of the following questions:

- 3 (i) Obtain the ladder structure for the system function $H(z)$ given below. 2 x 15 = 30
- $$H(z) = \frac{2 + 8z^{-1} + 6z^{-2}}{1 + 8z^{-1} + 12z^{-2}}$$
- (ii) Compute the Circular convolution of two discrete time sequences $x_1(n) = \{1, 2, 1, 2\}$ and $x_2(n) = \{3, 2, 1, 4\}$
- 4 (a) Determine the 4-point discrete time sequence from its DFT $X(k) = \{4, 1-j, -2, 1+j\}$
 (b) Explain the following phenomenon: (i) Gibbs Oscillations, (ii) Frequency wrapping
- 5 (a) Derive the relation between DFT and Z-transform of a discrete time sequence $s(n)$.
 (b) Design a digital Chebyshev filter to satisfy the constraints

$$0.707 \leq |H(e^{j\omega})| \leq 1 \quad 0 \leq \omega \leq 0.2\pi$$

$$|H(e^{j\omega})| \leq 0.1, \quad 0.5\pi \leq \omega \leq \pi$$

Using bilinear transformation with $T=1$ s

1. Explain the following:
- What is a helical antenna?
 - Write any two applications of helical antenna.
 - Define axial ratio.
 - Explain the radiation pattern of a helical antenna.
 - Draw and label the radiation pattern of a helical antenna.
 - In a helical antenna, explain the axial ratio.
 - Explain the radiation pattern of a helical antenna.
 - How much axial ratio is required for a helical antenna?
 - What is the axial ratio of a helical antenna?
 - Write the axial ratio of a helical antenna.

2. Attempt any five

- A microstrip antenna is made of epoxy board with dielectric constant is 4.8, thickness is 1.6 mm, length is 48 mm, width is 16 mm. Calculate the resonant frequency of the antenna.
 - Calculate the resonant frequency of the antenna.
 - Calculate the resonant frequency of the antenna.
 - Calculate the resonant frequency of the antenna.
 - Calculate the resonant frequency of the antenna.
 - Calculate the resonant frequency of the antenna.
- With the help of a block diagram, explain the operation of a Klystron. What is the voltage gain of a Klystron? Explain.
- (i) DFT of a discrete time sequence $x(n)$ is $X(k)$. Write the relation between DFT and Z-transform of a discrete time sequence $x(n)$.
 (ii) Write the relation between DFT and Z-transform of a discrete time sequence $x(n)$.
- (i) Explain the radiation pattern of a helical antenna.
 (ii) Explain the radiation pattern of a helical antenna.



THEORY EXAMINATION (SEM-VI) 2016-17
MICROWAVE ENGINEERING.

Time : 3 Hours

Max. Marks : 100

Note : Be precise in your answer. In case of numerical problem, use data wherever not provided.

SECTION - A

1. Explain the following:

10 x 2 = 20

- What is evanescent mode in waveguides?
- Write any two properties of E-plane tee microwave device.
- Define cut-off wave number (k_c) show that $k_c = \omega \sqrt{\mu \epsilon}$ for loss less dielectric.
- Explain threshold field for Gunn diode.
- Draw and explain the trajectory of electron moving from cathode to anode if Hull magnetic field is applied in magnetron.
- In a helical slow wave structure if pitch is 5 cm and diameter is 10 cm, calculate the axial velocity with which wave will propagate.
- Explain V-I characteristics of tunnel diode.
- How microwave solid state device is different from low frequency devices.
- What is the condition for sustained oscillation in Reflex Klystron?
- Write the S-parameter matrix of a 3 port circulator shown in Fig 1.



