G 3102 (Pages : 3) Reg. No.....

Name.....

# M.TECH. DEGREE EXAMINATION, JULY 2015

**Second Semester**

Branch : Electronics and Communication Engineering

Specialization : Communication Engineering

MECCE 201—CODING THEORY

(Regular/Supplementary—2013 Admission onwards)

Time : Three Hours Maximum : 100 Marks

*Answer* **all** *questions.*
*Each question carries* 25 *marks.*

1. (a) Enumerate the properties of fields and prove each one of them. (15 marks)

   (b) Prove that any irreducible polynomial over $GF(2)$ of degree $m$ divides $X^{2^m-1}+1$. (10 marks)

*Or*

2. (a) Given the matrices

$$G=\begin{bmatrix}1&1&0&1&1&0&0\\1&1&1&0&0&1&0\\0&1&1&1&0&0&1\end{bmatrix};\ H=\begin{bmatrix}1&0&0&0&1&1&0\\0&1&0&0&1&1&1\\0&0&1&0&0&1&1\\0&0&0&1&1&0&1\end{bmatrix}.$$

   Show that row space of G is null space of H and vice versa. (15 marks)

   (b) Prove that $GF(2^m)$ is a vector space over $GF(2)$. (10 marks)

3. (a) The generator matrix for a linear binary code is

$$G=\begin{bmatrix}0&0&1&1&1&0&1\\0&1&0&0&1&1&1\\1&0&0&1&1&1&0\end{bmatrix}.$$

   (i) Express G in the systematic $(I/P)$ form and determine the parity matrix H for the code.

   (ii) Construct the table of syndromes for the code and find its minimum distance.

   (iii) Demonstrate that the code word corresponding to the information sequence 101 is orthogonal to H.

   (15 marks)

**Turn over**

(b) Write short notes on Perfect and Quasi-perfect codes. (10 marks)

*Or*

4. (a) A systematic $(7,3)$ code has the generator matrix as follows :

$$G=\begin{vmatrix}1 & 0 & 0 & 1 & 0 & 1 & 1\\ 0 & 1 & 0 & 1 & 1 & 1 & 0\\ 0 & 0 & 1 & 0 & 1 & 1 & 1\end{vmatrix}.$$

(i) Construct the standard array for the code.

(ii) Determine the correctable patterns and their corresponding syndromes. (15 marks)

(b) Let $g(p)=p^4+p+1$ be a generator polynomial for a $(15,11)$ Hamming binary code. Determine the generator matrix G for this code in systematic form and the generator polynomial for the dual code. (10 marks)

5. (a) Let $g(p)=p^8+p^6+p^4+p+1$ be a polynomial over the binary field.

(i) Find the lowest-rate cyclic code whose generator polynomial is $g(p)$.

(ii) Find the rate and minimum distance of the code found in (i).

(iii) What is the coding gain for the code found in (i) ? (15 marks)

(b) Is there a binary $t$-error-correcting BCH code of length $2^m+1$ for $m\geq 3$ and $t<2^{m-1}$ ? If there is such a code, determine its generator polynomial. (10 marks)

*Or*

6. (a) Let C be a $\mathrm{RS}(7,2,6)$ code over $\mathrm{GF}(2^3)$. (i) What are the parameters of the equivalent binary linear code C2 obtained from C by expressing each element in $\mathrm{GF}(2^3)$ as a binary vector of length 3 ? (ii) Determine a generator polynomial of C ; (iii) Suppose that the received polynomial is $\overline{r}(x)=\alpha^4+\alpha^2x+x^2+\alpha^5x^4$ and is known to contain three erasures in the last three positions. Determine the most likely code polynomial. (15 marks)

(b) Explain the Berlekamp decoding algorithm of BCH codes. (10 marks)

7. (a) The convolutional code is described by $g_1 = [1\,0\,0]; g_2 = [1\,0\,1]; g_3 = [1\,1\,1]$; Draw the encoder diagram, state transition diagram and trellis diagram for this code. Find its transfer function and free distance.

Check whether this code is catastrophic or not. (15 marks)

(b) The convolutional code of Problem $7(a)$ is used for transmission over a AWGN channel with hard-decision decoding. The output of the demodulator detector is $(101001011110111.....)$

Using the Viterbi algorithm, find the transmitted sequence. (10 marks)

*Or*

8. (a) Describe the various methods of decoding LPDC Codes. (15 marks)

(b) With neat sketch, explain the basic encoding scheme of Turbo coding and summarize the basic features of Turbo codes.

(10 marks)

[4 × 25 = 100 marks]

G 3126 (Pages : 2) Reg. No.....

Name.....

