



SRI JAGADGURU MURUGHARAJENDRA UNIVERSITY

(Established under SJM University Act 2020)

Part – A

Subject Specific (Engineering Discipline)

Civil Engineering

Model Question Paper - 50 Marks

1. Reynolds number is the ratio of
 - a) Inertia force to viscous force
 - b) Kinematic viscosity to Dynamic Viscosity
 - c) Inertia force to gravity force
 - d) Inertia force to force due to compressibility
2. Lime stone is a
 - a) Igneous rock
 - b) Metamorphic rock
 - c) Sedimentary rock
 - d) granite rock
3. Period of cleaning slow sand filter
 - a) 24-48 hours
 - b) 10-12 days
 - c) 2- 3 months
 - d) 1-2 Years
4. Maximum total settlement for foundations on clayey soils should be limited to
 - a) 25mm
 - b) 40mm
 - c) 65mm
 - d) 100mm
5. The correct relation between theoretical oxygen demand (TOD) , Biological oxygen demand (BOD) and Chemical oxygen demand (COD)
 - a) $TOD > BOD > COD$
 - b) $TOD > COD > BOD$
 - c) $COD > BOD > TOD$
 - d) $BOD < COD > TOD$
6. A Francis turbine is
 - a) Inward flow reaction turbine
 - b) Inward flow impulse turbine
 - c) Outward flow reaction turbine
 - d) Outward flow impulse turbine
7. Ratio of cement sand mortar preferred in load bearing wall is
 - a) 1:2
 - b) 1:6
 - c) 1:8
 - d) 1:12

8. In Chlorination, with rise in temperature of water, death rate of bacteria
- Increases
 - Decreases
 - Remains unaffected
 - None of the above
9. CPM Network is
- Slack oriented
 - Event oriented
 - Activity oriented
 - work oriented
10. The young's modulus of concrete is
- $1000 f_{ck}$
 - $5000 \sqrt{f_{ck}}$
 - $5700 \sqrt{f_{ck}}$
 - $1000 \sqrt{f_{ck}}$
11. Angle of contact between mercury and glass tube in case of capillary depression is
- 0°
 - 10°
 - 90°
 - 128°
12. Standard EDTA (Ethyelne diamine tetra acetic acid) solution is used to determine
- Hardness in water
 - Turbidity in water
 - Dissolved oxygen in water
 - Residual chlorine in water
13. Poisson's ratio of concrete increases with
- Increases with richer mix
 - decreases with richer mix
 - Remains constant
 - increases with leaner mix
14. Cross staff is an instrument used for
- Measuring approximate horizontal angles
 - setting out right angles
 - Measuring bearings of the lines
 - none of the above
15. High yield deformed bars have a
- Definite yield value
 - Percentage elongation less than that of mild steel
 - Percentage elongation more than that of mild steel
 - None of the above
16. Minimum number of equilibrium equation to be consider for a space structure is
- 3
 - 6
 - 8
 - 9
17. In working stress method the factor of safety is applied on
- Ultimate stress
 - Yield stress
 - Stress at elastic limit
 - none of the above

18. Activated Carbon is used for in water treatment for
- a) Disinfectant
 - b) Removing Hardness
 - c) Removing odour
 - d) Removing colour
19. Ultimate bearing capacity of soil is the
- a) maximum gross pressure at which soil fails in shear.
 - b) maximum net pressure at which soil fails in shear.
 - c) maximum pressure at which soil settles beyond the specified limit.
 - d) both (a) and (c).
20. if the age of concrete at loading is 7 days, the value of creep coefficient is
- a) 2.2
 - b) 1.6
 - c) 1.1
 - d) 1.0
21. Flash set in ordinary Portland cement
- a) C₃A
 - b) C₂S
 - c) C₄AF
 - d) Gypsum
22. Which of the following members are generally not designed for shear
- a) a slab
 - b) a cantilever Beam
 - c) a footing
 - d) none of the above
23. The maximum tolerance in a 20 m chain is
- a) ± 2 mm
 - b) ± 3 mm
 - c) ± 5 mm
 - d) ± 8 mm
24. Column splices are assumed to be
- a) Short column
 - b) Long column
 - c) Carrying compression and tension
 - d) None
25. Local attraction in compass surveying may exist due to
- a) Incorrect levelling of the magnetic needle
 - b) loss of magnetism of the needle
 - c) Friction of the needle at the pivot
 - d) presence of magnetic substances near the instrument
26. Terzaghi's bearing capacity factors N_c , N_q and N_r are functions of
- a) cohesion only
 - b) angle of internal friction only
 - c) both cohesion and angle of internal friction
 - d) none of the above

