S.E. | SEM III (CBSGS) - CMPN | IMFT
A.M. III
Nov-Dec 2017

Q.P. Code : 23178

[Time: Three Hours] **[Marks:80]**

Please check whether you have got the right question paper.

N.B:
1. Question.No.1 is compulsory.
2. Attempt any three from the remaining six questions.
3. Figures to the right indicate full marks.

Q.1
a) If the Laplace transform of $\sin^2 3t$ 20
b) Prove that $f(z) = \log z$ is analytic
c) Obtain Fourier series for $f(x) = x^2$ in (-2,2)
d) Find the Z-Transform of $cos2k, k \geq 0$

Q.2
a) Prove that $\overline{F} = 2xyz^3 i + x^2z^3 j + 3x^2yz^2 k$ is irrotational. 06
Find Scalar potential for $\overline{F}$

b) Find the inverse Laplace Transform using Convolution theorem 06
$\frac{1}{(s^2+6s+18)^2}$

c) Find Fourier Series of $f(x) = \frac{\pi - x}{2}$ in $(0,2\pi)$. 08

Hence deduce that $\frac{\pi}{4} = 1 - \frac{1}{3} + \frac{1}{5} + - - - - -$.

Q.3
a) Find the Analytic function $f(z) = u + iv$ $if\ u + v = \cos x \cosh y - \sin x \sinh y$ 06

b) Find Inverse Z transform of $\frac{2z^2-10z+13}{(z-3)^2(z-2)}$, $2 < |z| < 3$ 06

c) Solve the Differential Equation $\frac{d^2y}{dt^2} + 2\frac{dy}{dx}y = 3te^{-1}, y(0) = 4, y'(0) = 2$ using Laplace Transform 08

Q.4
a) Find the Orthogonal Trajectory of $x^2 + y^2 - 3xy + 2y = c$ 06

b) Using Greens theorem evaluate $\int_c (x^2 - y)dx + (2y^2 + x)dy, C$ is closed path formed by $y = 4, y = x^2$ 06

c) Express the function $f(x) = \begin{cases} \sin x \,; 0 < X \leq \pi \\ 0 \quad ; X > \pi \end{cases}$ as Fourier Integral. Hence evaluate $\int_0^\infty \frac{\cos(\lambda\pi/2)}{1-\lambda^2}\, d\lambda$ 08

Q.5

a) Find Inverse Laplace Transform of $\frac{2s^2-6s+5}{s^3-6s^2+11s-6}$ 06

b) Find the Bilinear Transformation that maps the points $z = 1, i, -1$ $into\ w = i, 0, -i$ 06

c) Evaluate using Stoke's theorem $\int_c \bar{F} \bullet \overline{dr}$ where c is the boundary of the circle $x^2 + y^2 + z^2 = 1, z = 0$ and $\bar{F} = yzi + zxj + xyk$ 08

Q.6

a) Find the Directional derivative of $\emptyset = x^2 + y^2 + z^2$ in the direction of the line $\frac{x}{3} = \frac{y}{4} = \frac{z}{5}$ $at\ (1,2,3)$ 06

b) Find complex form of Fourier series for $e^{ax}; (-\pi, \pi)$ 06

c) Find Half Range sine Series for $f(x) = x(2-x)$ $\quad 0 < x < 2$ hence deduce that $\sum\left(\frac{1}{n^2}\right) = \frac{\pi^6}{945}$ 08

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F. / Sem-III - (CBSGS) / Analog and Digital Circuits / Dec-2017

Q. P. Code: 26352

(3 Hours) **[Total Marks: 80]**

N.B.: (1) Question No. **1** is **compulsory.**
(2) Solve any **three** questions out of remaining **five.**
(3) Figures to **right** indicate **full** marks.
(4) Assume suitable **data** where **necessary.**

Q1. Solve any four 20

a) State ideal and Practical Characteristics of an Op-amp
b) Explain Multiplexer and Demultiplexer.
c) Convert following decimal number to Binary ,Octal, Hexadecimal and Gray code
i) $(128)_{10}$ ii)$(73)_{10}$
d) Explain working of LCD.
e) Covert D flip flop to S-R flip flop.

Q2. a) a) Implement following using only one 8:1 Multiplexer and few gates.

$F(A,B,C,D)= \sum m(0,1,3,4,5,8,9,10,12,15)$ 10

b) Explain Fixed Biasing Circuit with its stability factor. 10

Q3. a) Draw and Explain Instrumentation Amplifier using Op-amp. 10

b) Draw circuit diagram and explain the operation of Monostable Multivibrator using IC555. 10

Q4. a) Minimize the following four variable logic function using K-map and design by using basic gates 10

$f(A,B,C,D)=\sum m (0,1,2,3,4,7,8,9,11,15)$

b) What are the different methods used to improve CMRR in Differential Amplifier. Explain one in brief. 10

Q5. a) Design a Mod 12 asynchronous counter using J-K-flip flop 10
b) Design 4-bit binary to gray code conversion 10

Q6 Write short notes on any four 20

a) Explain the working of a Non-inverting amplifier using Op-amp
b) Explain working of a transistor.
c) Write VHDL program for NAND gate.
d) Explain working of Current Mirror Circuit.
e) Explain block diagram of op-amp.

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