# M.TECH. DEGREE EXAMINATION, JULY 2015

## Second Semester

Branch : Applied Electronics and Instrumentation/Electronics and Communication Engineering

Specialization : Signal Processing /Communication Engineering

MAESP-202/MECCE-202—ESTIMATION AND DETECTION THEORY

(Regular/Supplementary—2013 Admission onwards)

Time : Three Hours Maximum : 100 Marks

*Answer* **all** *questions.*
*Each question carries* 25 *marks.*

1. (a) Explain in about the MAP detection.

   (b) Write about the minimum probability of error criterion.

(12 + 13 = 25 marks)

*Or*

2. (a) Write about the ML detection.

   (b) Write about the Neyman-Pearson criterion.

(12 + 13 = 25 marks)

3. (a) Explain in detail about the role of estimation in signal processing.

   (b) Write about the Cramer-Rao lower bound.

(12+13 = 25 marks)

*Or*

4. (a) Write about the finding MVU estimators.

   (b) Explain the importance of estimation theory.

(12 + 13 = 25 marks)

5. (a) Write about the recursive least square estimation.

   (b) Explain the best linear unbiased estimation.

(12 + 13 = 25 marks)

*Or*

6. (a) Explain in about the maximum likelihood estimation and its features.

   (b) Write about the applications of recursive least square estimation.

(13 + 12 = 25 marks)

**Turn over**

7. (a) Explain the Bayesian linear model.

   (b) Write note on estimation techniques and its types in detail.

(12 + 13 = 25 marks)

*Or*

8. (a) Explain about the applications of maximum a posteriori estimation.

   (b) Discuss the Bayesian approach estimation. What are the typical risk functions used ?. Show that use of the absolute error function leads to the median of the posterior density function $p(e|X)$ as the optimal estimate of $e$.

(10 + 15 = 25 marks)

[4 × 25 = 100 marks]

G 3151 (Pages : 2) Reg. No.....

Name.....

# M.TECH. DEGREE EXAMINATION, JULY 2015

**Second Semester**

Branch : Electronics and Communication Engineering

Specialization : Communication Engineering

MECCE 203—WIRELESS NETWORKS

(Regular/Supplementary—2013 Admission onwards)

Time : Three Hours Maximum : 100 Marks

*Answer* **all** *questions.*
*Each full question carries* 25 *marks.*

1. (a) Explain the characteristics of wireless PANs. (10 marks)
   (b) Explain the applications and limitations of Zigbee in detail. (10 marks)
   (c) Explain the concept of Bluetooth. (5 marks)

*Or*

2. (a) Explain the differences between WPAN and HyperLAN. Explain their concepts. (10 marks)
   (b) Give an account on "WiMAX standard". (10 marks)
   (c) Explain the features of IR LAN in detail. (5 marks)
3. (a) Discuss the problems associated with power saving mechanisms. (10 marks)
   (b) Explain the concept of Hand off in detail. (10 marks)
   (c) Explain in detail the concept and need for gateway. (5 marks)

*Or*

4. (a) Explain the practical issues in Ad Hoc wireless networks. (10 marks)
   (b) Explain the concept of voice and data traffic. (5 marks)
   (c) Give an account on "Challenges in wireless ATM networks". (10 marks)
5. (a) Explain the MAC protocol architecture for sensor networks. (10 marks)
   (b) Explain the principle of routing and its types. (10 marks)
   (c) What is field sampling ? Explain in detail. (5 marks)

*Or*

6. (a) Explain the structure of IEEE 802.15.4 MAC protocols in detail. (10 marks)
   (b) Give an account on "Quality of sensor networks". (5 marks)
   (c) Explain the low duty cycle and wake up concepts in detail. (10 marks)

**Turn over**

7. (a) Explain the design principles of Wireless sensor networks with an example. (10 marks)

   (b) Explain the concept of wireless body sensor networks in medical care. (10 marks)

   (c) Give an account on "Geographic routing". (5 marks)

*Or*

8. (a) Elaborate on the requirements of MAC protocols for WSNs. (5 marks)

   (b) Discuss the basics of Position Based Routing Protocol for WSN. (10 marks)

   (c) What are the different programming models and indicate which model is best suited for WSN ? Explain. (10 marks)

[4 × 25 = 100 marks]

G 3174 (Pages : 2) Reg. No.....

Name.....