Fig. 1

SECTION - B

2. Attempt any five of the following questions:

5 x 10 = 50

- A microstrip line is made of a copper conductor 0.0254 mm wide on a G-10 fiberglass-epoxy board 0.20mm in height. The relative dielectric constant ϵ_r of the board material is 4.8, measured at 25 GHz. The microstrip line 0.035 mm thick is to be used for 10 GHz. Determine the
 - Characteristic impedance Z_0 of the microstrip line
 - Surface resistivity R_s of copper conductor
 - Conductor attenuation constant α_c
 - Dielectric attenuation constant α_d
 - Quality factor
- With the help of functional diagram explain the working principle of two cavity Klystron amplifier. Calculate optimum length of drift space, maximum efficiency, and voltage gain.
- What is directional coupler? What are the different types of directional coupler? Explain the working principle of 2-hole directional coupler. Also determine its S-matrix.
- Discuss the salient features of microwave measurements. Describe a voltage standing wave ratio (VSWR) meter.
 - What is meant by insertion loss and attenuation? Discuss any one method for measurement of attenuation using microwave test bench.
- Classify different types of microwave amplifiers and oscillators. Discuss working principle of avalanche transit time devices.
 - Explain Gunn Effect with respect to two valley model. Draw the graph between applied electric field and current density across Gunn diode.

- (f) (i) Explain the construction, working and application of microwave isolators.
- (ii) A rectangular cavity resonator has dimension $a = 7.5 \text{ cm}$, $b = 4 \text{ cm}$ and $c = 16 \text{ cm}$. Calculate cut-off wave number and phase constant.
- (g) Draw the schematic diagram of IMPATT diode. Explain its principle of operation. Derive an expression for operating frequency and efficiency of IMPATT diode.
- (h) (i) Explain the experimental setup measurement set up of radiation pattern and beam width.
- (ii) Explain the method of measuring VSWR. 10.

SECTION - C

2 x 15 = 30

Attempt any two of the following questions:

3. (a) Design the S-parameter matrix of a microwave device given in Fig. 2. If a signal of power 20 mW is fed into port 1, determine the power in remaining port when other ports are perfectly matched.

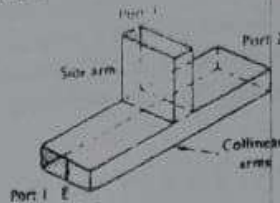


Fig. 2

- (b) A TE_{11} mode is propagating through a circular waveguide. The guide is air filled and has a diameter of 12 cm. Calculate (Given $X'_{11} = 1.841$)
 - (i) Cut off frequency
 - (ii) Guide wavelength for the frequency of 2.5 GHz
 - (iii) Wave impedance at 2.5 GHz frequency
- 4. (a) By means of applegate diagram explain the working of reflex klystron.
- (b) Why is Magnetron called cross field device? What is meant by π mode operation in Magnetron containing eight cavity resonators? Describe how strapping separates the π mode from other possible modes.
- 5. (a) Derive all Electric and Magnetic field components in Transverse magnetic mode of rectangular waveguides.
- (b) Show that the TM_{01} and TM_{10} modes in rectangular waveguide do not exist.

Time : 3 Hours

Note : Be precise in

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Attempt any two

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B. TECH.

THEORY EXAMINATION (SEM-VI) 2016-17
INTEGRATED CIRCUIT TECHNOLOGY

Time : 3 Hours

Max. Marks : 100

Note : Be precise in your answer. In case of numerical problem assume data wherever not provided.

SECTION - A

1. Attempt all of the following questions:

10 x 2 = 20

- (a) What are the used of Silicon Dioxide?
- (b) Differentiate among Point, Frank and Schottky Defects.
- (c) What is preoxidation cleaning?
- (d) What is Epitaxy?
- (e) What do you understand by Ion - implantation?
- (f) Write the diffusion equation at any given distance and time.
- (g) Define the total stopping power of the target.
- (h) What are the four important performance of a projection printer?
- (i) Write the principle of mass separation.
- (j) What does ion source contain?

SECTION - B

2. Attempt any five of the following questions:

5 x 10 = 50

- a) Explain Electronic Grade Silicon with neat diagram. Explain the polishing process of Silicon in detail.
- b) Why is cleaning of Silicon wafer necessary before any processing steps? Explain the crystal structure.
- c) Describe the Silicon on insulator with neat diagram. Discuss about the epitaxial defects.
- d) Explain plasma oxidation technique for the growth of oxide layer. Explain the application of SiO_2 layer in IC Fabrication.
- e) Describe the effect of impurities and damage on the oxidation rate.
- f) Explain Lithography with neat schematic diagram.
- g) Describe basic layout of implantation equipment.
- h) Discuss gaseous and liquid diffusion systems.

