Reg. No.										

MANIPAL UNIVERSITY

THIRD SEMESTER B.S. (ENGG.) DEGREE EXAMINATION – DECEMBER 2015

SUBJECT: LINEAR NETWORKS: TRANSIENT ANALYSIS (EE 231)

(BRANCH: COMP./COMP.SC./E&C/E&E/BIOMED.)

Wednesday, December 16, 2015

Time: 10:00 – 13:00 Hrs. Max. Marks: 100

Answer any TEN full questions.

1A. Write the equation of the waveform shown in Fig Q1A in terms of step and ramp signals. Find and sketch its first derivative.

1B. Determine the value of K in the waveform shown in the Fig. Q1B, such that

i) $\int_{-\infty}^{+\infty} f(t)dt = 0$ ii) $\int_{0+}^{+\infty} f(t)dt = 0$

(6+4 = 10 marks)

2A. Resolve the waveform given in Fig. Q2A in to odd and even components.

2B. Second derivative of the function f(t) is

$f''(t) = \partial(t) - \partial(t-1) - \partial''(t-1) - \partial(t-2) + 2\partial(t-4) - \partial(t-6)$

Find and sketch function f(t) and its first derivative f'(t).

(5+5 = 10 marks)

3A. In the circuit shown in Fig.Q3A, switch K is changed from the position 1 to 2 at t=0. Find $i_L, \frac{di_L}{dt}$ and $\frac{di_L^2}{dt}$ at t=0+.

3B. In the network shown in Fig.Q3B, switch K is changed from position 1 to 2 at t=0. Find $v_c, \frac{dv_c}{dt}$ at t=0+.

(5+5 = 10 marks)

4. In the network shown in Fig.Q4, the switch K is closed at t=0. Find $v_1, v_2, \frac{dv_1}{dt}$ and $\frac{dv_2}{dt}$ at t=0+. Assume the initial voltage across the capacittor is zero.

(10 marks)

5A. Find the Laplace transform of the periodic signal shown in Fig. Q5A.

5B. Find the Laplace transform of the non-periodic waveform shown in Fig.Q5B.

(6+4 = 10 marks)

6. Determine the value of i(t) for t>0 in the network shown in Fig.Q6. Assume the network was in steady state with the switch K at position 1. At t=0 the switch K is transferred to position 2.

(10 marks)

7. A series RC circuit with R=10Ω and C=0.1μF is excited by the following voltage signals. Obtain the current response in each case.

7A. $v(t)=8u(t-1)$

7B. $v(t)=3r(t)$

7C. $v(t)=7\partial(t-1)$

(10 marks)

8. In the network shown in the Fig.Q8, switch K_1 is opened and K_2 is closed at t=0. At t=1.01s the switch K_1 is closed and K_2 is opened. Find the expression for the voltage across the capacitor for t>1.01s.

(10 marks)

9. Determine the expression for v(t) in the network shown in Fig.Q9 using convolution integral technique.

(10 marks)

10. Find the initial and final values of the following function using initial and final value theorem. If not applicable give reason.

(i) $F(S)=\frac{s^2+3s+2}{s^3+3s^2+3s+1}$ (ii) $F(S)=\frac{s^2+7s+12}{s(s+5+\frac{6}{s})}$

(iii) $F(S)=\frac{s^2+5s+6}{3s^3+5s^2+3s+6}$ (iv) $F(S)=\frac{3s^2+4s}{3s^3+2s+5}$

(10 marks)

11. Draw the pole zero diagram of the function $F(S)=\frac{S^2+2S}{(S+1)(S^2+4)}$, hence find residues at all poles and f(t).

(10 marks)

12. The driving point impedance function of the network shown in the Fig.Q12 has zero at s=-4 and poles at s=-2±j2. Find the values of R,L,C if Z(S)=2 for S=0.

(10 marks)

13. Determine the current i(t) in the network shown in Fig.Q13 and sketch the output current for the input voltage shown.

(10 marks)

14A. Draw the transformed circuit of the circuit shown in Fig.Q14A for t≥0 and find I(S). Assume zero initial condition.

14B. Find the driving point impedance of the network shown in Fig.Q14B.

