

# ASSIGNMENT 5

EE24BTECH11011 - PRANAY

14) A function  $y(t)$ , such that  $y(0) = 1$  and  $y(1) = 3e^{-1}$ , is a solution of the differential equation  $\frac{d^2y}{dx^2} + 2\frac{dy}{dx} + y = 0$ . Then  $y(2)$  is

- a)  $5e^{-1}$                       b)  $5e^{-2}$                       c)  $7e^{-1}$                       d)  $7e^{-2}$

15) The value of the integral

$$\oint_c \frac{2z + c}{\left(z - \frac{1}{z}\right) + (z^2 - 4z + 5)} dz \quad (1)$$

over the contour  $|z| = 1$ , taken in anticlockwise direction, would be

- a)  $\frac{24\pi i}{13}$                       b)  $\frac{48\pi i}{13}$                       c)  $\frac{24}{13}$                       d)  $\frac{12}{13}$

16) The transfer function of a system is  $\frac{Y(s)}{R(s)} = \frac{s}{s+2}$ . Then the steady state output  $y(t)$  is  $A \cos(2t + \varphi)$  for the input  $\cos(2t)$ . Then the values of  $A$  and  $\varphi$ , respectively are

- a)  $\frac{1}{\sqrt{2}}, -45^\circ$                       b)  $\frac{1}{\sqrt{2}}, +45^\circ$                       c)  $\sqrt{2}, +45^\circ$                       d)  $\sqrt{2}, -45^\circ$

17) The phase cross-over frequency of the transfer function  $G(s) = \frac{100}{(s+1)^3}$  in rad/s is

- a)  $\sqrt{3}$                       b)  $\frac{1}{\sqrt{3}}$                       c) 3                      d)  $3\sqrt{3}$

18) Consider a continuous-time system with input  $x(t)$  and output  $y(t)$  given by

$$y(t) = x(t) \cos t \quad (2)$$

This system is

- a) linear and time-invariant  
b) non-linear and time-invariant  
c) linear and time-varying  
d) non-linear and time-varying

19) The value of  $\int_{-\infty}^{+\infty} e^{-t} \delta(2t - 2) dt$ , where  $\delta(t)$  is the Dirac delta function, is

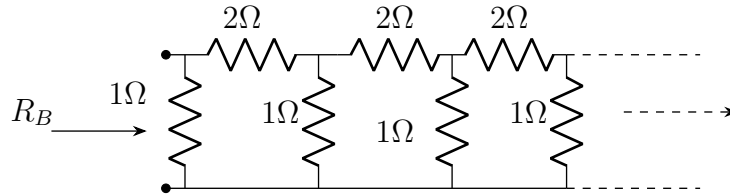
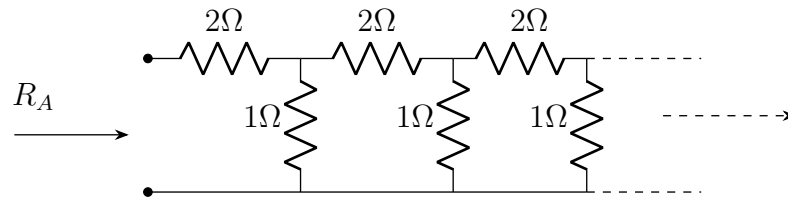
- a)  $\frac{1}{2e}$                       b)  $\frac{2}{e}$                       c)  $\frac{1}{e^2}$                       d)  $\frac{1}{2e^2}$

20) A temperature in the range of  $-40^\circ\text{C}$  to  $55^\circ\text{C}$  is to be measured with a resistance of  $0.1^\circ\text{C}$ . The minimum number of ADC bits required to get a matching dynamic range of the temperature sensor is

- a) 8                      b) 10                      c) 12                      d) 14

21) Consider the following unit which uses 2-to-1 multiplier as shown in the figure. The boolean expression for output  $F$  in terms of  $A$  and  $B$  is





a)  $R_A = R_B$

b)  $R_A = R_B = 0$

c)  $R_A < R_B$

d)  $R_B = \frac{R_A}{1+R_A}$

26) In a constant  $\frac{V}{f}$  induction motor drive, the slip at maximum torque

- a) is directly proportional to the synchronous speed
- b) remains constant with respect to the synchronous speed
- c) has an inverse relation with the synchronous speed
- d) has no relation with the synchronous speed