ACE Engineering Academy

Head Office : Sree Sindhi Guru Sangat Sabha Association, # 4-1-1236/1/A, King Koti, Abids, Hyderabad – 500001.

Ph: 040-23234418, 040-23234419, 040-23234420, 040 - 24750437

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ESE- 2020 (Prelims) - Offline Test Series Test - 19

ELECTRICAL ENGINEERING

SUBJECT: ELECTRICAL & ELECTRONIC MEASUREMENTS + COMPUTER FUNDAMENTALS + ENGINEERING MATHEMATICS

01. Ans: (d)

For standard coil with impedance $Z_s = R_s + j\omega_1 L_s$, Q meter resonates with a capacitor of capacitance C_1 and corresponding Q factor is Q_1.

$$\Rightarrow Q_1 = \frac{1}{\omega_1 C_1 R_s}$$

$$\Rightarrow R_s = \frac{1}{2\pi f_1 C_1 Q_1} \text{ --------- (1)}$$

When an unknown impedance of $Z_x = R_x + j\omega_1 L_x$ is connected in series with standard coil then resonant capacitance C_2 and corresponding Q factor is Q_2

$$\Rightarrow Q_2 = \frac{1}{\omega_1 C_2 (R_s + R_x)}$$

$$\Rightarrow R_s + R_x = \frac{1}{2\pi f_1 C_2 Q_2}$$

$$R_x = \frac{1}{2\pi f_1 C_2 Q_2} - R_s$$

$$= \frac{1}{2\pi f_1 C_2 Q_2} - \frac{1}{2\pi f_1 C_1 Q_1} \quad \text{[From (1)]}$$

$$R_x = \frac{1}{2\pi f_1}\left[\frac{1}{C_2 Q_2} - \frac{1}{C_1 Q_1}\right]$$

02. Ans: (d)

Sol: Given time period T = 10ms

Count (C) = 025 = 25

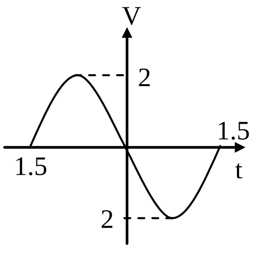
$$\therefore \text{Frequency (f)} = \frac{C}{T}$$

$$= \frac{25}{10 \times 10^{-3}}$$

= 2500 Hz

03. Ans: (c)

Sol:



$$\frac{\text{time}}{\text{disvision}} = 10\mu s$$

$$\frac{\text{volt}}{\text{division}} = 100 \text{ mV}$$

Here the wave repeats for every 3 divisions.

Time period T = 10 μs × 3 = 30 μs.

$$\text{Frequency} = \quad 1/T = \frac{1}{30\times10^{-6}} = 33.33\text{kHz}$$

and

Number of division for peak to peak is 4.

$$\therefore \text{Peak to peak voltage} = 4\times\frac{\text{voltage}}{\text{division}}$$

$$= 4 \times 100 = 400\text{mV}$$

04. Ans: (b)

Sol: A multimeter can measure voltage, current and resistance

05. Ans: (b)

Sol: During the retrace time or flyback time, the beam returns quickly to the left side of the screen.

06. Ans: (b)

Sol: Given $R_1 = R_2 = 100\pm1\%\Omega$

$\Rightarrow \sigma_{x1} = \sigma_{x2} = 1\Omega$

For parallel combination

$$R = \frac{R_1R_2}{R_1+R_2}$$

$$\frac{\partial R}{\partial R_1} = \frac{R_2^2}{(R_1+R_2)^2} = \frac{(100)^2}{(100+100)^2} = \frac{1}{4}$$

$$\frac{\partial R}{\partial R_2} = \frac{R_1^2}{(R_1+R_2)^2} = \frac{100^2}{(100+100)^2} = \frac{1}{4}$$

$$\sigma_R = \sqrt{\left(\frac{\partial R}{\partial R_1}\right)^2 \sigma_{R_1}^2 + \left(\frac{\partial R}{\partial R_2}\right)^2 \sigma_{R_2}^2}$$

$$= \sqrt{\left(\frac{1}{4}\right)^2 (1)^2 + \left(\frac{1}{4}\right)^2 (1)^2} = \frac{1}{2\sqrt{2}}\Omega$$

$$R = \frac{100\times 100}{100+100} = 50\Omega$$

$$\therefore \%\sigma_R = \frac{\sigma_R}{R}\times 100$$

$$= \frac{\frac{1}{2\sqrt{2}}}{50}\times 100$$

$$= \frac{1}{100\sqrt{2}}\times 100$$

$$\%\sigma_R = \frac{1}{\sqrt{2}}$$

07. Ans: (d)

Sol: Application of measurement systems

1. Control of processes & operations
2. Experimental Engineering analysis.
3. Monitoring of processes and operations

08. Ans: (d)

Sol: For converting galvanometer into ammeter, we put a low value of resistance in parallel with the galvanometer.

