Knowledge Resource & Relay Centre (KRRC)

AIKTC/KRRC/SoET/ACKN/QUES/2018-19/ **Date:** ____________

School: SoET-CBSGS **Branch: EXTC ENGG.** **SEM: III**

To,
Exam Controller,
AIKTC, New Panvel.

Dear Sir/Madam,

Received with thanks the following **Semester/Unit Test-I/Unit Test-II (Reg./ATKT)** question papers from your exam cell:

Sr. No.	Subject Name	Subject Code	Format SC	Format HC	No. of Copies
1	Applied Mathematics- III	ETS301		✓	02
2	Analog Electronics – I	ETC302			
3	Digital Electonics	ETC303			
4	Circuits & Transmission Lines	ETC304		✓	02
5	Electronics Instruments & Measurement	ETC305			

Note: SC – Softcopy, HC - Hardcopy

(Shaheen Ansari)
Librarian, AIKTC

Paper / Subject Code: 49602 / APPLIED MATHEMATICS-III

14/5/19

Q.P. Code : 37077

(3 Hours) [Total marks : 80

Note :-
1) Question number 1 is **compulsory**.
2) Attempt any **three** questions from the remaining **five** questions.
3) **Figures** to the **right** indicate **full** marks.

Q.1 a) Find the Laplace transform of $sinh^5 t$. 05

b) Find an analytic function whose imaginary part is $e^{-x}(y\cos y - x\sin y)$. 05

c) Find the Fourier series for $f(x) = 1 - x^2$ in $(-1, 1)$. 05

d) Evaluate $\int_C \bar{F}\cdot d\bar{r}$ where $\bar{F} = 2x\,i + (xz - y)\,j + 2z\,k$ from $O(0,0,0)$ to $P(3,1,2)$ along the line OP. 05

Q.2 a) Find a cosine series of period 2π to represent $\sin x$ in $0 \le x \le \pi$. 06

b) Find a, b, c if $\bar{F} = (axy + bz^3)\,i + (3x^2 - cz)\,j + (3xz^2 - y)\,k$ is irrotational. 06

c) Find the image of the circle $|z| = k$ where k is real under the bilinear transformation $w = \frac{5-4z}{4z-3}$. 08

Q.3 a) Prove that $J_{\frac{1}{2}}(x) = \tan x \cdot J_{-\frac{1}{2}}(x)$. 06

b) Find the inverse Laplace transform of the following function by convolution theorem $\frac{(s+2)^2}{(s^2+4s+8)^2}$. 06

c) Obtain the complex form of Fourier series for $f(x) = e^{ax}$ in $(-l, l)$ where a is not an integer. 08

Q.4 a) Find the angle between the normals to the surface $xy = z^2$ at the points $(1, 4, 2)$ and $(-3, -3, 3)$. 06

b) Prove that $x^2 J_n''(x) = (n^2 - n - x^2)\,J_n(x) + x\,J_{n+1}(x)$; $n = 0, 1, 2, \ldots\ldots$ 06

5E3DE25E6A27B8E7164E07E60585B10D

c)
(i) Find the Laplace transform of $\sinh at \sin at$. 04

(ii) Find the Laplace transform of $te^{-4t} \sin 3t$. 04

Q. 5 a) Prove that $J_2(x) = J''_0(x) - \frac{J_0'(x)}{x}$. 06

b) If $v = e^x \sin y$, show that v is harmonic and find the corresponding analytic function. 06

c) Find the Fourier series for $f(x)$ in $(0, 2\pi)$, 08

$$f(x) = \begin{cases} x, & 0 < x \leq \pi \\ 2\pi - x, & \pi \leq x < 2\pi \end{cases}$$

Hence, deduce that

$$\frac{\pi^4}{96} = \frac{1}{1^4} + \frac{1}{3^4} + \frac{1}{5^4} + \ldots\ldots$$

