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4E4131

Roll No. _____ Total No. of Pages : 7

4E4131

B. Tech. IV-Sem. (Main) Exam; April-May 2017

Electronics & Communication Engg.

4EC2A Random Variables & Stochastic Processes

Time : 3 Hours **Maximum Marks : 80**

Min. Passing Marks : 24

Instructions to Candidates :-

*Attempt any **five questions**, selecting **one question** from **each unit**. All Questions carry **equal** marks. Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly.*
Units of quantities used / calculated must be stated clearly.
Use of following supporting material is permitted during examination.
(Mentioned in form No. 205)

1. NIL 2. NIL

UNIT - I

1 (a) State the theorem of total probability and Baye's theorem on inverse probability. **8**

(b) For a certain binary communication channel, the probability that a transmitted '0' is received as '0' is 0.95 and the probability that a transmitted '1' is received as '1' is 0.90. If the probability that a '0' is transmitted is 0.4, find the probability that (i) a '1' is received (ii) a '1' was transmitted given that '1' was received. **8**

OR

1 (a) A fair dice is rolled 5 times. Find the probability that 1 shows twice, 3 shows twice and 6 shows once.

5

(b) State Bernoulli's theorem on independent trials.

6

(c) Each of two persons A and B tosses 3 fair coins. What is the probability that they obtain the same number of heads ?

5

UNIT - II

2 (a) A random variable (continuous) 'x' has a pdf $f(x) = k\,x^2 e^{-x}$; $x \geq 0$. Find k, mean and variance.

8

(b) If a continuous random variable 'x' has Rayleigh density $f(x) = \frac{x}{\alpha^2} e^{-\frac{x^2}{2\alpha^2}} X v(x)$, find $E(X^n)$ and deduce the values of $E(X)$ and $\text{var}(X)$.

8

OR

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(c) Th

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3 (a) The

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2 (a) If 'x' is $N\left(\mu;\sigma^2\right)$ then show that $z=\frac{(x-\mu)}{\sigma}$ is a standard normal random variable; that is $N(0',1)$.

8

(b) A noisy transmission channel has a per digit error probability P_e=0.01.

(i) Calculate the probability of more than one error in 10 received digits.

(ii) Repeat using Poisson approximation.

5

(c) The pdf of a random variable x is given by

$$f_x(x)=\begin{cases}k & a\le x\le b\\ 0 & \text{otherwise}\end{cases}$$

Calculate $P\left((x)\le c\right)$ for $c=\frac{1}{2}$ if $a=-11,\ b=2$.

3

UNIT - III

3 (a) The joint pdf of (x,y) is given by $f(x,y)=24\,xy;\ x>0,\ y>0,\ x+y\le 1$ and $f(x,y)=0$, elsewhere, find the conditional mean and variance of y given x.

8

8

(b) State central limit theorem and verify it for random variables (independent) x_k, where for each k, $P(x_k = \pm 1) = \frac{1}{2}$. 8

OR

3 (a) Calculate the correlation coefficients for the following ages of husband (x) and wives (y). 8

x:	23	27	28	28	29	30	31	33	35	36
y:	18	20	22	27	21	29	27	29	28	29

(b) Let x and y be defined by

$x = \cos\Theta$ and $y = \sin\Theta$

where Θ is a random variable uniformly distributed over $[0, 2\pi]$.

(i) Show x and y are uncorrelated

(ii) Show that x and y are not independent.

UNIT - IV

4 (a) Consider a random process $x(t)$ is defined by

$x(t) = u\cos t + v\sin t \quad -\infty < t < \infty$

where 'u' and 'v' are independent random variables, each of which assumes the values –2 and 1 with the probabilities $\frac{1}{3}$ and $\frac{2}{3}$ respectively. Show that $x(t)$ is wss but not strict sense stationary.

8

(b) Verify the equations :

(i) $R_{xy}(-\tau) = R_{yx}(\tau)$

(ii) $\left|R_{xy}(\tau)\right| \le \sqrt{R_x(0)R_y(0)}$

(iii) $\left|R_{xy}(\tau)\right| \le \frac{1}{2}\left[R_x(0) + R_y(0)\right]$.

8

OR

4 (a) If the input to a continuous time linear system is a random process $\{X(t),\ t \in T_x\}$ and output of the linear system is $\left(Y(t), t \in T_y\right)$.

Find the autocorrelation function of $Y(t)$.

10

(b) If $X(t)$ is a wss random process and has a m.s. derivative $X'(t)$ then show that

(i) $R_{XX'}(\tau)=\frac{d}{d\tau}R_x(\tau)$

(ii) $R_{X'}(\tau)=-\frac{d^2}{d\tau^2}R_x(\tau)$.

6

UNIT - V

5 (a) A wss random process $X(t)$ with autocorrelation function $R_x(\tau)=\bar{e}^{a|\tau|}$ where 'a' is a real positive constant is applied to the input of an LTI system with impulse response $n(t)=\bar{e}^{bt}u(t)$ find the autocorrelation function of the output $Y(t)$.

8

(b) A zero mean wss random process is called band limited white noise if its spectral density is given by

$$S_X(w)=\begin{cases}N_0/2 & |\omega|\le\omega B\\ 0 & |\omega|>\omega B\end{cases}$$

Find the autocorrelation function of $X(t)$.

8

OR

5 (a) Let $Y(t)$ be the output of an LTI system with impulse response $n(t)$ when a wss random process $X(t)$ is applied as input. Show that

(i) $S_{xy}(w) = n(w)S_x(w)$

(ii) $S_y(w) = n^*(w)S_{xy}(w)$

10

(b) Consider a wss process $X(t)$ with autocorrelation function $R_x(z)$ and power spectral density $S_x(w)$ let $X'(t) = dx(t)|\,dt$ show that $S_x(w) = w^2 S_x(w)$.

6

4E4132

Roll No. _____ Total No. of Pages : 4

4E4132

B. Tech. IV-Sem. (Main) Exam; April-May 2017

Electronics & Communication Engineering

4EC3A Electronic Measurement & Instrumentation

Time : 3 Hours **Maximum Marks : 80**

Min. Passing Marks : 24

Instructions to Candidates :-

*Attempt any **five questions**, selecting **one question** from **each unit**. All Questions carry **equal** marks. Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly.*
Units of quantities used / calculated must be stated clearly.
Use of following supporting material is permitted during examination. (Mentioned in form No. 205)

1. NIL 2. NIL

UNIT - I

1 (a) Explain the types of errors in measurements in detail. **10**

(b) A resistance was rated at 20 Ω and the measured current through this resistor was 8.2 A. The range of the ammeter was 10A. Compute the power in watts dissipated in the resistor. The scale of the ammeter had 100 divisions and could be read with certainty to ± 0.5 division. It was later found that the resistance of the resistor was 0.2% greater than the specified resistance and the ammeter 1.0% more than the true value. Determine the known error in the computed power in watt and in percent of the computed power. **6**

OR

1 (a) The stress in a mild steel plate circular diaphragm is given by

$$\delta = \frac{3D^2P}{16t^2} \; N/m^2$$

where D = diameter of diaphragm, m
t = thickness of diaphragm, m
P = applied pressure, N/m^2
A diaphragm has a diameter of 15 mm and thickness of 0.2 mm and the applied pressure is 300×10^3 N/m^2. Calculate the stress. The known error in diameter is 1% and in thickness is 3%. Calculate the error in stress.