09. Ans: (d)

Sol: Given i = 5 +10sin (100πt) + 20sin (200πt) is flowing through PMMC and M.I instrument.

PMMC reads average value = 5A

M.I reads rms value

$$= \sqrt{(5)^2 + \left(\frac{10}{\sqrt{2}}\right)^2 + \left(\frac{20}{\sqrt{2}}\right)^2}$$

$$= \sqrt{25+50+200} = 16.58 \text{ Amp}$$

Ratio of M.I to PMMC reading

$$= \frac{16.58}{5} = 3.31$$

10. Ans: (d)

Sol: CC current settings: 15A, 30A

PC voltage settings : 300V, 600V

Full scale reading = 4500 Watts

When the meter is connected for 30A, 600V

VA rating = 30 × 600 = 18,000

Which is 4 times the full scale watt meter reading

Therefore, Multiplying factor = 4

Actual power = 4 × Wattmeter reading

= 4 × 2000 = 8000 watts

11. Ans: (d)

Sol: First 6 hrs energy consumption is

$E_1 = VI\cos\theta \times t$

$= 250 \times 10 \times 1 \times 6$

$= 15$ kWh

for next 10 hours

$E_2 = VI\cos\theta \times t$

$= 250 \times 10 \times 0.8 \times 10 \times 0.5$

$= 20$ kWh $\times 0.5 = 10$ kWh

For last 8 hours

$E_3 = VI\cos\theta \times t$

$= 250 \times 7.5 \times 0.6 \times 8 = 9$ kWh

$\therefore E = E_1 + E_2 + E_3$

$= 15 + 10 + 9 = 34$ kWh

$\therefore$ Number of revolutions = meter constant × total energy

= 34 kWh × 1600 revolutions/kWh

= 54,400 revolutions

12. Ans: (b)

Sol: The given bridge is Desauty's bridge

Given $R_3 = 40\ \Omega$, $R_4 = 80\ \Omega$, $C_2 = 20\ \mu F$

$\therefore$ Unknown capacitance $C_x = \dfrac{R_4}{R_3} \times C_2$

$$= \frac{80}{40} \times 20 = 40\ \mu\text{F}.$$

13. Ans: (b)

Sol: For normal frequency of supply, the voltage drop across non inductive resistor and across inductor are equal. So needle takes up a position to 45° to show pointer reading as normal.

14. Ans: (d)

Sol: (i) Controlling torque is not required in both $1-\phi$ and $3-\phi$ electrodynamometer type power factor meters

(ii) Frequency changes will cause errors in $1-\phi$ pf meter but not in $3-\phi$ pf meters

15. Ans: (b)

Sol: load current $I_1 = 50$ A (primary current)

Wattmeter CC current $I_2 = 5$ A (secondary current)

$$\text{CT ratio} = \frac{I_1}{I_2} = \frac{50}{5} = \frac{10}{1}$$

16. Ans: (c)

Sol: $\theta = \dfrac{180}{\pi} \times \dfrac{I_m}{nI_s}$

$$= \frac{180}{\pi} \times \frac{80}{200 \times 5}$$

$= 4.58°$

17. Ans: (d)

Sol: In the measurement of strain by wheat stone bridge, the maximum sensitivity is obtained by a combination of four active strain gauges.

18. Ans: (b)

Sol: Acceleration (a) $= \dfrac{Kx}{M}$

$K = 3\times10^{3}$ N/m

M = 0.05 kg

x = ± 1mm

$$a = \frac{3\times10^{3}\times1\times10^{-3}}{0.05}$$

$= 60\ m/s^{2}$

19. Ans: (c)

Sol: Hall effect converts magnetic energy to electric energy.Hall effect pick-up can be used for the measurement of magnetic flux.

20. Ans: (a)

Sol: The coefficient of discharge (d) of orifice opening. The Cd value of orifice meter is much smaller than Cd value of a venturi-meter. The orifice normal value of Cd is 0.6 and the % loss of work out at 65% of the differential pressure.