Q. 6 a) Show that the set of functions $\cos nx$, $n = 1, 2, 3, \ldots\ldots$ is orthogonal on $(0, 2\pi)$. 06

b) Using Green's theorem evaluate $\int_C \bar{F} \cdot d\bar{r}$ where C is the curve enclosing the region bounded by $y^2 = 4ax, x = a$ in the plane $z = 0$ and 06

$$\bar{F} = (2x^2y + 3z^2)\, i + (x^2 + 4yz)\, j + (2y^2 + 6xz)\, k.$$

c) Use Laplace transform to solve 08

$$\frac{d^2y}{dt^2} + 4\frac{dy}{dt} + 8y = 1 \text{ with } y(0) = 0, y'(0) = 1.$$

****

5E3DE25E6A27B8E7164E07E60585B10D

(8) TE - sem - III - CBSGS - EXTC 30/5/19

Paper / Subject Code: 49605 / CIRCUITS AND TRANSMISSION LINES

Time: 3 Hours **Total Marks: 80**

N.B.

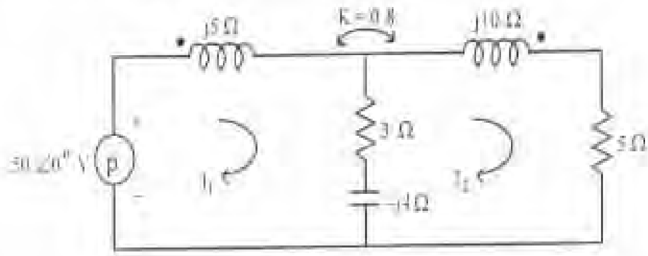
1) Question No. 1 is Compulsory

2) Out of remaining questions, attempt any three

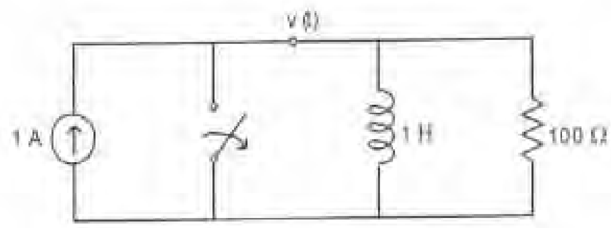
3) Assume suitable data if required

4) Figures to the right indicate full marks

1 (A) Draw equivalent circuit for given magnetically coupled circuit. 05



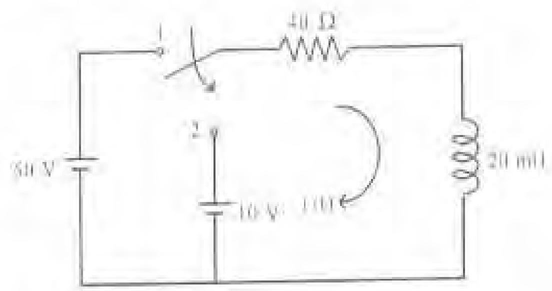
(B) In the network shown in Fig., at $t = 0$, switch is opened. Calculate v, $\frac{dv}{dt}$ at $t = 0+$. 05



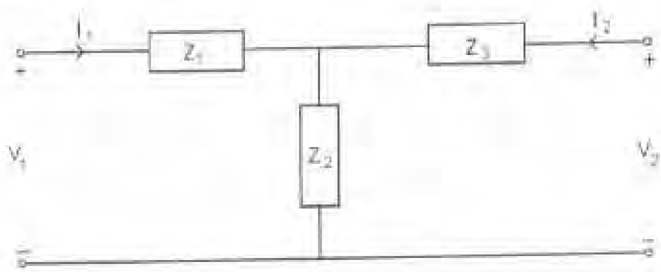
(C) The Z parameters of a 2 port network are, $Z_{11} = 20\ \Omega$, $Z_{22} = 30\ \Omega$, $Z_{12} = Z_{21} = 10\ \Omega$. Find Y parameters. 05

(D) Two two port networks are connected in parallel. Prove that the sum of the corresponding individual parameters is equal to the overall y parameters. 05