10

(b) Define the following terms :
(1) Accuracy (2) Precision.

6

UNIT - II

2 (a) Explain the true r.m.s. responding a.c. voltmeter with the suitable block diagram.

8

(b) In a dual slop integrating DVM, the reference voltage is 100 mV and the first integrating period is set as 50 ms. The input resistor of the integrator is 100 kΩ and the integrating capacitor 0.047 μF. For an input voltage of 120 mV, determine the second integration (de-integration) period.

8

OR

2 (a) An ideal diode has been connected across a 10 Ω, 100 mA, centre-zero PMMC meter as shown in figure 2 (a). Determine the reading of meter.

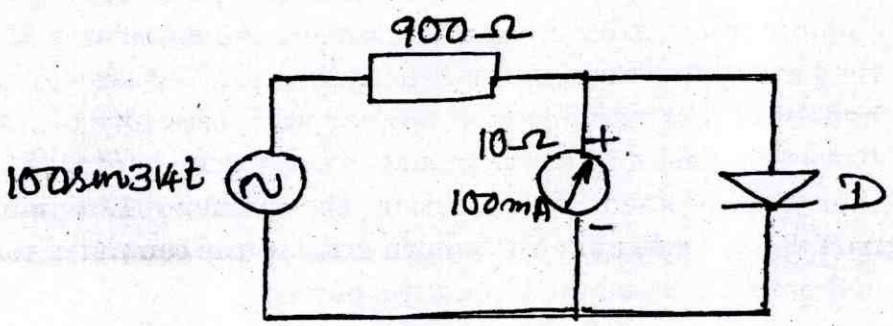

Fig. 2(a)

6

(b) Explain the vector impedance meter with the neat diagram. **10**

UNIT - III

3 (a) How can the following quantity be measured using CRO ?

(1) Current

(2) Frequency

(3) Phase angle

(4) Voltage.

(b) Explain the dual beam oscilloscope. **16**

OR

3 (a) Compare the digital storage oscilloscope and analog storage oscilloscope. **8**

(b) What value should C_1 have for V_o to be equal to 0.1 V_i in circuit shown below ?

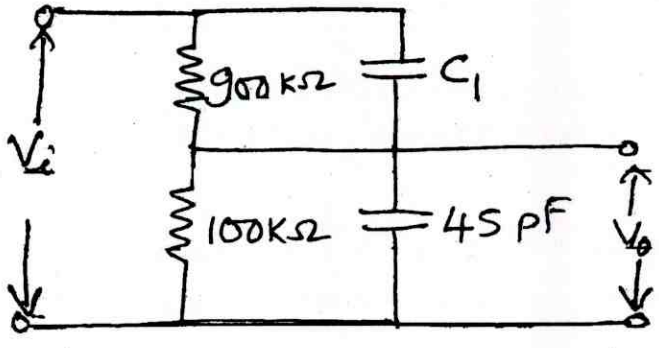

Fig. 3(b)

UNIT - IV

4 Explain all kind of attenuators used in signal generators. **16**

OR

4 (a) What is the frequency synthesized signal generator ? Explain direct analog synthesizer. **8**

(b) Draw the block diagram and explain the working of a random noise generator. **8**

UNIT - V

5 (a) An accelerator has a damping ratio of 0.7. Calculate the value of frequency ratio so that ratio of steady relative displacement to amplitude of input displacement is 0.99 (i.e. the error is 1%) **6**

(b) Explain the loading effect and frequency response of piezoelectric transducer. **10**

OR

5 (a) Derive an expressions for the gauge factor of strain gauges. Give its applications and working principle in detail. **10**

(b) A thermistor has a resistance of 4000 Ω at 0°C and 800 Ω at 40°C. The resistance temperature relationship is given by

$R_1 = R_0 \alpha\ e^{\beta/T}$

determine the constant α and β. Determine the range of resistance to be measured in case the temperature rises from 50°C to 100°C. **6**

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Roll No. _____ Total No. of Pages : 6

4E4133

B. Tech. IV-Sem. (Main / Back) Exam; April-May 2017

Electronics & Communication Engg.

4EC4A Electromagnetic Field Theory

Time : 3 Hours **Maximum Marks : 80**

Min. Passing Marks : 24

Instructions to Candidates :-

*Attempt any **five questions**, selecting **one question** from **each unit**. All Questions carry **equal** marks. Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly.*
Units of quantities used / calculated must be stated clearly.
Use of following supporting materials is permitted during examination. (Mentioned in form No. 205)

1. NIL 2. NIL

UNIT - I

1 If the electric field intensity is given by $\vec{E} = 30i + 2xy^2\hat{j} + 5xz^2\hat{k}$ then find

(i) The work done in moving 20μc from origin to (1,2,0) in this field.

(ii) The work done in a circular path of radius 2 meter in xy plane for unit positive charge

(iii) The electric field in cylindrical co-ordinate system.

4+4+8=16

OR

1 (a) If the charge density is given by $p(x,y,z) = \frac{20}{x} + y^2 z$ then find the total charge in a cube placed in first quardant as shown in fig-1.

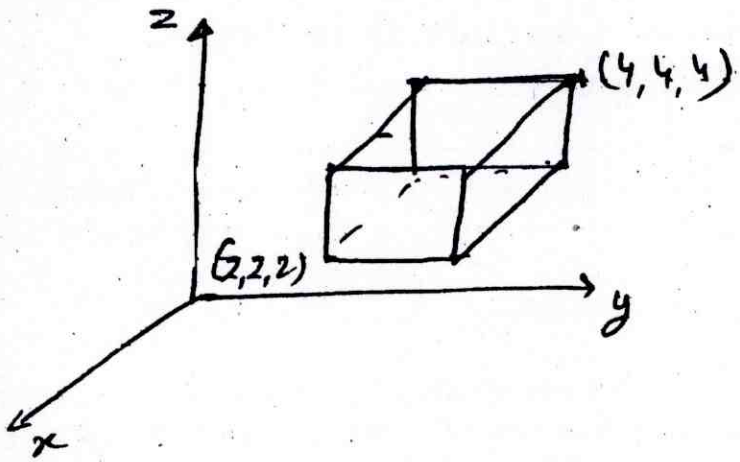

Fig. 1

10

(b) Explain the use of following w.r. to field theory.

(i) Curl

(ii) Divergence

(iii) Stokes theorem

(iv) Divergence theorem.

6

UNIT - II

2 Prove that :

(i) Equipotential surface is normal to electric field intensity.

(ii) Normal component of electric flux density passes without any change at the interface when charge density at interface is zero.