SECTION - C

Attempt any two of the following questions:

2 x 15 = 30

- 3 (a) Discuss different shaping operations involved in Preparing Wafers with diagram.
- (b) Explain the principle of molecular beam epitaxy.
- 4 (a) Explain the concept of vacuum Deposition.
- (b) Describe the various charges present in oxidation layer in detail.
- 5 (a) How is the silicon nitride used? Explain its deposition variables.
- (b) Explain Monolithic and Hybrid Integrated Circuits.



THEORY EXAMINATION (SEM-VI) 2016-17
MICROCONTROLLERS FOR EMBEDDED SYSTEMS

Time : 3 Hours

Max. Marks : 100

Note : Be precise in your answer. In case of numerical problem assume data wherever not provided.

SECTION - A

1. Explain the following:

10 x 2 = 20

- Define the use of MOVX and MOVC instruction in 8051 Microcontroller.
- Define bit addressable RAM in 8051 Microcontroller.
- Define Pullup/Pulldown resistor concept in MSP430 Microcontroller.
- Compare 8051 and MSP430x5xxx main features.
- What are the various transfer modes in DMA controller of MSP430.
- Define how data acquisition is done.
- Write down any four GPIO registers.
- Define functionality of WDTPW and WDTNMI.
- What are the various serial communication interfaces available in MSP430 Microcontroller.
- Enlist the features of ADC10 of MSP430 Microcontroller.

SECTION - B

2. Attempt any five of the following questions:

5 x 10 = 50

- Write down the differences in Memory mapped peripherals and Input output mapped Peripherals.
- What are the various addressing modes in 8051.
- Explain the block diagram of RTC (Real Time clock) with its modes of operation. What are the applications of RTC.
- Explain the working of PWM (Pulse width modulation) with its block diagram.
- Write a program using MSP430x5xx to toggle two LED connected at port P1.5 and P1.7. Use a pull down switch connected at port P1.2 for toggling these LED.
- Write a program to vary the intensity of LED connected at port P1.2 using PWM method.
- Explain the flow chart of receiving single byte from slave having address 0*32H using USCI_Bx.
- What do you mean by ZigBee wireless module? Explain ZigBee device block diagram.

SECTION - C

Attempt any two of the following question.:

2 x 15 = 30

- Write an assembly language code to send command to LCD display from 8051 to display any string.
 - Explain the working of maskable interrupt in MSP430.
- Explain the Data frame format in I2C communication
 - What are the various GPIO resistors in MSP430x5xx? Explain each resistors briefly.
- What do mean by Near Field Communication (NFC)? Explain different modes of NFC device.
 - What are the different transfer mode in the DMA? Explain in brief.

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B. TECH.

THEORY EXAMINATION (SEM-VI) 2016-17

MACHINE DESIGN- II

Time : 3 Hours

Max. Marks : 100

Note : Be precise in your answer. In case of numerical problem assume data wherever not provided.
Use of Design Data book is allowed.

SECTION - A

1. Attempt all of the following questions:

10 x 2 = 20

- (a) Explain wedge film and squeeze film journal bearings.
- (b) Explain the following terms as applied to journal bearings:
 - (i) Bearing characteristic number; and
 - (ii) Bearing modulus.
- (c) How do you express the life of a bearing? What is an average or median life?
- (d) Explain the different causes of gear tooth failures and suggest possible remedies to avoid such failures.
- (e) What is a herringbone gear? Where they are used?
- (f) What are the various forces acting on worm and worm gears?
- (g) Explain the various types of cylinder liners.
- (h) Explain the various forces induced in the connecting rod.
- (i) What is the function of a connecting rod of an internal combustion engine?
- (j) Explain the following terms used in helical gears :
 - (a) Helix angle; (b) normal pitch