21. Ans: (b)

Sol: For the Piezo electric transducer,

No load output voltage, E_0 = 3V

Crystal capacitance, C_P = 250 pF

Load capacitance, C_L = 125 pF

At high frequencies, the voltage across the load is $E_L \approx E_0 \dfrac{C_P}{C_P + C_L}$

$$\Rightarrow E_L = 3\times\frac{250}{375} = 2V$$

22. Ans: (b)

Sol: Recursive functions are elegant and cleaner and all algorithms which uses recursive functions are easier to visualize.

Recursive functions make the program execution slow due to stack overlapping.

Recursive implicitly evaluates all stack operations.

23. Ans: (b)

24. Ans: (c)

Sol: We cannot copy anything using strcpy function to the character pointer pointing to NULL.

25. Ans: (a)

Sol: If two or more processes are sharing resources then it should be mandatory that only one process should access the resource at a time, this condition is called as mutual exclusion.

26. Ans: (c)

Sol: By Definition all statements in their content are TRUE.

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27. Ans: (d)

Sol: All four are benefits of using multithreading.

28. Ans: (a)

Sol: Number of pages $= \dfrac{2^{32}\text{ B}}{64\text{KB}} = 2^{16}$

Size of page table = Number of pages * 1 entry size

$= 2^{16} * 4\text{B}$

$= 2^{18}\text{ B}$

Number of pages required

$$= \frac{2^{18}\text{B}}{\text{page size}} = \frac{2^{18}\text{B}}{2^{16}\text{B}} = 2^2$$

But because, all the entries cannot be stored in single page, hence 2-level paging will be required. So, 1 extra page is required to store the external page table.

Hence total 4 + 1 = 5 pages are needed.

29. Ans: (c)

Sol: ARP: Address Resolution Protocol, it maps logical address (IP address) into physical address (MAC address)

30. Ans: (c)

Sol: MAC address (48 bits) = 6 bytes

31. Ans: (c)

Sol:

- Number of processes in memory is known as degree of multiprogramming
- Interrupts are not allowed in non-preemptive multiprogramming because once a process is given to run of CPU, process can leave CPU by its own wish (either completed or going for I/O).

32. Ans: (d)

Sol: In paging $\Rightarrow$ Page table

In segmentation $\Rightarrow$ Segment table

For particular implementation either of these two is used.

33. Ans: (d)

Sol: In direct mapping at each index only one block is stored in cache. Hence if new block comes in cache then existing block should be replaced from that index. Hence no any choice of selecting one victim among multiple which mean no any replacement policy is required.

34. Ans: (d)

Sol: All statements are false.

35. Ans: (a)

Sol: Option (b) is true only for liner pipelines

Option (c) is true only for synchronized pipeline with no hazard.

36. Ans: (a)

Sol:

- O.S. stops executing a process (i.e. process crashes) when exception is caught such as divide by zero exception & null pointer exception
- Stack & Heap overflow are not considered as crashing errors

37. Ans: (b)

Sol: In linked allocation, there is no accommodation of the principle of locality.

38. Ans: (d)

Sol: I. Differential Manchester encoding has a transition at the middle of each bit.

II. Ethernet frame include CRC.

III. ARP request is normally broadcast & ARP reply is normally unicast.

39. Ans: (a)

Sol: Reading the clock of system is done in user mode and accessing the I/O devices needs privileged instruction.

40. Ans: (a)

Sol: The blocks / chunks of same size of logical memory are called as pages

The blocks / chunks of same size of physical memory are called as frames

Page Table contains the base address of the frame location for each page in the process

Page offset is combined with the base address to define the physical memory address.

41. Ans: (a)

Sol: EAT = H(T + M) + (1 – H) (T + 2M)

=0.8 (20 + 100) + (0.2) (20 + 200)

$$= \frac{8}{10} \times 120 + \frac{2}{10} \times 220$$

= 96 + 44

= 140 ns

42. Ans: (d)

Sol: 3F000000

$$\underbrace{0}_{\text{Sign}}\ \underbrace{01111110}_{\text{Exponent}}\ \underbrace{0........00}_{\text{Mantissa}} \Rightarrow +(1.0)\times 2^{(126-127)}$$
$$\Rightarrow +0.5$$

BF800000

$$\underbrace{1}_{\text{Sign}}\ \underbrace{01111111}_{\text{Exponent}}\ \underbrace{000..00}_{\text{Mantissa}} \Rightarrow -(1.0)\times 2^{(127-127)}$$
$$\Rightarrow -1.0$$

(+0.5) – (–1.0) = 0.5 + 1.0 = 1.5

43. Ans: (c)

Sol: By using definition, a real square matrix A is said to be skew -symmetric matrix if

$A^T = -A$ (or) $a_{ij} = -a_{ji}\ \forall\ ij$

44. Ans: (a)

Sol: If we interchange any two rows (or columns), then the value of the determinant will be multiplied by –1.