(iii) $\nabla \cdot D = \rho_v$

(iv) $\nabla \times E = 0$ in static field.

4×4=16

OR

2 (a) Find the electric field intensity at any point due to a charge density and its

$\rho(x, y, z) = 20x^2y^2z\ c/m^3$

Also find the electric field at

(i) Origin and

(ii) (0, 0, 2)

Assume the medium has relative permittivity $E_r = 4$

10

(b) Find the electrical energy stored in a sphere of radius = 2 meter around a point charge of 10 μc placed at the centre of this sphere. Assume the relative permittivity is $E_r = 2$.

6

UNIT - III

3 (a) Find the magnetic field intensity in medium-2 (fig.2)

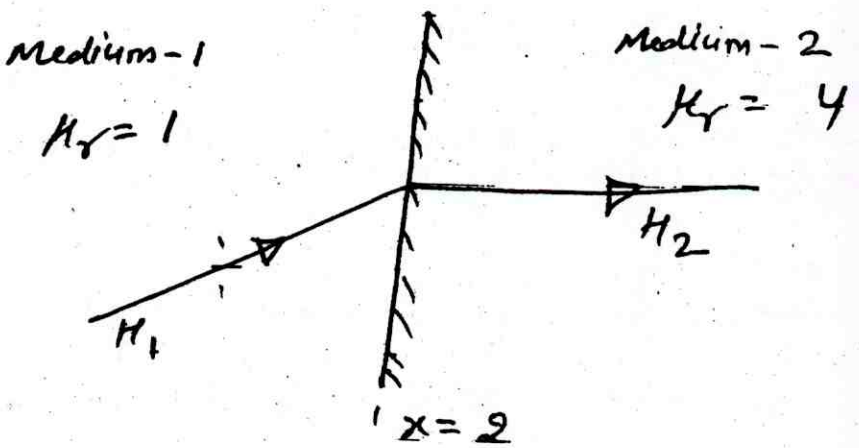

Fig. 2

1+4=8

1×2=8

16

Assume

$\mu_1 = 20i + yj + a\hat{k}$ and current density at interface is zero.

8

P.T.O.

(b) Prove that

(i) $\nabla \cdot B = 0$

(ii) $\vec{B} = \nabla \times \vec{A}$.

4+4=8

OR

3 (a) Find the analogous relation of following in magnetic field.

(i) $V(x,y,z) = \frac{1}{4\pi t_0} \int \frac{p(x,y,z)dv}{r}$

(ii) $\nabla^2 V = \frac{P}{\epsilon}$

4+4=8

(b) A current loop (2×4) cm^2, carrying 2 ampere current is placed in yz plane. Find torque on it if the magnetic field at that region is given $\vec{B} = 200\hat{j} + 10\hat{k}$

8

UNIT - IV

4 (a) The electric field of an EM wave is given by
$E_x = 100e^{-0.02z} \sin(2000\ t - 0.02\ z)$
Then find the
(i) Speed of EM wave
(ii) Magnitude of electric field at a distance of 10 km

4×2=8

(b) Find the ideal value of skin depth in following medium
(i) Perfect vacuum
(ii) Perfect conductor at DC
(iii) Perfect conductor at f = 10 GHz
(iv) Conductor with conductivity $\sigma = 10^6$ SΩ at f = 10^9 Hz

4×2=8

OR

4 (a) A wave is incident from medium 1 to medium 2 then find its (fig 3)

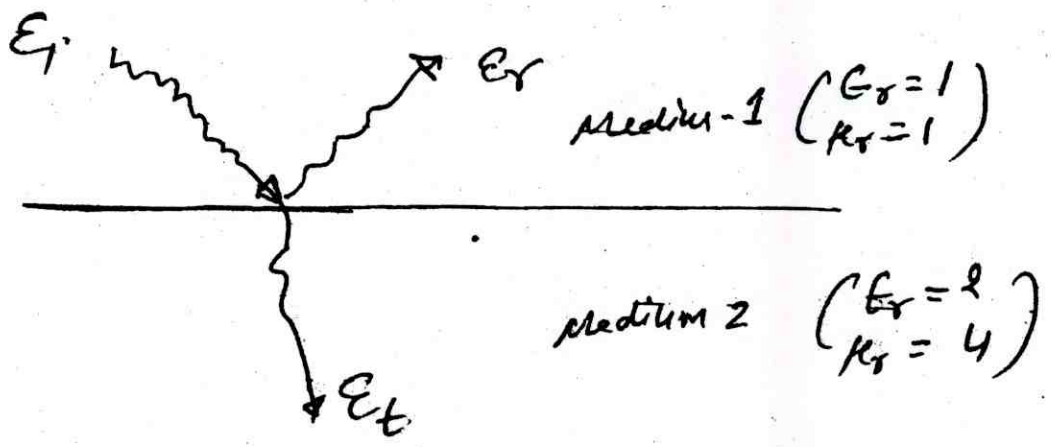

Fig. 3

(i) reflected power
(ii) transmitted power.

4+4=8

(b) Define the following with their proper expressions :
(i) Displacement vector
(ii) Depth of penetration
(iii) Phase shift coefficient
(iv) Energy density of EM wave.

4×2=8

UNIT - V

5 Find the radiation resistance of dipole antenna.

16

OR

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Roll No. _____ Total No. of Pages : 8

4E4134

B. Tech. IV-Sem. (Main / Back) Exam; April-May 2017

Electronics & Communication Engg.

4EC5A Optimization Techniques

Time : 3 Hours **Maximum Marks : 80**

Min. Passing Marks : 24

Instructions to Candidates :-

*Attempt any **five questions**, selecting **one question** from **each unit**. All Questions carry **equal** marks. Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly.*
Units of quantities used / calculated must be stated clearly.
Use of following supporting material is permitted during examination.
(Mentioned in form No. 205)

1. NIL 2. NIL

UNIT - I

1 (a) Explain the term 'optimization'. Discuss briefly the applications of optimization techniques in engineering field. **8**

(b) A carpenter has 90, 80 and 50 running feet respectively of teak, plywood and rosewood. Product A requires 2, 1 and 1 running feet of take, plywood and rosewood respectively. Product B requires 1, 2 and 1 running feet of teek, plywood and rosewood respectively. If A would sell for Rs. 48 and B would sell for Rs. 40 per unit, how much of each should he make and sell in order to obtain the maximum gross income out of his stock of wood ? Give a mathematical formulation to this linear programming problem. **8**

OR

1 (a) Discuss the meaning, significance and scope of optimization techniques. 8

(b) Vitamin C and vitamin E are found in two different fruits F_1 and F_2. One unit of fruit F_1 contains 3 units of vitamin C and 2 units of vitamin E. Similarly, one unit of fruit F_2 contains 2 units of vitamin C and 2 units vitamin E in it. A patient needs minimum of 30 units of vitamin C and 20 units of vitamin E. Also one unit of fruit F_1 costs Rs. 20 and one unit of fruit F_2 costs Rs. 25. The problem, that the hospital faces is to find such units of fruit F_1 and F_2 which should be supplied to the patients at minimum cost. Formulate the above as a linear programming problem. 8