SECTION - B

2. Attempt any five of the following questions:

5 x 10 = 50

- (a) A 80 mm long journal bearing supports a load of 2800 N on a 50 mm diameter shaft. The bearing has a radial clearance of 0.05 mm and the viscosity of the oil is 0.021 kg / m-s at the operating temperature. If the bearing is capable of dissipating 80 J/s, determine the maximum safe speed.
- (b) The thrust of propeller shaft is absorbed by 6 collars. The rubbing surfaces of these collars have outer diameter 300 mm and inner diameter 200 mm. If the shaft runs at 120 r.p.m., the bearing pressure amounts to 0.4 N/mm². The coefficient of friction may be taken as 0.05. Assuming that the pressure is uniformly distributed, determine the power absorbed by the collars.
- (c) A shaft rotating at constant speed is subjected to variable load. The bearings supporting the shaft are subjected to stationary equivalent radial load of 3 kN for 10 per cent of time, 2 kN for 20 per cent of time, 1 kN for 30 per cent of time and no load for remaining time of cycle. If the total life expected for the bearing is 20×10^6 revolutions at 95 per cent reliability, calculate dynamic load rating of the ball bearing.
- (d) A bronze spur pinion rotating at 600 r.p.m. drives a cast iron spur gear at a transmission ratio of 4: 1. The allowable static stresses for the bronze pinion and cast iron gear are 84 MPa and 105 MPa respectively. The pinion has 16 standard 20° full depth involute teeth of module 8 mm. The face width of both the gears is 90 mm. Find the power that can be transmitted from the standpoint of strength.
- (e) A pair of helical gears are to transmit 15 kW. The teeth are 20° stub in diametral plane and have a helix angle of 45°. The pinion runs at 10 000 r.p.m. and has 80 mm pitch diameter. The gear has 320 mm pitch diameter. If the gears are made of cast steel

- having allowable static strength of 100 MPa; determine a suitable module and face width from static strength considerations and check the gears for wear, given $\mu = 0.1$ and $\sigma_{wc} = 100$ MPa.
- (f) A worm drive transmits 15 kW at 2000 r.p.m. to a machine carriage at 75 r.p.m. The worm is triple threaded and has 65 mm pitch diameter. The worm gear has 90 teeth of 5 mm module. The tooth form is to be 20° full depth involute. The coefficient of friction between the mating teeth may be taken as 0.10. Calculate: 1. tangential force acting on the worm; 2. axial thrust and separating force on worm; and 3. efficiency of the worm drive.
- (g) A four stroke diesel engine has the following specifications:
 Brake power = 5 kW; Speed = 1200 r.p.m.; Indicated mean effective pressure = 0.75 N/mm^2 ; Mechanical efficiency = 80%.
 Determine: 1. bore and length of the cylinder; 2. thickness of the cylinder head; and 3. size of studs for the cylinder head.
- (h) Derive the following expression as applied to rolling contact bearings subjected to variable load cycle

$$W_e = \sqrt[3]{\frac{N_1(W_1)^3 + N_2(W_2)^3 + N_3(W_3)^3 + \dots}{N_1 + N_2 + N_3 + \dots}}$$

W_e = Equivalent cubic load,

W_1, W_2 and W_3 = Loads acting respectively for N_1, N_2, N_3, \dots

SECTION - C

Attempt any two of the following questions:

- 3 A full journal bearing of 50 mm diameter and 100 mm long has a bearing pressure of 1.4 N/mm^2 . The speed of the journal is 900 r.p.m. and the ratio of journal diameter to the diametral clearance is 1000. The bearing is lubricated with oil whose absolute viscosity at the operating temperature of 75°C may be taken as 0.011 kg/m-s . The room temperature is 35°C . Find: 1. The amount of artificial cooling required, and 2. The mass of the lubricating oil required, if the difference between the outlet and inlet temperature of the oil is 10°C . Take specific heat of the oil as $1850 \text{ J/kg}^\circ\text{C}$. 2 x 15 = 30
- 4 A pair of 20° full depth involute teeth bevel gears connect two shafts at right angle having velocity ratio 3 : 1. The gear is made of cast steel having allowable static stress as 70 MPa and the pinion is of steel with allowable static stress as 100 MPa. The pinion transmits 37.5 kW at 750 r.p.m. Determine: a) Module and face width; b) Pitch diameters; and c) Pinion shaft diameter.
 Assume tooth form factor,

$$y = 0.154 - \frac{0.912}{T_E}$$
 Where T_E is the formative number of teeth, width = $1/3$ rd the length of pitch cone, and pinion shaft overhangs by 150 mm.
- 5 Design a cast iron piston for a single acting four stroke engine for the following data:
 Cylinder bore = 100 mm; Stroke = 125 mm; Maximum gas pressure = 5 N/mm^2 ;
 Indicated mean effective pressure = 0.75 N/mm^2 ; Mechanical efficiency = 80%; Fuel consumption = 0.15 kg per brake power per hour; Higher calorific value of fuel = $42 \times 10^3 \text{ kJ/kg}$; Speed = 2000 r.p.m. Any other data required for the design may be assumed.