27. The stress strain curve for a glass rod during tensile test would exhibit
- A straight line
 - A Parabola
 - A sudden break
 - An irregular curve
28. For pin joint structure to be statically determinate the necessary condition is
- $m+r=3j$
 - $m+r=2j$
 - $m+2r=3j$
 - $3m+r=3j$
29. Poisson's ratio for cast iron is
- 0.27
 - 0.31
 - 0.35
 - 0.38
30. The following sights are taken on a "turning point"
- Foresight only
 - back sight only
 - Foresight and back sight
 - foresight and intermediate sight
31. The formula for quick lime is
- CaO
 - Ca(OH)₂
 - CaCO₃
 - None
32. Curing of concrete with high temperature results in
- Increase in ultimate strength
 - Cracking of concrete
 - Decreases ultimate strength
 - Early development of ultimate strength
33. Compaction of soil is measured in terms of
- Specific gravity
 - Permeability
 - Dry density
 - Compressibility
34. The rise of carriage way at the outer edge is
- Gradient
 - Super elevation
 - Camber
 - Transition curve
35. Capillarity is due to
- Cohesion
 - Adhesion
 - Cohesion and Adhesion
 - Gravity
36. In terms of bulk modulus (K) and modulus of rigidity(C) the Poisson's can be expressed as
- $\frac{3k-4c}{6K+4C}$
 - $\frac{3k+4c}{6K+4C}$
 - $\frac{3k-2c}{6K+2C}$
 - $\frac{3k-2c}{6K+4C}$

37. The absolute stiffness of prismatic member with one end is fixed

- a) $\frac{2EI}{L}$
- b) $\frac{4EI}{L}$
- c) $\frac{3EI}{L}$
- d) $\frac{5EI}{L}$

38. Minimum area of tension reinforcement in a beam expressed as per centage of cross sectional area is

- a) $0.58/f_y$
- b) $85/f_y$
- c) 4
- d) none

39. The angle of taper on a draft tube is

- a) less than $7\frac{1}{2}^\circ$
- b) around 10°
- c) around 15°
- d) around 12°

40. The section modulus of a circular section about an axis through its CG is

- a) $\frac{\pi}{16} d^3$
- b) $\frac{\pi}{32} d^3$
- c) $\frac{\pi}{64} d^3$
- d) $\frac{\pi}{192} d^3$

41. Flow occurring in a pipe line when a valve being opened is

- a) Steady
- b) unsteady
- c) laminar
- d) vortex

42. Hydraulic jump is used for

- a) Increasing the flow rate
- b) Reducing flow rate
- c) Reducing the velocity of flow
- d) reducing the energy of flow

43. If the section modulus of a beam decreases, then the bending stress will

- a) Decrease
- b) Increase
- c) Remains same
- d) there is no such correlation

44. Bending moment on section is maximum where shear force is

- a) Maximum
- b) Minimum
- c) Zero
- d) Does not depend upon shear force

45. Raft foundation is type of

- a) deep foundation
- b) shallow foundation
- c) None of the above
- d) foundation in water

46. Diameter of ties in column should be greater than

- a) or equal to 5mm
- b) or equal to $\frac{1}{4}$ of dia of main bar
- c) 5mm but less than $\frac{1}{4}$ of main bar
- d) 5mm and more than $\frac{1}{4}$ of main bar

47. Ratio of maximum hourly consumption and average hourly consumption of the maximum day is

- a) 1.2
- b) 1.5
- c) 1.8
- d) 2.7

48. For maximum acidity, the pH value of water should be

- a) Zero
- b) 0.1
- c) 1.0
- d) 1.4

49. Water losses in water supply is assumed as

- a) 15%
- b) 12.5%
- c) 10%
- d) 7.5 %

50. Bitumen of grade 80/100 means its penetration value is

- a) 8m
- b) 10mm
- c) 8 to 10mm
- d) none of the above

Part –B

**General Aptitude Entrance Test Question paper for Ph.D- 30 marks
Common to all branches**

1) In how many different ways can the letters of the word 'LEADING' be arranged in such a way that the vowels always come together?