UNIT - II

2 (a) Describe the revised simplex procedure for solving a linear programming problem. 8

(b) Solve the following LPP by converting it into its dual :

Minimize $Z = x_1 + x_2$

Subject to $3x_1 + 2x_2 \geq 4$

$-x_1 + 3x_2 \geq 5$

$4x_1 + 2x_2 \geq 5$

$2x_1 + x_2 \geq 1$

and $x_1, x_2 \geq 0$ 8

OR

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2 (a) Solve the following LPP using simplex method :

Minimize $Z = x_1 - 3x_2 + 2x_3$

Subject to $3x_1 - x_2 + 3x_3 \leq 7$

$-2x_1 + 4x_2 \leq 12$

$-4x_1 + 3x_2 + 8x_3 \leq 10$

and $x_1, x_2, x_3 \geq 0$

8

(b) Consider the linear programming problem :

Maximize $Z = 3x_1 + 5x_2 + 4x_3$

Subject to $2x_1 + 3x_2 \leq 8$

$2x_2 + 5x_3 \leq 10$

$3x_1 + 2x_2 + 4x_3 \leq 15$ and

$x_1, x_2, x_3 \geq 0$

The optimum solution to this problem is contained in the following simplex table :

Basic variables	$C_j \rightarrow$		3	5	4	0	0	0
	C_B	X_B	X_1	X_2	X_3	X_4	X_5	X_6
x_2	5	$50/41$	0	1	0	$15/41$	$8/41$	$-10/41$
x_3	4	$62/41$	0	0	1	$-6/41$	$5/41$	$4/41$
x_1	3	$89/41$	1	0	0	$-2/41$	$-12/41$	$15/41$
$\left(Z = 765/41\right)$	$Z_j - C_j \rightarrow$		0	0	0	$45/41$	$24/41$	$11/41$

Find the range over which components b_2 and b_3 of the requirement vectors can be changed maintaining the feasibility of the solution.

8

UNIT - III

3 (a) Find the optimum solution of the following transportation problem :

	D_1	D_2	D_3	D_4	Capacity
O_1	19	30	50	10	7
O_2	70	30	40	60	9
O_3	40	8	70	20	18
Demand	5	8	7	14	

8

(b) Solve the following assignment problem :

Jobs

		J_1	J_2	J_3	J_4	J_5
	M_1	10	4	5	3	11
	M_2	13	11	9	12	10
Machines	M_3	12	3	10	1	9
	M_4	9	1	11	4	8
	M_5	8	6	7	3	10

8

OR

3 (a) Find the optimum solution of the following transportation problem :

Stores

		1	2	3	4	Supply
Factories	*A*	4	6	8	13	50
	B	13	11	10	8	70
	C	14	4	10	13	30
	D	9	11	13	8	50
Demand		25	35	105	20	

8

(b) A department head has five subordinates and five jobs to be done. The subordinates differ in efficiency and jobs differ in their intrinsic difficulty. The estimate of the times each man would take to perform each job is given in effectiveness matrix. How should the tasks be allocated on one to one basis, so as to minimize the total man hours.

Subordinates

		I	*II*	*III*	*IV*	*V*
Jobs	*A*	1	3	2	3	6
	B	2	4	3	1	5
	C	5	6	3	4	6
	D	3	1	4	2	2
	E	1	5	6	5	4

8

UNIT - IV

4 (a) Solve by steepest descent method : 5

Minimize $f(x)=2x_1^2+x_2^2+2x_1x_2+x_1-x_2$ starting from the point $x_1=(0,0)$.

8

(b) Solve :

Minimize $f(x)=x_1^2+x_2^2$

Subject to $g_1(x)=-x_1-x_2+5\leq 0$

$g_2(x)=-x_1+x_2\leq 0$

By the exterior penalty method and find the solutions corresponding to $r=1$, 10 and ∞.

8

OR

4 (a) Solve :

Minimize $f(x)=x_1-x_2$

Subject to $g(x)=3x_1^2+x_2^2-2x_1x_2-1\leq 0$

Using the sequential linear programming method and taking the convergence limit $\epsilon=0.02$. 5

8

(b) Compute the Newton step corresponding to $x_1=(0,1)$ in a search of unconstrained nonlinear programming

Minimize $f(x_1,x_2)=(x_1+1)^4+(x_2+1)^4+x_1x_2$.

8

55

UNIT - V

5 (a) State Bellman's principle of optimality, using it solve the following dynamic programming problem :

Minimize $Z = x_1^2 + x_2^2 + x_3^2$

Subject to $x_1 + x_2 + x_3 \geq 15$ and

$x_1, x_2, x_3 \geq 0$.

8

(b) Solve the following LPP by using dynamic programming method :

Maximize $Z = 3000x_1 + 2000x_2$

Subject to $5x_1 + 2x_2 \leq 180$

$3x_1 + 3x_2 \leq 135$

and $x_1, x_2 \geq 0$.

8

OR

5 (a) State the 'Principle of optimality' in dynamic programming, using it solve the following dynamic programming problem :

Maximize $Z = x_1\, x_2\, x_3$

Subject to $x_1 + x_2 + x_3 = 10$ and

$x_1, x_2, x_3 \geq 0$

8

(b) Solve the following linear programming problem by using dynamic programming approach :

Maximize $Z = 6x_1 + 4x_2$

Subject to $2x_1 + x_2 \leq 390$

$3x_1 + 3x_2 \leq 810$

$x_2 \leq 200$

and $x_1, x_2 \geq 0$.

8

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B. Tech. IV-Sem. (Main) Exam; April-May 2017

Electronics & Communication Engg.

4EC6A Mathematics - IV

Time : 3 Hours **Maximum Marks : 80**

Min. Passing Marks : 24

Instructions to Candidates :-

*Attempt any **five questions**, selecting **one question** from **each unit**. All Questions carry **equal** marks. Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly.*
Units of quantities used / calculated must be stated clearly.
Use of following supporting material is permitted during examination.
(Mentioned in form No. 205)

1. NIL 2. NIL

UNIT - I

1 (a) Define the operators : $\Delta, \nabla, \delta, \mu$. 2

(b) Prove that :

$$u_0 + \frac{xu_1}{1!} + \frac{x^2u_2}{2!} + \frac{x^3u_3}{3!} + \ldots\ldots = e^x \left[u_0 + x\Delta u_0 + \frac{x^2}{2!}\Delta^2 u_0 + \ldots\ldots \right]$$

8

(c) Prove that : $\Delta \log f(x) = \log\left[1 + \frac{\Delta f(x)}{f(x)}\right]$.