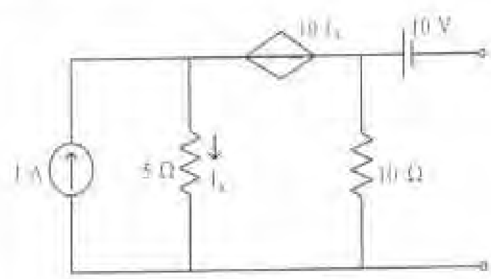
2 (A) The network of Fig. is under steady state with switch at position 1. At t = 0, switch is moved to position 2. Find i (t). **10**



(B) The Z-parameters of a two port are : Z_{11} = 20 Ω, Z_{12} = Z_{21} = 10 Ω, Z_{22} = 30 Ω. Find equivalent T-network. **10**



3 (A) Determine Thevenin's equivalent network for the Fig. shown. **10**



(B) The parameters of a transmission lines are R = 65Ω/km, L=1.6mH/km, G = 2.25 mmho/km, C=0.1μF/km. Find **10**

i) Characteristic Impedance

ii) Propagation Constant

iii) Attenuation Constant

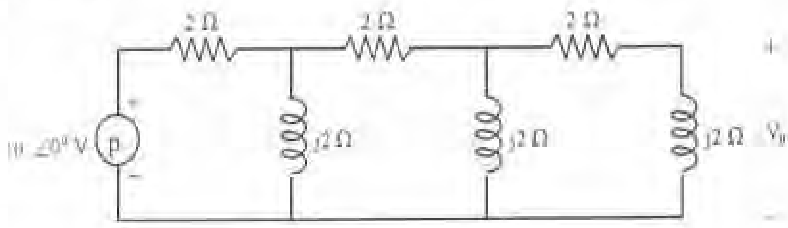
iv) Phase Constant at 1 kHz

4 (A) Determine whether following functions are positive real **10**

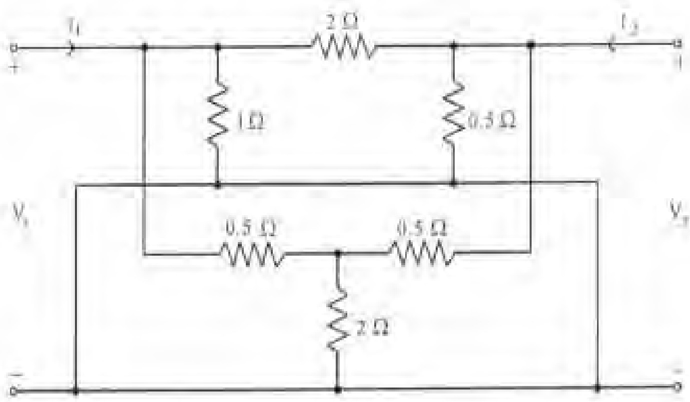
i) $\dfrac{s^4 + 2s^3 + 3s^2 + 1}{s^4 + s^3 + 3s^2 + 2s + 1}$

ii) $\dfrac{s^2 + 2s}{s^2 + 1}$

(B) In the network of Fig. find V_0. **10**



5 (A) Find Y-parameters for the network shown in Fig **10**

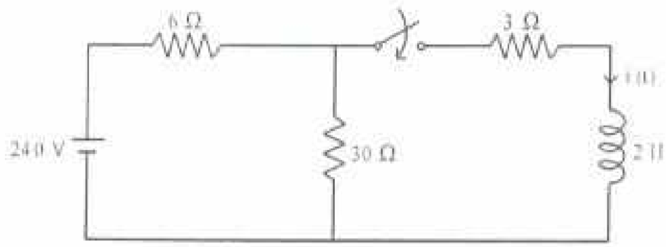


(B) Realize the following functions in Foster I and Foster II form **10**

$$F(s) = \frac{4(s+1)(s+3)}{(s+2)(s+6)}$$

6 (A) A transmission line has a characteristics impedance of 50 ohm and terminate in a load $Z_L = 25 + j50$ ohm. Use smith chart and Find VSWR and Reflection coefficient at the load. **10**

(B) The switch in Fig. is open for a long time and closes at t = 0. Determine i (t) for t > 0. **10**



****

85A55AA012BBCD63B826DE55CD870867

(29)

Paper / Subject Code: 49602 / APPLIED MATHEMATICS-III

14/5/16

Q.P. Code : 37077

(3 Hours) **[Total marks : 80**

Note :- 1) Question number **1** is **compulsory.**
2) Attempt any **three** questions from the remaining **five** questions.
3) **Figures** to the **right** indicate **full** marks.