(6+4 = 10 marks)

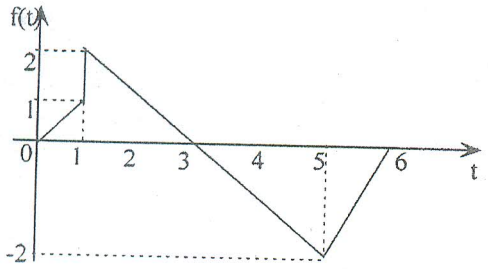


Fig Q1A

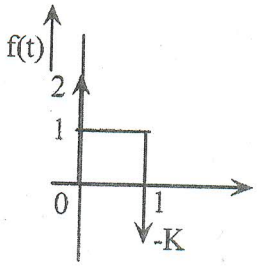


Fig.Q1B

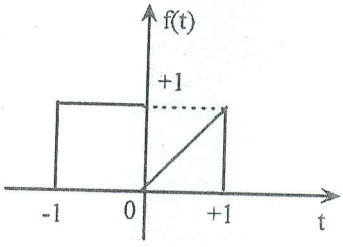


Fig.Q2A

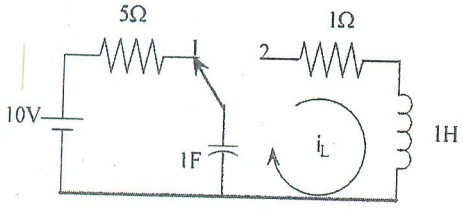


Fig.Q3A

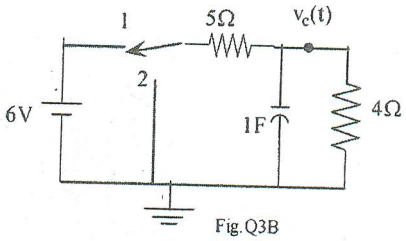


Fig.Q3B

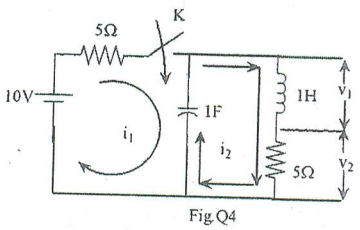


Fig.Q4

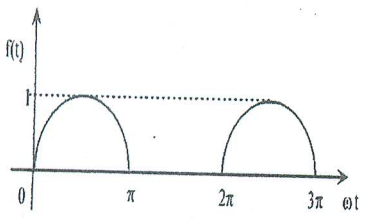


Fig.Q5A

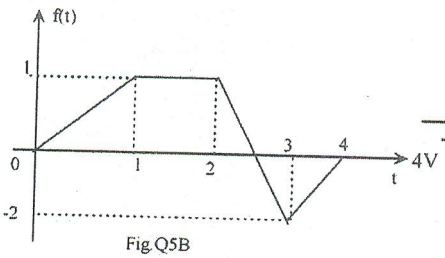


Fig.Q5B

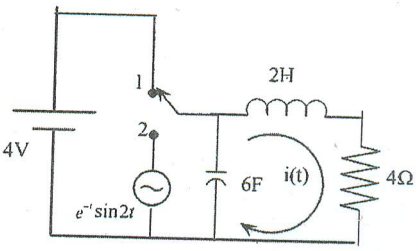


Fig.Q6

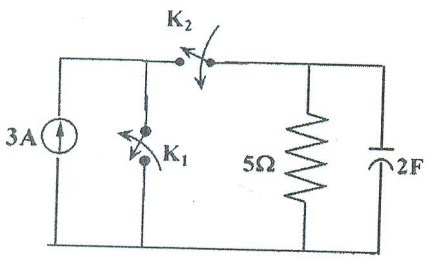


Fig .Q8

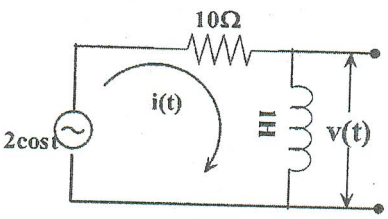


Fig.Q9

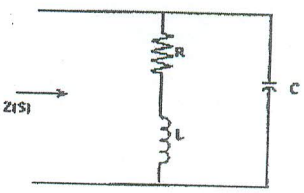
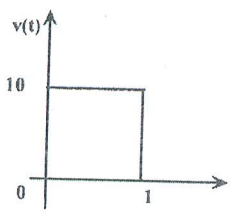


Fig.Q12



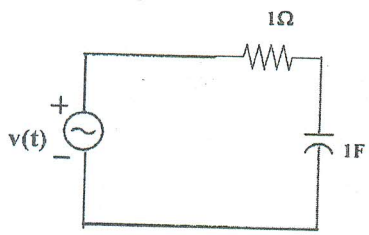


Fig.Q13

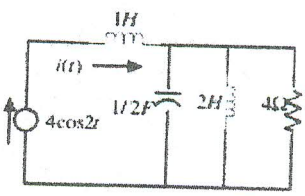


Fig.Q14A

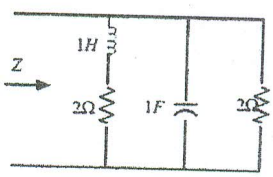


Fig.Q14B