- | | |
|---------|---------|
| (A) 720 | (B) 520 |
| (C) 420 | (D) 630 |

2) There are 7 non-collinear points. How many triangles can be drawn by joining these points?

- | | |
|--------|--------|
| (A) 45 | (B) 85 |
| (C) 35 | (D) 25 |

3) A is 3 years older to B and 3 years younger to C, while B and D are twins. How many years older is C and D?

- | | |
|-------|-------|
| (A) 7 | (B) 5 |
| (C) 6 | (D) 8 |

4) The ratio between the speeds of two trains is 7 : 8. If the second train runs 400 kms in 4 hours, then the speed of the first train is:

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|----------------|----------------|
| (A) 78.5 km/hr | (B) 52 km/hr |
| (C) 60 km/hr | (D) 87.5 km/hr |

5) Two numbers are respectively 20% and 50% more than a third number. The ratio of the two numbers is:

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|---------|---------|
| (A) 4:5 | (B) 5:4 |
| (C) 6:5 | (D) 2:5 |

6) Three unbiased coins are tossed. What is the probability of getting at most two heads?

- | | |
|-------------------|-------------------|
| (A) $\frac{5}{7}$ | (B) $\frac{5}{4}$ |
| (C) $\frac{7}{8}$ | (D) $\frac{3}{6}$ |

7) If an angle is its own complementary angle, then its measure is

- | | |
|----------------|----------------|
| (A) 45° | (B) 55° |
| (C) 60° | (D) 70° |

8) The digit in unit's place of the product

- (A) 2 (B) 1
(C) 0 (D) 4

9) When he

P : did not know

Q : he was nervous and

R : heard the hue and cry at midnight

S : what to do

The Proper sequence should be:

- (A) RQPS (B) PQRS
(C) SPQR (D) QPRS

10) Correct the sentence "He was very tired as he is working since 6'0 clock in the morning".

- (A) he was working (B) he had been working
(C) he has been working (D) he will be working

11) Pain: sedative

- (A) Day: Night (B) Dengue: Mosquito
(C) Malaria: Water (D) Grief: Consolation

12) Find the missing term of the given expression: $18.834 + 818.34 - ? = 618.43$

- (A) 217.644 (B) 218.744
(C) 217.744 (D) 217.844

13) The amount of uncertainty in a system of the symbol is called.

- (A) bandwidth (B) Entropy
(C) loss (D) quantum

14) Buffering is....

- (A) The process of temporarily storing the data to allow for small variation in device speeds.
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16) Which among the following is NOT a web browser?

- (A) SpaceTim
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17) Which of the following comprise the software components of a computer?

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18) Which of the following are the features of a Spreadsheet?

- (A) Layers an Lines
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19) Which of these IEEE standards represent wireless local area network?

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- 20) Which of these protocols is used by TFTP for data transport?
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21) The last Sunday of March, 2006 fell on which date?

Statements:

- I. The first Sunday of that month fell on 5th.
II. The last day of that month was Friday.
- (A) I alone is sufficient while II alone is not sufficient
(B) II alone is sufficient while I alone is not sufficient
(C) Either I or II is sufficient
(D) Neither I nor II is sufficient

22) Five persons - A, B, C, D and E are sitting in a row. Who is sitting in the middle?

Statements:

- I. B is between E and C.
II. B is to the right of E
III. D is between A and E.
- (A) Only I and II
(B) Only II and III
(C) Only I and III
(D) All I, II and III

23) All the trees in the park are flowering trees. Some of the trees in the park are dogwoods. All dogwoods in the park are flowering trees. If the first two statements are true, the third statement is

- (A) True
(B) False
(C) Uncertain
(D) None of the above

24) $5 : 150 :: 8 : \underline{\quad}$

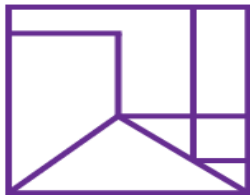
- (A) 576 (B) 567
(C) 512 (D) 520

25) Find the number of parallelograms.



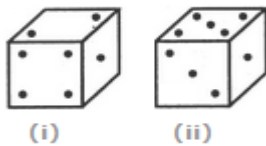
- (A) 8
- (B) 10
- (C) 15
- (D) None of These

26) How many triangles are there in the following figure?