6

OR

1 (a) Given the following data :

x :	10^o	20^o	30^o	40^o	50^o	60^o	70^o	80^o
y :	0.9848	0.9397	0.8660	0.7660	0.6428	0.5000	0.3420	0.1737

Evaluate :

(i) $y(25^o)$

(ii) $y(32^o)$

(iii) $y(73^o)$

8

(b) Apply Lagrange's formula to find $f(x)$ from the following data :

x :	0	1	4	5
$f(x)$:	4	3	24	39

Hence find f(3)

8

UNIT - II

2 (a) A slider in a machine moves along a fixed straight rod. Its distance $x(cm)$ along the rod is given below for various values of time $t(\text{secs.})$:

Evalaute :

t:	0.0	0.1	0.2	0.3	0.4	0.5	0.6
x:	30.28	31.43	32.98	33.54	33.97	33.48	32.13

(i) $\frac{dx}{dt}$ for $t=0.1,\ t=0.3,\ t=0.5$

(ii) $\frac{d^2x}{dt^2}$ for $t=0.1,\ t=0.3,\ t=0.5$

8

(b) Use Milne's predictor-corrector method to obtain $y(0.4)$ and $y(0.5)$ for the following differential equation :

$\frac{dy}{dx}=2e^x-y$, given that

x:	0	0.1	0.2	0.3
y:	2	2.01	2.04	2.09

8

OR

2 (a) Evaluate $\int_{-1.6}^{-1} e^x dx$ by the

(i) Trapezoidal rule

(ii) Simpson's $\frac{1}{3}$ rule

(iii) Simpson's $\frac{3}{8}$ rule and compare your results with the exact value.

8

(b) If $\frac{dy}{dx} = x + y^2$, use Runge-Kutta method to find an approximate value of y for $x = 0.2$, given that $y = 1$ when $x = 0$ (take $h = 0.1$)

8

UNIT - III

3 (a) Establish the follqwing differential formulae involving $J_n(x)$:

(i) $\frac{d}{dx}\left[x^n J_n(x)\right] = x^n J_{n-1}(x),\ n \geq 0;$

(ii) $\frac{d}{dx}\left[x^{-n} J_n(x)\right] = -x^{-n} J_{n+1}(x),\ n \geq 0.$

8

(b) Show that :

(i) $(2n+1)x\,P_n(x)=(n+1)\,P_{n+1}(x)+n\,P_{n-1}(x)$

(ii) $\int_{-1}^{1} x\,P_n(x)\,P_{n-1}(x)\,dx=\frac{2n}{(2n-1)(2n+1)}$.

8

OR

3 (a) State and prove orthogonal properties of Bessel's functions.

8

(b) Expand in a series of Legendre's polynomials :

$x^4+3x^3-x^2+5x-2$.

8

UNIT - IV

4 (a) There are three boxes containing respectively 1 white, 2 red and 3 black balls; 2 white, 3 red and 1 black ball; 3 white, 1 red and 2 black balls. A box is chosen at random and from it two balls are drawn at random. The two balls are one red and one white. Find the probability that these come from (i) the first box, (ii) the second box, (iii) the third box.

8

(b) In a normal distribution, 31% of the items are under 45 and 8% are over 64. Find the mean and S.D. of the distribution. Given that $P=\frac{1}{\sqrt{2\pi}}\int_{0}^{Z} e^{-\frac{1}{2}t^2}\,dt$, the values of Z corresponding to p=0.19 and p=0.42 are 0.50 and 1.40 respectively.

8

OR

4 (a) Razor blades are supplied by a manufacturing company in packets of 10. There is a probability of 1 in 100 blades to be defective. Using Poisson distribution calculate the number of packets containing one defective blade, no defective blade and all defective blades in a consignment of 10,000 packets. 8

(b) Two random variables have the least square regression lines with equations :

$3x+2y-26=0$ and $6x+y-31=0$. Find the mean values and the coefficient of correlation between x and y. 8

UNIT - V

5 (a) Show that a necessary condition for $I=\int_{x_1}^{x_2} f(x,y,y')dx,\ y'=\frac{dy}{dx}$ to be an extremum is that $\frac{\partial f}{\partial y}-\frac{d}{dx}\left(\frac{\partial f}{\partial y'}\right)=0$. 8

(b) Find the path on which a particle, in absence of friction, will slide from one fixed point to another point in the shortest time under the action of gravity. 8

OR

5. (a) Find a function $y(x)$ for which

$$\int_0^1 \left[x^2 + (y')^2\right] dx \text{ is stationary given that } \int_0^1 y^2 dx = 2;\ y(0) = 0,\ y(1) = 0.$$

8

(b) Find the equations of the curves for which the functional

$$\int_0^1 \left[(y')^2 + 12xy\right] dx,\ y' = \frac{dy}{dx}$$

with $y(0) = 0$ and $y(1) = 1$ can be extremised.

8

4E4120

Roll No. _____ 4

4E4120

B. Tech. IV-Sem. (Main & Back) Exam; April-May 2017

Electronic Inst. & Control Engg.

4E11A Analog Electronics

Time : 3 Hours **Maximum Marks : 80**
Min. Passing Marks : 26

Instructions to Candidates .:-

*Attempt any **five questions**, selecting **one question** from **each unit**. All Questions carry **equal** marks. Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly.*
Units of quantities used / calculated must be stated clearly.

Use of following supporting materials is permitted during examination. (Mentioned in form No. 205)

1. NIL 2. NIL

UNIT - I

1 (a) For a current shunt feedback amplifier, find expression for input resistance and output resistance.

(b) For the circuit given that $R_C = 4k\Omega$, $R_1 = 40\,k\Omega$, $R_S = 10\,k\Omega$, $h_{ie} = 1.1\,k\Omega$, $h_{fe} = 50$, $h_{re} \fallingdotseq h_{oe} = 0$, find : (i) A_{vf} (ii) R_{if} (iii) R'_{of}

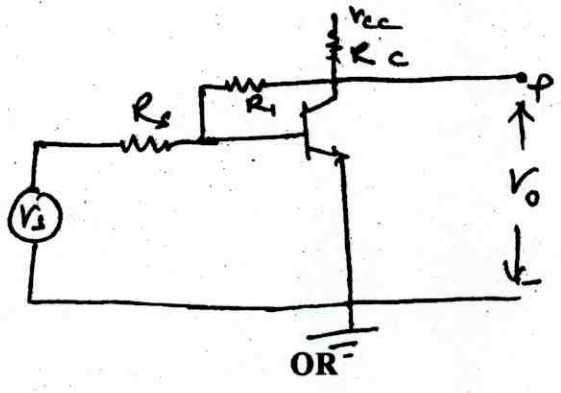

Fig. 1

1 (a) Enumerate the effect of negative feedback amplifiers.

(b) An amplifier has a voltage gain of 40. The amplifier is now modified to provide a 10% negative feedback in series with the input. Determine :

(i) Voltage gain with feed back

(ii) Amount of feedback in dB.

(iii) Loop gain,

UNIT - II

2 (a) Explain a generalised reasonant circuit oscillator (LC oscillator). How is its resonant frequency controlled by external circuit elements ? Under what conditions such an oscillator is called Colpitt oscillator ?