45. Ans: (b)

Sol: Determinant of a matrix = product of its eigen values.

$\therefore$ Determinant is negative $\Rightarrow$ there exists atleast one eigen value, which is negative.

46. Ans: (b)

Sol: From the previous problem, we have

$\rho(A) = 4$, $\rho(A \mid b) = 4$ and

$n = 4$ = number of variables.

But $\rho(A) = \rho(A \mid b) = 4 = n$

$\therefore$ x is unique.

47. Ans: (b)

Sol: $f(x) = 1-x^2$ defined in $(-1,1)$

$f(x)$ is even function defined on $(-1,1)$

$\therefore$ The fourier series of $f(x)$ contain only cosine terms.

48. Ans: (c)

Sol: $f(x) = c$ in $[0,\pi]$

The coefficient of $\sin(\pi x)$ in half range Fourier sine series is b_n where

$$b_n = \frac{2}{\ell}\int_0^{\ell} f(x)\sin\left(\frac{n\pi x}{\ell}\right)dx$$

$$b_n = \frac{2}{\pi}\int_0^{\pi} c\sin(nx)dx$$

$$b_2 = \frac{2}{\pi}\int_0^{\pi} c\sin(2x)dx$$

$$= \frac{2c}{\pi}\left\{\frac{-\cos(2x)}{2}\right\}_0^{\pi}$$

$$= 0$$

49. Ans: (d)

Sol: 1. Even periodic function:

sin terms which are odd are absent. Only constant and cos terms are present.

2. Odd periodic function:

D.C. term and cos terms are absent. Only Sine terms which are odd are present.

3. Half-wave symmetric function:

Contains only odd harmonics of sines or cosines or both depending upon the other symmetry present: odd or even or neither.

50. Ans: (c)

Sol: $$\frac{dy}{dx} = e^{x+y} + x^2 e^{x^3+y}$$

$$\frac{dy}{dx} = e^y\left[e^x + x^2 e^{x^3}\right]$$

$$\int \frac{1}{e^y}dy = \int\left(e^x + x^2 e^{x^3}\right)dx$$

$$-e^{-y} = e^x + \int x^2 e^{x^3}dx + c$$

Let $x^3 = t \Rightarrow 3x^2\,dx = dt$

$$\Rightarrow x^2 dx = \frac{dt}{3}$$

$$-e^{-y} = e^{x} + \int e^{t}\frac{dt}{3} + c$$

$$-e^{-y} = e^{x} + \frac{1}{3}e^{t} + c$$

$$e^{x} + e^{-y} + \frac{e^{x^3}}{3} + c = 0$$

51. Ans: (a)

Sol: $$\frac{\partial u}{\partial r} = \frac{\partial u}{\partial x}.\frac{du}{dr} + \frac{\partial u}{\partial y}.\frac{du}{dr}$$

$$= (2x)(1) + (2y).2$$

$$\left.\frac{\partial u}{\partial r}\right|_{(2,2)} = 2(2) + 4(2) = 12$$

52. Ans: (b)

Sol: Squaring on both sides of the given equation

$$\left(\frac{d^3y}{dx^3}\right)^8 = \left(\frac{d^2y}{dx^2} + \frac{dy}{dx}\right)^3$$

Which is free from reduces hence order and degree are 3, 8 respectively.

53. Ans: (d)

Sol: $\frac{dy}{dx} - \frac{y}{x+1} = e^{3x}(x+1)$ is in standard form of linear equation.

$$\text{I.F} = e^{\int \frac{-1}{x+1}dx} = e^{-\log(x+1)}$$

$$\text{I.F} = \frac{1}{x+1}$$

54. Ans: (b)

Sol: $\lambda = 1.5$

$P(x > 2) = 1 - P(x \le 2)$

$= 1 - [P(x = 0) + P(x = 1) + P(x = 2)]$

$= 3.625\ e^{-1.5}$

55. Ans: (b)

Sol: $P(♠ \text{ or } Q) = P(♠) + P(Q) - P(♠ \cap Q)$

$$= \frac{13}{52} + \frac{4}{52} - \frac{1}{52}$$

$$= \frac{4}{13}$$

56. Ans: (a)

Sol: Total cases = ${}^{15}C_3$

Favorable cases for no defective light bulbs = ${}^{10}C_3$

P(atleast one bulb defective)