THEORY EXAMINATION REFRIGERATION

Time : 3 Hours

Note : Be precise in your answer. In case of any doubt, use of steam tables, refrigerant property tables and Enthalpy-concentration diagrams is permitted.

- Attempt all parts of the following questions:
 - What do you mean by refrigeration?
 - Describe boot-strap cycle.
 - Differentiate open and closed cycle.
 - Explain Dry air rated capacity.
 - How does an actual vapour compression cycle differ from a theoretical cycle?
 - Discuss the operation of a refrigeration system.
 - Explain psychrometric chart.
 - Explain the modified Rankine cycle.
 - Write the expression for COP of a refrigeration system.
 - What are the different applications of refrigeration?
- Attempt any five of the following questions:
 - In an open cycle air refrigeration system, the air is at 1 bar and 30°C before compression and 1 bar and 20°C after expansion. The compression process is isentropic. The refrigeration capacity is 10 tonnes. Determine: 1) COP, 2) mass flow rate, and 3) piston displacement.
 - In a vapour compression refrigeration system, the evaporator temperature is -10°C and the condenser temperature is 30°C . The refrigerant is R-12. The process is isentropic. Determine: 1) refrigerant mass flow rate, 2) COP, and 3) piston displacement.
 - In a 100TR aqua-ammonia refrigeration system, the condenser temperature is 30°C and the evaporator temperature is -10°C . Determine: 1) refrigerant mass flow rate, 2) COP, and 3) piston displacement.
 - Atmospheric air at 30°C and 70% RH is cooled and dehumidified through a furnace. The final temperature is 10°C and 30% RH. Also determine the amount of water removed per kg of dry air.

B. TECH.

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THEORY EXAMINATION (SEM-VI) 2016-17
REFRIGERATION & AIR CONDITIONING

Time : 3 Hours

Max. Marks : 100

Note : Be precise in your answer. In case of numerical problem assume data wherever not provided.
 Use of steam tables, refrigerant's property tables and charts, and psychrometric charts, and Enthalpy-concentration diagram is allowed.

SECTION A

1. Attempt all parts of the following.

[2×10=20]

- a) What do you mean by refrigeration effect and unit of refrigeration?
- b) Describe boot-strap cycle of air refrigeration system.
- c) Differentiate open and closed air refrigeration system.
- d) Explain Dry air rated temperature (DART)
- e) How does an actual vapour compression cycle differ from that of a theoretical cycle?
- f) Discuss the operation of a capillary tube in refrigeration system.
- g) Explain psychrometric process.
- h) Explain the modified comfort chart with neat sketches.
- i) Write the expression for calculating the heat gain through the ducts.
- j) What are the different factors considered in load estimation sheet for comfort application?

SECTION B

2. Attempt any five of the following.

10×5=50]

- a) In an open cycle air refrigeration machine, air is drawn from a cold chamber at -2°C and 1 bar and compressed to 11 bar. It is then cooled at this pressure, to the cooler temperature of 20°C and then expanded in expansion cylinder and returned to the cold room. The compression and expansion are isentropic and follows the law $p v^{1.4} = \text{constant}$. Sketch the $p-v$ and $T-s$ diagrams of the cycle and for a refrigeration of 15 tonnes. Determine: 1) theoretical C.O.P., 2) rate of circulation of the air in kg/min, and 3) piston displacement per minute in the compressor and expander.
- b) In a vapour compression refrigeration system using R-12, the evaporator pressure is 1.4 bar and the condenser pressure is 8 bar. The refrigerant leaves the condenser sub-cooled to 30°C . The vapour leaving the evaporator is dry and saturated. The compression process is isentropic. The amount of heat rejected in the condenser is 13.42 MJ/min. Determine: 1) refrigerating effect in kJ/kg, 2) refrigerating load in TR, and 3) C.O.P.
- c) In a 100TR aqua ammonia absorption plant, saturated liquid ammonia at 30°C leaves the condenser and enters the expansion valve. The evaporator pressure is 1.9 bar and the vapour temperature at evaporator exit is -10°C . The mass concentrations of ammonia in the weak and strong solutions are 0.25 and 0.325 respectively. Determine the mass flow rates in kg/min of the strong and weak solutions
- d) Atmospheric air at dry bulb temperature of 16°C and 25% relative humidity passes through a furnace and then through a humidifier, in such a way that the final dry bulb temperature is 30°C and 50% relative humidity. Find the heat and moisture added to the air. Also determine the sensible heat factor of the process.