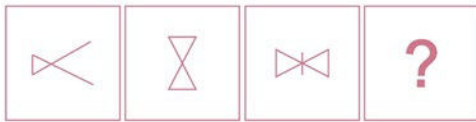
- (A) 2
- (B) 3
- (C) 4
- (D) More than 4

27) Two positions of a cube are shown below. When the number 4 will be at the bottom, then which number will be at the top?

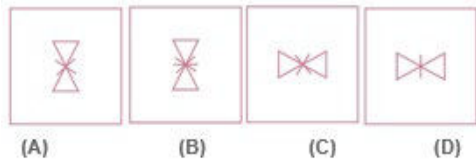


- (A) 3
- (B) 5
- (C) 6
- (D) None of these

28) Questions Figures



Answer figures



(A) A

(B) C

(C) D

(D) B

29) A man is facing west. He turns 45 degrees in the clockwise direction and then another 180 degrees in the same direction and then 270 degrees in the anticlockwise direction. Find which direction he is facing now?

(A) South

(B) West

(C) South West

(D) East

30) Statement 1: Pens cost more than pencils. Statement 2: Pens cost less than erasers.

Statement 3: Erasers cost more than pencils and pens. If the first two statements are true, the third Statement is

(A) True

(B) False

(C) Uncertain

(D) Cannot be determined

Part –C

Mathematics Entrance Test Question paper for Ph.D- 20 Marks Common to all branches

1. For the linear transformation, $X = \begin{bmatrix} 2 & 1 & 1 \\ 1 & 1 & 2 \\ 1 & 0 & -2 \end{bmatrix} Y$, find the Y co-ordinates for (1, 2, -1) in X.
 - a) (0, -2, 0)
 - b) (-1, 3, 1)
 - c) (-1, -2, 0)
 - d) (-1, 3, 0)

2. Which of the following statements is true about the regression line?
 - a) A regression line is also known as the line of the average relationship
 - b) A regression line is also known as the estimating equation
 - c) A regression line is also known as the prediction equation
 - d) All of the above

3. If the values of two variables move in the same direction, _____
 - a) The correlation is said to be non-linear
 - b) The correlation is said to be linear
 - c) The correlation is said to be negative
 - d) The correlation is said to be positive

4. Which of the following are types of correlation?
 - a) Positive and Negative
 - b) Simple, Partial and Multiple
 - c) Linear and Nonlinear
 - d) All of the above

5. A is 5×5 matrix, all of whose entries are 1, then
 - a) A is not diagonalizable
 - b) A is idempotent
 - c) A is nilpotent
 - d) The minimal polynomial and the characteristics polynomial of A are not equal.

6. $T : R^3 \rightarrow R^3$ such that $T(a, b, c) = (0, a, b)$, for $(a, b, c) \in R^3$. Then $T + I$ is a zero of the polynomial:
 - a) t
 - b) t^2
 - c) t^3
 - d) None of above

7. $T : P_2(\mathbb{R}) \rightarrow P_3(\mathbb{R})$ such that $T(f(x)) = 2f'(x) + 3 \int_0^x f(t)dt$. Then rank of T is
- a) 1 b) 2 c) 3 d) 4

8. The minimal polynomial of $\begin{pmatrix} 2 & 1 & 0 & 0 \\ 0 & 2 & 0 & 0 \\ 0 & 0 & 2 & 0 \\ 0 & 0 & 0 & 5 \end{pmatrix}$ is

- a) $(x - 2)$
 b) $(x - 2)(x - 5)$
 c) $(x - 2)^2(x - 5)$
 d) $(x - 2)^3(x - 5)$

9. Number of linearly independent Eigen vectors of $\begin{pmatrix} 2 & 2 & 0 & 0 \\ 2 & 1 & 0 & 0 \\ 0 & 0 & 3 & 0 \\ 0 & 0 & 1 & 4 \end{pmatrix}$ is
- a) 1 b) 2 c) 3 d) 4