= 1 – P(no defective bulb)

$$= 1 - \frac{{}^{10}C_3}{{}^{15}C_3}$$

$$= \frac{67}{91}$$

57. Ans: (c)

Sol: $\lambda = 3$ (Mean)

$P(|X - 3| < 1) = P(2 < X < 4) = P(X = 3)$

$$= \frac{\lambda^3 e^{-\lambda}}{3!} = \frac{3^3 e^{-3}}{6}$$

[$\because$ X is a Poisson variate]

$$= \frac{9}{2}e^{-3}$$

58. Ans: (c)

Sol: $x_{n+1} = \dfrac{4x_n^5 + R}{5x_n^4}$

Put $x_{n+1} = x_n = x$

$\Rightarrow x = \dfrac{4x^5 + R}{5x^4}$

$\Rightarrow 5x^5 = 4x^5 + R \Rightarrow x^5 = R$

$\Rightarrow x = (R)^{1/5}$

59. Ans: (b)

Sol: $f(x) = x^3 - 3x - 5$

$f(x_0) = f(2) = 2^3 - 3(2) - 5 = -3 < 0$

$f(x_1) = f(3) = 3^3 - 3(3) - 5 = 13 > 0$

$\therefore$ A root lies between 2 and 3

$x_2 = \dfrac{f_1x_0 - f_0x_1}{f_1 - f_0}$

$= \dfrac{13\times 2 - (-3)(3)}{13 - (-3)}$

$= \dfrac{26+9}{16} = 2.1875$

60. Ans: (a)

Sol: Newton-Raphson method has quadratic convergence method of false position (or) regula falsi method has linear rate of convergence.

In secent method of finding the solution of $f(x) = 0$ in the interval $[a, b]$, $f(a)$ and $f(b)$ need not to have opposite signs. So it need not convergence to the required solution. It is called unreliable method.

61. Ans: (d)

Sol: All the other methods, we need two initial values near the root.

62. Ans: (c)

Sol: Given $f(x) = \sin|x|$

$\Rightarrow \dfrac{df}{dx} = \cos|x| . \dfrac{|x|}{x}$

$\therefore$ At $x = -\dfrac{\pi}{4}, \dfrac{df}{dx} = \cos\left|\dfrac{-\pi}{4}\right|(-1) = -\dfrac{1}{\sqrt{2}}$

63. Ans: (a)

Sol: Given $f(x) = x^{\frac{-1}{3}} = \dfrac{1}{x^{\frac{1}{3}}}$

$\Rightarrow$ f(x) is not defined at x = 0

$\Rightarrow$ f(x) is not continuous at x = 0

$\therefore$ f(x) is not continuous in [–1, 1].

Here given function f(x) is infinite or not finite in [–1, 1] and f(x) is not continuous in [–1, 1].

$\therefore$ f(x) is not bounded in [–1, 1]

Now, $A = \int_{-1}^{1} x^{\frac{-1}{3}} dx$

$= \int_{-1}^{0} x^{\frac{-1}{3}} dx + \int_{0}^{1} x^{\frac{-1}{3}} dx$

$= \left(\dfrac{x^{\frac{2}{3}}}{\frac{2}{3}}\right)_{-1}^{0} + \left(\dfrac{x^{\frac{2}{3}}}{\frac{2}{3}}\right)_{0}^{1}$

$= \dfrac{3}{2}(0-1) + \dfrac{3}{2}(1-0) = 0$

$\therefore$ A is zero and finite.

64. Ans: (a)

Sol: div $\bar{P}$ = $3x^2y - 2x^2y - x^2y = 0$

So, $\bar{P}$ is solenoidal vector

$$\text{curl}\,\bar{P} = \begin{vmatrix} \bar{i} & \bar{j} & \bar{k} \\ \frac{\partial}{\partial x} & \frac{\partial}{\partial y} & \frac{\partial}{\partial z} \\ x^3y & -x^2y^2 & -x^2yz \end{vmatrix}$$

$$= \bar{i}\left(-x^2z - 0\right) - \bar{j}\left(-2xyz - 0\right) + \bar{k}\left(-2xy^2 - x^3\right)$$

curl $\bar{P} \neq \bar{0}$

So, $\bar{P}$ is NOT irrotational vector

65. Ans: (b)

Sol: Given that f(z) = g(z) + h(z)

If g(z) and h(z) are differentiable at z_o then their sum f(z) is also differentiable at z_o.