# M.TECH. DEGREE EXAMINATION, JULY 2015

**Second Semester**

Branch : Electronics and Communication Engineering

Specialization : Communication Engineering

MECCE 204—ADAPTIVE SIGNAL PROCESSING

(Regular/Supplementary—2013 Admission onwards)

Time : Three Hours Maximum : 100 Marks

*Answer* **all** *questions.*
*Each full question carries* 25 *marks.*

1. (a) State the orthogonality principle and derive the expression of Weiner-Hopf equation. (20 marks)

   (b) Explain stochastic gradient approach of linear adaptive filtering algorithm. (5 marks)

*Or*

2. (a) Suppose in an adaptive filtering environment, the input signal consists of $x(k)=\cos(\omega_0 k)$. The desired signal is given by $d(k)=\sin(\omega_0 k)$, where $\omega_0=\frac{2\pi}{7}$. In this case M=7. Compute the optimal solution for a first order adaptive filter. (15 marks)

   (b) Explain Linear regression model in detail. (10 marks)

3. (a) Explain Forward Linear prediction in detail. (20 marks)

   (b) Derive augmented Weiner-Hopf equation for forward prediction. (5 marks)

*Or*

4. (a) Compute the tap weights of traversal filter using gradient based Steepest descent algorithm. (20 marks)

   (b) Discuss about the convergence and stability of steepest descent algorithm. (5 marks)

5. (a) Derive Normalized Least-Mean-Square Adaptation (NLMS) algorithm. (20 marks)

   (b) Compare LMS algorithm with Steepest-Descent algorithm. (5 marks)

*Or*

**Turn over**

6. (a) Describe the techniques of Adaptive beamforming in detail. (10 marks)

(b) Explain MSE behaviour of LMS and its Mis-adjustment with appropriate expressions. (15 marks)

7. (a) State Matrix Inversion Lemma. (5 marks)

(b) Derive Normal equations and Linear least square filters. (20 marks)

*Or*

8. (a) Derive Exponentially weighted Recursive least square algoritm. (15 marks)

(b) Discuss about convergence analysis of RLS algorithm. (10 marks)

[4 × 25 = 100 marks]

G 3174 (Pages : 2) Reg. No.....

Name.....

# M.TECH. DEGREE EXAMINATION, JULY 2015

**Second Semester**

Branch : Electronics and Communication Engineering

Specialization : Communication Engineering

MECCE 204—ADAPTIVE SIGNAL PROCESSING

(Regular/Supplementary—2013 Admission onwards)

Time : Three Hours Maximum : 100 Marks

*Answer* **all** *questions.*
*Each full question carries* 25 *marks.*

1. (a) State the orthogonality principle and derive the expression of Weiner-Hopf equation. (20 marks)

   (b) Explain stochastic gradient approach of linear adaptive filtering algorithm. (5 marks)

*Or*

2. (a) Suppose in an adaptive filtering environment, the input signal consists of $x(k)=\cos(\omega_0 k)$. The desired signal is given by $d(k)=\sin(\omega_0 k)$, where $\omega_0=\frac{2\pi}{7}$. In this case M=7. Compute the optimal solution for a first order adaptive filter. (15 marks)

   (b) Explain Linear regression model in detail. (10 marks)

3. (a) Explain Forward Linear prediction in detail. (20 marks)

   (b) Derive augmented Weiner-Hopf equation for forward prediction. (5 marks)

*Or*

4. (a) Compute the tap weights of traversal filter using gradient based Steepest descent algorithm. (20 marks)

   (b) Discuss about the convergence and stability of steepest descent algorithm. (5 marks)

5. (a) Derive Normalized Least-Mean-Square Adaptation (NLMS) algorithm. (20 marks)

   (b) Compare LMS algorithm with Steepest-Descent algorithm. (5 marks)

*Or*

**Turn over**

6. (a) Describe the techniques of Adaptive beamforming in detail. (10 marks)

(b) Explain MSE behaviour of LMS and its Mis-adjustment with appropriate expressions. (15 marks)

7. (a) State Matrix Inversion Lemma. (5 marks)

(b) Derive Normal equations and Linear least square filters. (20 marks)

*Or*

8. (a) Derive Exponentially weighted Recursive least square algoritm. (15 marks)

(b) Discuss about convergence analysis of RLS algorithm. (10 marks)

[4 × 25 = 100 marks]

**G 3204** (Pages : 2) Reg. No.....

Name.....