(b) A phase shift oscillator uses three identical RC sections in the feedback network. The value of components are $R = 100\,k\Omega$ and $C = 0.01\,\mu F$. Calculate the frequency of oscillator.

OR

2 (a) Explain the working of a monostable multivibrator with the help of suitable circuit diagram using BJT and also show the waveforms at various points and derive expression for time width.

(b) A Colpitts oscillator is designed with $C_1 = 100\,pF$ and $C_2 = 7500\,pF$. The inductance is variable. Determine the range of inductance values of the frequency if oscillation is varied between 950 kHz to 2050 kHz.

UNIT - III

3 (a) Derive the expression for the CE current gain and voltage gain including source resistance R_S.

(b) A transistor's short circuit current gain is measured to be 25 at a frequency of 2 MHz. If $f_B = 200\,kHz$, calculate :

(i) The current gain bandwidth product.

(ii) h_{fe} at low frequency

(iii) Short circuit current gain at 10 MHz and 100 MHz.

OR

3 (a) Draw the high frequency equivalent circuit of an emitter follower and derive the expression of upper cut-off frequency, f_H.

(b) Given the following transistor measurements made at $I_C = 5\,mA$, $V_{CC} = 10\,V$ and at room temperature $h_{fe} = 100$, $h_{ie} = 600\,\Omega$ $A_i = 10$ at frequency f = 10 mHz $C_c = 3\,Pf$. Find $f_B, f_T, C_e, R_{b'e}$ and $r_{bb'}$

UNIT - IV

4 (a) How you can classify tuned amplifiers, discuss in brief with suitable examples.

(b) A tank circuit has a capacitor of 100 pF and an inductor of 150 μH. The series resistance is $15\,\Omega$. Find the impedance, Q and bandwidth of resonant circuit.

OR

4 (a) An FET having $g_m = 6\,mA/V$ has a tuned load consisting of a 400 μH inductance of $5\,\Omega$ in parallel with a capacitor of 2500 pF. Find.

(i) Resonant frequency
(ii) Tuned circuit dynamic resistance
(iii) Gain at resonance
(iv) Signal bandwidth

(b) Explain the working of stagger tuned amplifier with help of frequency response.

UNIT - V

5 (a) Compare the power output, efficiency and rating of devices required for a class-A push pull and class-B push pull stages. Also derive the required expression.

(b) A power transistor operated in class 'A' operator delivers a maximum of 6W to a $8\,\Omega$ load with the supply voltage of 25 V. The Q point is adjusted for a symmetrical swing. Calculate

(i) Steps down turns ratio
(ii) Peak collector current
(iii) Efficiency

OR

5 (a) Discuss crossover distortion in class-B power amplifier.

(b) A complimentary symmetry class-B amplifier supplies output to a load of $3\,\Omega$ from the supply voltage of 20 V. Calculate maximum power output, Power dissipation rating of each transistor.

4E4121

Roll No. _____ 6

4E4121

B. Tech. IV-Sem. (Main & Back) Exam; April-May 2017

Electronic Inst. & Control Engg.
4EI2A Control System - I

Time : 3 Hours **Maximum Marks : 80**
Min. Passing Marks : 26

Instructions to Candidates :-

*Attempt any **five questions**, selecting **one question** from **each unit**. All Questions carry **equal** marks. Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly.*
Units of quantities used / calculated must be stated clearly.

Use of following supporting material is permitted during examination.
(Mentioned in form No. 205)

1. NIL 2. NIL

UNIT - I

1 The block diagram of a feedback control system is shown in fig.

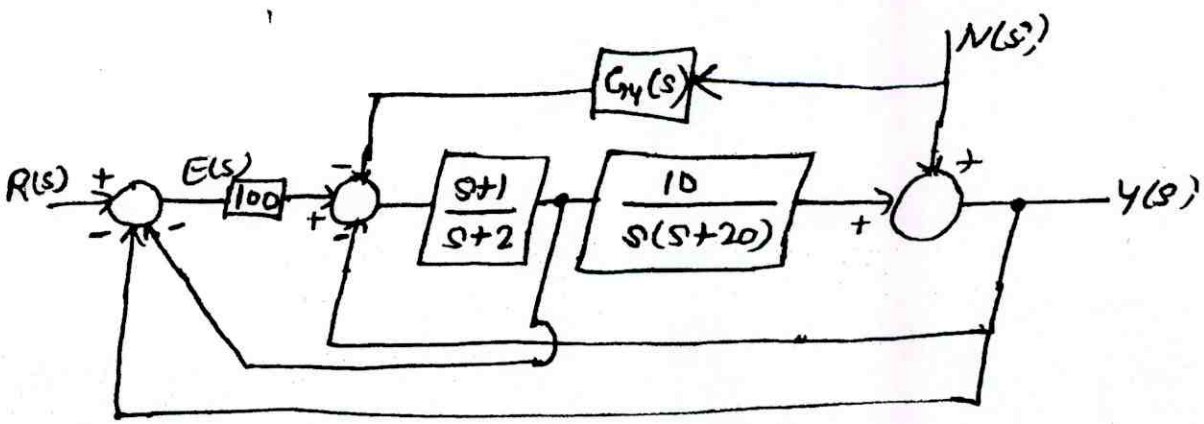

Fig. : Block diagram of fb control system

(i) The controller with T.F. $G_4(S)$ is for the reducation of the effect of the noise N(S). Find $G_4(S)$ so that the output Y(S) is totally independent of N(S).

8

(ii) Find steady-state value of e(t) when the input is a unit-step function set N(S) = 0.

8

OR

1 (a) Consider the two-DOF spring mass system, with two masses m_1 and m_2, two springs k_1 and k_2 and two forces f_1 and f_2 as shown in fig. Find the equations of motion. Also find output $y(t)$.

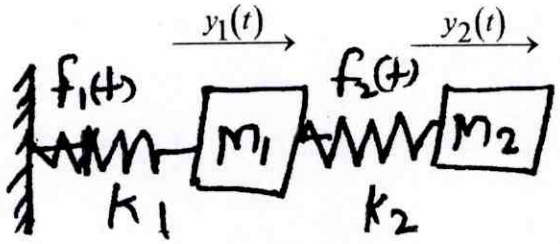

Fig. - A - 2-DOF spring - mass system

10

3

(b) Find the transform of $\frac{a}{a^2+t^2}$

6

UNIT - II

2 (a) When will a synchro generate more heat than its designed to handle ? **6**

(b) A 200V, dc shunt machine has an armature resistance of $0.5\,\Omega$ and field resistance of $200\,\Omega$. The machine is running at 1000 rpm as a motor drawing 31A from the supply mains. Calculate the speed at which the machine must be driven to achieve this a generator. **10**

OR

2 (a) When you zero a synchro with a synchro testor, what is indicated by a jump in the synchro testor's dial when the S_1 and S_3 leads are momentarily shorted. **10**

(b) Explain variable reluctance type step motor. **6**

UNIT - III

3 (a) A thermometer requires 1 min to indicate 98% of the response to a stop input. Assuming the thermometer to be a first order system, find the time constant.