(Property of functions of complex variables)

$\therefore$ Option (b) is a correct statement.

66. Ans: (b)

Sol: Let $I = \int_C f(z)\,dz = \int_C \frac{z^2}{z^4 - 1}\,dz$, where C is a circle |z + 1| = 1.

Then the function f(z) has singular points at $z = \pm 1$ & $z = \pm i$.

Only z = –1 lies inside the circle |z+1| = 1.

By Cauchy's Integral Formula and Cauchy's Integral Theorem, we have

$$I = \int \frac{z^2}{\left(z^2 - 1\right)(z^2 + 1)}\,dz$$

$$\Rightarrow I = \frac{1}{2}\int\left(\frac{1}{(z^2-1)} + \frac{1}{(z^2+1)}\right)dz$$

$$\Rightarrow I = \frac{1}{2}\oint_C \frac{1}{z^2-1}\,dz + \frac{1}{2}\oint_C \frac{1}{z^2+1}\,dz$$

$$\Rightarrow I = \frac{1}{2}\oint_C \frac{1}{(z-1)(z+1)}\,dz + \frac{1}{2}\oint_C \frac{1}{(z+i)(z-i)}\,dz$$

$$\Rightarrow I = \frac{1}{2}\,2\pi i\left[\frac{1}{z-1}\right]_{Z=-1} + \frac{1}{2}\,2\pi i\ (0)$$

$$\Rightarrow \therefore I = -\frac{\pi i}{2}$$

67. Ans: (a)

Sol: Let $I = \int_{-\infty}^{\infty} \frac{\sin(x)}{x^2 + 2x + 2}\,dx$

and $f(z) = \frac{I_m\left(e^{iz}\right)}{z^2 + 2z + 2}$

Then poles of f(z) are given by $z^2 + 2z + 2 = 0$

$\therefore z = -1 \pm i$

$R_1 = \text{Res}(f(z): z = -1 + i)$

$$= \underset{z\to -1+i}{\text{Lt}}\left[z-(-1+i)\right]\frac{e^{iz}}{\left[z-(-1+i)\right]\left[z-(-1-i)\right]}$$

$$= \frac{e^{i(-1+i)}}{-1+i+1+i} = \frac{e^{-i-1}}{2i}$$

$\Rightarrow$ z = –1 – i does not lie in the upper half plane.

$$\int_c f(z)dz = \int_c \frac{I_m\left(e^{iz}\right)}{z^2 + 2z + 2}\,dz$$

$$= I_m\left[2\pi i(R_1)\right] = I_m\left[2\pi i\left(\frac{e^{-i-1}}{2i}\right)\right]$$

$$= I_m\left[\pi e^{-1}\left(\cos(1) - i\sin(1)\right)\right]$$

$$= -\frac{\pi\sin(1)}{e}$$

68. Ans: (a)

Sol: Associative memories are content addressable memories, in those searching is performed with content not with addresses. The content matching in each cell is performed parallely with the help of the matching logic in each cell.

69. Ans: (b)

Sol: Statement(I) and Statement(II) both are true but Statement(II) is not the correct reason for Statement(I) because increasing the number of page frames allocated to a process sometimes increases the page fault rate is "Belady's anamoly" and it is not related with locality of reference.

70. Ans: (a)

71. Ans: (d)

Sol: For recursive function calls, a stack is required. Since the variables are declared at each function call and the instants of all the local variables at each function call are needed to be stored. For this, a stack data structure is used.

72. Ans: (a)

Sol: Dual scope A/D converter is most preferred A/D conversion approach in digital multimeters since it provides highest accuracy and also highest noise rejection.

73. Ans: (a)

Sol: Shunts used with measuring instruments should have the following properties:

(i) The resistance temperature coefficient of shunt should be low and as nearly as possible to that of the instrument.

(ii) Resistance of shunts should be time invariant

(iii)They should have low thermal emfs with copper.

(iv)They should carry current without excessive temperature rise.

Manganin has a low temperature coefficient of resistance which is 40×10^{-6} 1°C. Hence it is a preferred shunt material in DC instruments.

Constantan's thermal emf with copper, even though high, is unidirectional and hence it is used as a shunt in AC instruments.

74. Ans: (d)

Sol: Air cored electrodynamometer type instruments are protected against external magnetic fields by enclosing them in a casing of high permeability alloy.

75. Ans: (c)

Sol: Both are not related statement (II) is wrong