# M.TECH. DEGREE EXAMINATION, JULY 2015

## Second Semester

Branch : Electronics and Communication Engineering

Specialization : Communication Engineering/Advanced Communication and Information Systems

MECCE 205–2/MECCI 205–2—PRINCIPLES OF SECURE COMMUNICATION

(Regular/Supplementary—2013 Admission onwards)

Time : Three Hours Maximum : 100 Marks

*Answer* **all** *questions.*
*Each full question carries* 25 *marks.*

1. (a) Explain the concept and need for secure communication with examples in detail. (10 marks)

   (b) State and prove Euler theorem. (10 marks)

   (c) Give an account on "Euclidean domains". (5 marks)

*Or*

2. (a) Explain the limitations of secure communication in detail. (15 marks)

   (b) Discuss the concept of Homomorphism with diagrams. (10 marks)

3. (a) Enumerate and explain the standard encryption techniques. (10 marks)

   (b) Explain the concept of cryptanalysis in detail. (5 marks)

   (c) Give an account on "Block ciphers". (10 marks)

*Or*

4. (a) What is the difference between symmetric key cryptography and asymmetric key cryptography ? Explain. (10 marks)

   (b) How is a secret key different from a private key ? Explain. (10 marks)

   (c) What are the factors needed for a secured network ? Explain. (5 marks)

5. (a) Explain the principle of cryptography in detail. (10 marks)

   (b) Describe about asymmetric-key cryptography. (10 marks)

   (c) Mention the potential applications of stegnography. (5 marks)

*Or*

6. (a) Explain the applications of digital signature. (10 marks)

   (b) Explain the Hash algorithm with an example in detail. (10 marks)

   (c) Give an account on "RSA encryption". (5 marks)

Turn over

7. (a) Discuss the concept and applications of Elliptic curves. (10 marks)

   (b) State and derive Weirstrass equation. Explain the applications and limitations of the equation. (15 marks)

*Or*

8. Write technical notes on :

   (i) Elliptic curve cryptography.

   (ii) Elgamal encryption over EC.

(10 + 15 = 25 marks)

[4 × 25 = 100 marks]

G 3260 (Pages : 2) Reg. No.....

Name.....

# M.TECH. DEGREE EXAMINATION, JULY 2015

**Second Semester**

Branch : Electronics and Communication Engineering

Specialization : Communication Engineering

MECCE 206–4—PHOTONIC SWITCHING AND OPTICAL NETWORKS

(Regular/Supplementary—2013 Admission onwards)

Time : Three Hours Maximum : 100 Marks

*Answer* **all** *questions.*
*Each* **full** *question carries* 25 *marks.*

1. (a) Explain the evolution of DWDM optical networking in detail. (5 marks)

   (b) A 128 × 128 broadcast star is made by using 2 × 2 directional couplers, each having an insertion loss of 0.1 dB. Each channel transmits 0.6 mW of average power and requires 1 μW of average received power for operation at 1 Gb/s. What is the maximum transmission distance for each channel ?

   Assume a cable loss of 0.25 dB/km and a loss of 1.0 dB from connectors and splices. (10 marks)

   (c) Compare and contrast TDM and WDM. (10 marks)

*Or*

2. (a) Explain the concept of generation of soliton pulses. (5 marks)

   (b) Explain the following in detail :—

   (i) OADM ;

   (ii) FWM ;

   (iii) Photonic switching applications. (15 marks)

   (c) Explain the OXC functionality, with a neat diagram. (5 marks)

3. (a) Explain the differences between photonic switching and electronic switching. (5 marks)

   (b) How a wavelength assignment is done ? Explain with an example. (10 marks)

   (c) The Dry fibers have acceptable losses over a spectral region extending Iron 1.3 to 1.7 μm. Estimate the capacity of a WDM system covering this entire region using 35-Gb/s channels spaced apart by 45 GHz. (10 marks)

*Or*

**Turn over**

4. (a) Explain the concept of SAN with a diagram. (5 marks)

(b) Explain the following in detail :—

(i) OTDM ;

(ii) VPN ;

(iii) Traffic grooming.

(15 marks)

(c) Explain the concept of buffering with diagrams. (5 marks)

5. (a) Enumerate and explain the various network management layers and their significance in detail.

(5 marks)

(b) Draw the SDH frame format and explain in detail. (10 marks)

(c) Discuss the concept of Next generation optical rings with diagrams. (10 marks)

*Or*

6. (a) Briefly explain the operation of 2f–BESR and mesh architectures with diagrams.

(10 marks)

(b) Briefly comment on "Next Generation optical networks". (10 marks)

(c) Explain the need for protection schemes with examples. (5 marks)

*Or*

7. (a) Briefly explain the concept of WDM and DWDM. (10 marks)

(b) What are the optical components required to implement DWDM ? (5 marks)

(c) What is the principle of Angular dispersion DEMUX ? Explain with a sketch. (10 marks)

*Or*

8. (a) What are the features of WRN ? Explain in detail. (5 marks)

(b) Write short notes on :

1 FTTB ; 2 FTTH ;

3 Enhanced HFC ; 4 Statistical dimensioning models.

(20 marks)

[4 × 25 = 100 marks]