IF the thermometer is placed in a bath, the temp. of which is changing linearly at a rate of 10°/min., how much error does the thermometer show ? **10**

100

(b) The unit step response of a linear control sytem is shown in fig. Find the T.F. of a second order prototype system to model the system.

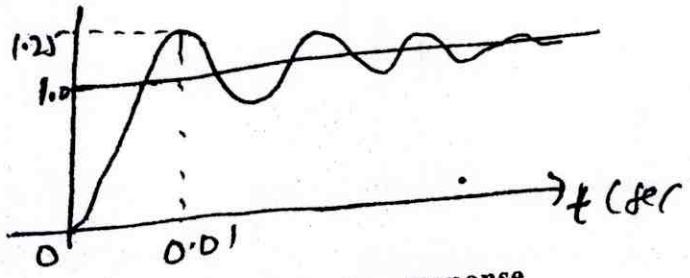

Fig. Unit step response 6

OR

3 (a) Consider the characteristics equation

$$S^4 + 2S^3 + (4+K)S^2 + 9S + 25 = 0$$

using the Hurwitz stability criterion, determine the range of K for stability. 8

(b) Explain why the proportional control of a plant that does not possess an integrating property suffers offset in response of step inputs. 8

UNIT - IV

4 (a) Sketch the root loci for the system shown in fig.

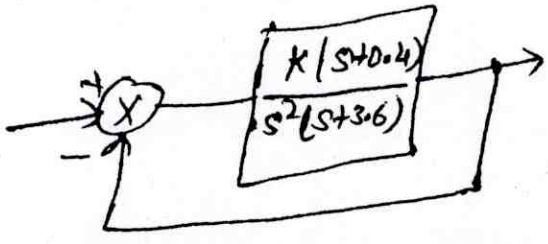

Fig. Closed-loop control system 8

[P.T.O.

(b) Consider a unity feedback system whose open-loop transfer function is

$$G(S)=\frac{Ke^{-0.8s}}{S+1}$$

using the Nyquist plot, determine the critical value of K for stability.

8

OR

4 (a) A block diagram of a space vehicle control system is shown in fig. Determine the gain K such that the P.M. is 50°. What is the GM in this case ?

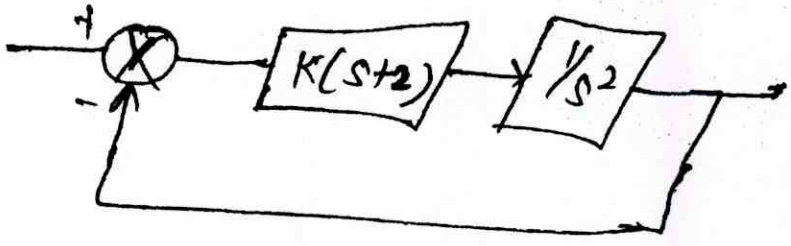

Fig. Space vehicle control system.

10

(b) Consider a closed loop system whose open loop T.F. is given by

$$G(S)H(S)=\frac{K}{(ST_1+1)(ST_2+1)}$$

Examine the stability of the system.

6

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UNIT - V

5 Consider a unity feedback system whose open loop transfer function is

$$G(S)=\frac{K}{S(S+1)(S+4)}$$

Design a lag-lead compensator $G_C(S)$ such that the static velocity error constant is 10 sec^{-1}, the PM is 50°, and the GM is 10 dB or more. **16**

OR

5 Consider that the loop transfer function of a closed-loop system is

$$L(S)=\frac{Ke^{-T_dS}}{S(S+1)(S+2)}$$

Plot the Bode plot. **16**

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4E4122

Roll No. _____ Total No. of Pages : 3

4E4122

B. Tech. IV-Sem. (Main/Back) Exam; April-May 2017

Electronics Instrumentation & Control Engg.

4E13A Electrical Measurement

Time : 3 Hours **Maximum Marks : 80**

Min. Passing Marks : 24

Instructions to Candidates :-

*Attempt any **five questions**, selecting **one question** from **each unit**. All Questions carry **equal** marks. Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly.*
Units of quantities used / calculated must be stated clearly.
Use of following supporting materials is permitted during examination. (Mentioned in form No. 205)

1. Nil 2. NIL

UNIT-I

1 (a) What do you mean by phantom loading ? Explain the calibration techniques of single phase energy meter by phantom loading. **8**

(b) The inductance of a moving iron ammeter with a full scale deflection of 90° at 1.3 A, is given by the expression $L = \left(200 + 35\theta - 5\theta^2 - \theta^3\right)\mu H$, where θ is the deflection in radian from the zero position. Estimate the angular deflection of the pointer for a current of 1.0 A. **8**

OR

1 (a) A 50 volt range spring controlled electrodynamic voltmeter having a square law scale response takes 0.04A on d.c. for full scale deflection of 90°. The control constant is 0.5×10^{-6} N-m/degree and the initial mutual inductance of the instrument is 0.31 H. Find the true potential difference across the instrument when it reads 50V at 50 Hz.

8

(b) Explain the working of repulsion type moving iron instruments. Discuss about the methods of producing controlling and damping torques in them.

8

UNIT-II

2 (a) Explain the effect of secondary burden on the ratio and phase errors of a current transformer.

8

(b) Explain two wattmeter method of measuring power in three phase circuits.

8

OR

2 (a) Define the following terms used for instrument transformers :

(i) Transformation ratio

(ii) Nominal ratio

(iii) Turns ratio

(iv) Ratio correction factor.

8

(b) Explain the Arnold's method for testing of current transformers.

8

UNIT-III

3 Explain the working of co-ordinate A.C. potentiometer. How is it standardized ? What are the functions of the transfer instrument and the phase shifting transformer.

16

OR

105

3 (a) Explain the circuit diagram of slide wire potentiometer and explain its applications also. 8

(b) Explain the reasons why d.c. potentiometer cannot be used for a.c. measurement straight way. Explain the modifications that are needed in a d.c. potentiometer to be used for a.c. applications. 8

UNIT-IV

4 (a) Explain the Price's Guard wire method for the measurement of high resistance. 8

(b) Draw and explain the circuit of Kelvin's Double bridge method for the measurement of low resistance. Also derive the conditions for balance. 8

OR

4 (a) Explain the loss of charge method for measurement of insulation resistance of cables. 8

(b) What do you mean by fall of potential method. What are the factors which influence the earth resistance. 8

UNIT-V

5 Explain the following AC bridges with phasor diagram :

(a) Heaviside bridge. 8

(b) Anderson bridge. 8

OR

5 (a) Derive the balance equations of Hay's bridge. Draw the phasor diagram for balance conditions. 8

(b) What are the various sources of error in bridge measurement and their precautions. 8

4E4123

Roll No. _____ Total No. of Pages : 3

4E4123

B. Tech. IV-Sem. (Main) Exam; April-May 2017

Electronics Instrumentation & Control Engg.