Q.1 a) Find the Laplace transform of $sinh^5 t$. 05

b) Find an analytic function whose imaginary part is $e^{-x}(y\cos y - x\sin y)$. 05

c) Find the Fourier series for $f(x) = 1 - x^2$ in $(-1, 1)$. 05

d) Evaluate $\int_C \bar{F} \cdot d\bar{r}$ where $\bar{F} = 2x\, i + (xz - y)\, j + 2z\, k$ from $O(0,0,0)$ to $P(3,1,2)$ along the line OP. 05

Q.2 a) Find a cosine series of period 2π to represent $\sin x$ in $0 \le x \le \pi$. 06

b) Find a, b, c if $\bar{F} = (axy + bz^3)\, i + (3x^2 - cz)\, j + (3xz^2 - y)\, k$ is irrotational. 06

c) Find the image of the circle $|z| = k$ where k is real under the bilinear transformation $w = \frac{5-4z}{4z-3}$. 08

Q.3 a) Prove that $J_{\frac{1}{2}}(x) = \tan x \cdot J_{-\frac{1}{2}}(x)$. 06

b) Find the inverse Laplace transform of the following function by convolution theorem $\frac{(s+2)^2}{(s^2+4s+8)^2}$. 06

c) Obtain the complex form of Fourier series for $f(x) = e^{ax}$ in $(-l, l)$ where a is not an integer. 08

Q.4 a) Find the angle between the normals to the surface $xy = z^2$ at the points $(1,\ 4,\ 2)$ and $(-3,\ -3,\ 3)$. 06

b) Prove that 06
$x^2 J_n''(x) = (n^2 - n - x^2) J_n(x) + x J_{n+1}(x)$;
$n = 0, 1, 2, \ldots\ldots$

5E3DE25E6A27B8E7164E07E60585B10D

c)
(i) Find the Laplace transform of $\sinh at \sin at$. 04

(ii) Find the Laplace transform of $te^{-4t}\sin 3t$. 04

Q. 5 a) Prove that $J_2(x) = J''_0(x) - \frac{J_0'(x)}{x}$. 06

b) If $v = e^x \sin y$, show that v is harmonic and find the corresponding analytic function. 06

c) Find the Fourier series for $f(x)$ in $(0, 2\pi)$, 08

$$f(x) = \begin{cases} x, & 0 < x \le \pi \\ 2\pi - x, & \pi \le x < 2\pi \end{cases}$$

Hence, deduce that

$\frac{\pi^4}{96} = \frac{1}{1^4} + \frac{1}{3^4} + \frac{1}{5^4} + \ldots\ldots$

Q. 6 a) Show that the set of functions $\cos nx$, $n = 1, 2, 3, \ldots..$ is orthogonal on $(0, 2\pi)$. 06

b) Using Green's theorem evaluate $\int_C \bar{F} \cdot d\bar{r}$ where C is the curve enclosing the region bounded by $y^2 = 4ax, x = a$ in the plane $z = 0$ and 06

$$\bar{F} = (2x^2y + 3z^2)\, i + (x^2 + 4yz)\, j + (2y^2 + 6xz)\, k.$$

c) Use Laplace transform to solve 08

$\frac{d^2y}{dt^2} + 4\frac{dy}{dt} + 8y = 1$ with $y(0) = 0, y'(0) = 1$.

****

5E3DE25E6A27B8E7164E07E60585B10D