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- e) An air conditioning plant is required to supply 60 m^3 of air per minute at a DBT of 21°C and 55% RH. The outside air is at DBT of 28°C and 60% RH. Determine the mass of water drained and capacity of the cooling coil. Assume the air condition is first to dehumidify and then to cool the air.
- f) Draw a neat labelled sketch of a Practical Vapour Absorption refrigeration cycle and explain its working in brief.
- g) Define the terms:
 - (i) Dew point temperature
 - (ii) Specific humidity
 - (iii) Relative humidity
 - (iv) Degree of saturation
- h) Attempt the following:
 - (i) What are the desirable properties of an ideal refrigerant?
 - (ii) Discuss in detail, the secondary refrigerants.

SECTION C

- 3. **Attempt any two of the following.** [15x2=30]

What is multi-stage vapour compression refrigeration system? Compare it with cascade refrigeration system. Explain advantages and disadvantages over simple vapour compression system.
- 4. A Bell Coleman refrigerator operates between pressure limits of 1.1 bar and 5 bar. The temperatures at the suction to the compressor, and inlet to the expander are 27°C and 37°C respectively. Isentropic efficiencies of the compressor and expander are 0.80 and 0.85 respectively. Determine the power input to the compressor, if the refrigerator produces cooling at the rate of 50 TR.
- 5. Answer the following:
 - a. Discuss the effect of variation of condenser and evaporator pressures and sub-cooling of condensate on COP of a vapour compression refrigeration system.
 - b. Discuss the applications of flash chamber with the help of P-h chart and schematic diagrams.

Printed Pages : 1

Time : 3 Hours

Note : Be precise in your answers

- 1. **Attempt all parts**
 - (a) What do you mean by...
 - (b) Differentiate...
 - (c) What are the...
 - (d) What is J...
 - (e) What do you...
 - (f) Define...
 - (g) What is...
 - (h) What is...
 - (i) Define...
 - (j) What are...

- 2. **Attempt any five**
 - (a) Define...
 - (b) Explain...
 - (c) Explain...
 - (d) What is...
 - (e) Explain...
 - (f) What are...
 - (g) Explain...
 - (h) Which...

- 3. **Attempt any two**
 - How can measurement...
 - What is transducer...
 - disadvantages...
 - Explain the working...

19

- e) An air conditioning plant is required to supply 60 m^3 of air per minute at a DBT of 21°C and 55% RH. The outside air is at DBT of 28°C and 60% RH. Determine the mass of water drained and capacity of the cooling coil. Assume the air condition is first to dehumidify and then to cool the air.
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 - b. Discuss the applications of flash chamber with the help of P-h chart and schematic diagrams.

Printed Pages : 1

Time : 3 Hours

Note : Be precise in your answers.

- 1. **Attempt all parts**
 - (a) What do you mean by...
 - (b) Differentiate...
 - (c) What are the...
 - (d) What is J...
 - (e) What do you...
 - (f) Define...
 - (g) What is...
 - (h) What is...
 - (i) Define...
 - (j) What are...

- 2. **Attempt any five**
 - (a) Define...
 - (b) Explain...
 - (c) Explain...
 - (d) What is...
 - (e) Explain...
 - (f) What are...
 - (g) Explain...
 - (h) Which...

- 3. **Attempt any two**
 - How can measurement...
 - What is trans...
 - disadvantages...
 - Explain the w...