4EI4A Sensor & Transducers

Time : 3 Hours **Maximum Marks : 80**

Min. Passing Marks : 24

Instructions to Candidates :-

*Attempt any **five questions**, selecting **one question** from **each unit**. All Questions carry **equal** marks. Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly.*
Units of quantities used / calculated must be stated clearly.
Use of following supporting material is permitted during examination.
(Mentioned in form No. 205)

1. NIL 2. NIL

UNIT - I

1 Differentiate between the following using suitable examples :
(i) Transducer and Inverse Transducer
(ii) Active and Passive Transducer
(iii) Primary and Secondary Transducer
(iv) Analog and Digital Transducer. **16**

OR

1 (a) Define the following with reference to transducers :
(i) Sensitivity error
(ii) Non conformity error
(iii) Hysteresis error
(iv) Dynamic error. **10**

(b) Explain the output characteristics of a transducer. 6

UNIT - II

2 (a) Explain the working principle of piezoelectric transducers with neat diagram. 8

(b) Explain the application and working principle of Pirani gauge. 8

OR

2 Explain the following transducers with their applications :

(a) Ionization Transducers 8

(b) Hall effect transducers. 8

UNIT - III

3 (a) Derive the expression of Gauge factor of strain gauge. 8

(b) Explain the working principle of displacement measurement transducers. 8

OR

3 Explain the following transducers with their applications :

(a) Capacitive transducers

(b) Passive type temperature transducers. 16

UNIT - IV

4 (a) Explain the following :

(i) Bourdon tubes

(ii) Bellows. 8

(b) Discuss about the load cell with merits and demerits. 8

OR

4 (a) Explain the construction and working of Hydrometer for the density measurement. 8

(b) Define the following :
(i) Viscosity to pressure transducers
(ii) Acceleration transducers. 8

UNIT - V

5 Write short notes on the following :
(a) Electro-luminescent displays. 8

(b) LED displays. 8

OR

5 Write short notes on the following :
(a) LCD displays 8

(b) Gas discharged plasma panels. 8

4E2090

Roll No. _____ Total No. of Pages : 3

4E2090

B. Tech. IV-Sem. (Old Back) Exam; April-May 2017

Electronic Inst. & Control Engg.

4IC6.1 Elective Object Oriented Programming

(Common for Electronics & Comm. Engg., AE & I Engg. & EI & C Engg. Branch)

Time : 3 Hours **Maximum Marks : 80**

Min. Passing Marks : 24

Instructions to Candidates :-

*Attempt any **five questions**, selecting **one question** from **each unit**. All Questions carry **equal** marks. Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly.*
Units of quantities used / calculated must be stated clearly.
Use of following supporting materials is permitted during examination.
(Mentioned in form No. 205)

1. NIL 2. NIL

UNIT - I

1 (a) Explain the concepts of classes and objects in OOPS. **6**

(b) What is inheritance ? Give an example of multiple inheritance. **6**

(c) What does polymorphism mean in object oriented programming ? **4**

OR

1 (a) What is Encapsulation in object oriented programming ? **4**

(b) What are public, private and protected members in object oriented programming language ? **6**

(c) What is reference variable ? Explain with suitable example. **6**

110

UNIT - II

2 (a) Write a C++ program to overload the increment operator with prefix and postfix forms. **10**

(b) Explain how the destructor is invoked ? **6**

OR

2 (a) What is constructor ? Explain the different types of constructors with suitable example. **8**

(b) What are friend functions ? Why are they used ? Explain with illustration. **8**

UNIT - III

3 (a) Explain the variation from C++ to Java. **4**

(b) What is the significance of byte code in Java programming ? **6**

(c) Explain the working of java virtual machine (JVM). **6**

OR

3 (a) What is array ? How can you declare an array in Java ? Explain with example. **8**

(b) Write a java program to swap two numbers without using third variable. **8**

UNIT - IV

4 (a) Write a java program to calculate the area of rectangle using parameterized constructor. **8**

(b) Explain the following operators :

(i) Bitwise operators

4

(ii) Assignment operator *operator.

4

OR

4 (a) What is operator overloading in Java ? What are the important points which should be taken care of while operator overloading ?

8

(b) Write a Java program to generate the Fibonacci Series using for loop.

8

UNIT - V

5 (a) Define package in java. Explain with suitable example, how you will create and import a package.

8

(b) What is interface ? Give an example to defining and implementing an interface. Also show how can multiple inheritance is achieved in Java using interface.

8

OR

5 (a) What is access protection in java ? Explain with example.

8

(b) Write short notes on :

(i) Exception handling

4

(ii) Packages.

4

1/2

4E2149

Roll No. _____ Total No. of Pages : 3

4E2149

B. Tech. IV-Sem. (Main/Back) Exam; April-May 2017

Biomedical

4BM3 Digital Electronics

Time : 3 Hours **Maximum Marks : 80**

Min. Passing Marks : 26

Instructions to Candidates :-

*Attempt any **five questions**, selecting **one question** from **each unit**. All Questions carry **equal** marks. Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly.*
Units of quantities used / calculated must be stated clearly.
Use of following supporting materials is permitted during examination.
(Mentioned in form No. 205)

1. NIL 2. NIL

UNIT - I

1 (a) How addition and subtraction is carried out in 2's complement representation ? Discuss with examples. **8**

(b) Explain signed binary numbers and 1's complement representation of negative numbers. **8**

OR

2 (a) Simplify the following :

(i) $xy + \overline{xz} + x\bar{y}z(xy + z)$

(ii) $\overline{\overline{x\bar{y}} + xyz + x(y + x\bar{y})}$

8

(b) Design the following boolean function with NAND gates only.

$f(A, B, C) = (A + BC)(B + \bar{C}A)$

8

UNIT - II

3 (a) Draw an open collector TTL circuit and explain its working.

8

(b) Discuss the various specification of digital IC's.

8

OR

4 (a) Explain the working of CMOS NAND gate and CMOS NOR gate.

8

(b) Explain the working of ECL with suitable diagram.

8

UNIT - III

5 (a) Simplify the following using K-map in SOP and POS form

$f(A, B, C, D) = \sum(1, 3, 4, 5, 6, 7, 9, 12, 13, 14, 15)$

10

(b) What are minterms and maxterms ? Explain with suitable example.

6

OR

6 (a) Simplify the following function using Quin-Mcklusky method.

$$f(A,B,C,D) = \sum(0,1,2,8,10,11,14,15)$$

10

(b) Explain the concept of variable mapping.

6

UNIT - IV

7 (a) Design a binary to gray code decoder.

12

(b) Give some features of combinational logic circuit.

4

OR

8 (a) Design a full adder using 4:1 MUX.

10

(b) Discuss half subtractor with logic diagram & truth table.

6

UNIT - V

9 (a) What is race arount condition ? How is it removed ?

6

(b) Design D flip-flop using SR flip-flop.

10

OR

10 (a) Design an MOD-6 synchronous up counter using T flip-flop.

10

(b) Explain the parallel in serial out shift register with proper diagram.

6