10. A is a 4-square matrix and $A^5 = 0$. Then

- a) $A^4 = I$ b) $A^4 = A$ c) $A^4 = 0$ d) $A^4 = -I$

11. Solve the following equations by Gauss Elimination Method.

$$x+4y-z = -5, \quad x+y-6z = -12, \quad 3x-y-z = 4$$

- a) $x = 1.64791, y = 1.14085, z = 2.08451$
 b) $x = 1.65791, y = 1.14185, z = 2.08441$
 c) $x = 1.64691, y = 1.14095, z = 2.08461$
 d) $x = 1.64491, y = 1.15085, z = 2.09451$

12. Find the values of x, y, z in the following system of equations by gauss Elimination Method. $2x + y - 3z = -10, -2y + z = -2, z = 6$

- a) 2, 4, 6
 b) 2, 7, 6
 c) 3, 4, 6
 d) 2, 4, 5

13. In Gauss Jordan method which of the following transformations are allowed?
- Diagonal transformation
 - Column transformation
 - Row transformation
 - Square transformation
14. Solve the equations using Gauss Jordan method.
 $x + 2y + 6z = 15$, $3x + 4y + z = 16$, $6x - y - z = 20$
- $x = 3.735, y = 0.795, z = 1.612$
 - $x = 3.735, y = 3.735, z = 1.612$
 - $x = 3.735, y = 1.612, z = 3.735$
 - $x = 1.612, y = 0.795, z = 3.735$
15. Gauss Seidal method is also termed as a method of _____
- Successive displacement
 - Eliminations
 - False positions
 - Iterations
16. Which of the following is not Dirichlet's condition for the Fourier series expansion?
- $f(x)$ is periodic, single valued, finite
 - $f(x)$ has finite number of discontinuities in only one period
 - $f(x)$ has finite number of maxima and minima
 - $f(x)$ is a periodic, single valued, finite
17. If the function $f(x)$ is odd, then which of the only coefficient is present?
- a_n
 - b_n
 - a_0
 - Everything is present
18. Find b_n if the function $f(x) = x^2$.
- finite value
 - infinite value
 - zero
 - can't be found
19. What is the coefficient of x^{101729} in the series expansion of $\cos(\sin(x))$?
- 0
 - $\frac{1}{101729!}$
 - $-\frac{1}{101729!}$
 - 1
20. The angle between Radius vector $r = a(1 - \cos(\frac{x}{a}))$ and tangent to the curve is ϕ given by _____
- $\phi = \pi/2$
 - $\phi = \pi$
 - $\phi = -\pi/2$
 - $\phi = 0$

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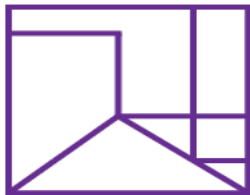
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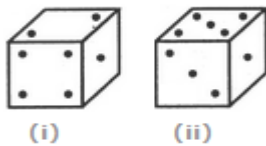
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26) How many triangles are there in the following figure?



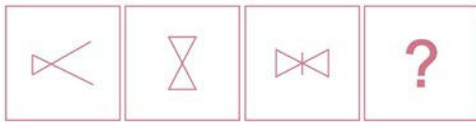
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- (C) 4
- (D) More than 4

27) Two positions of a cube are shown below. When the number 4 will be at the bottom, then which number will be at the top?

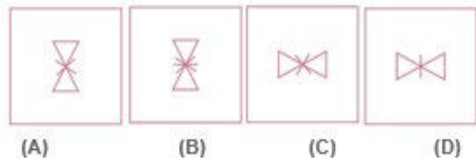


- (A) 3
- (B) 5
- (C) 6
- (D) None of these

28) Questions Figures



Answer figures



- (A) A
- (B) C
- (C) D
- (D) B

29) A man is facing west. He turns 45 degrees in the clockwise direction and then another 180 degrees in the same direction and then 270 degrees in the anticlockwise direction. Find which direction he is facing now?

- (A) South
- (B) West
- (C) South West
- (D) East

30) Statement 1: Pens cost more than pencils. Statement 2: Pens cost less than erasers.

Statement 3: Erasers cost more than pencils and pens. If the first two statements are true, the third Statement is

- (A) True
- (B) False
- (C) Uncertain
- (D) Cannot be determined

Part –C

Mathematics Entrance Test Question paper for Ph.D- 20 Marks Common to all branches

1. For the linear transformation, $X = \begin{bmatrix} 2 & 1 & 1 \\ 1 & 1 & 2 \\ 1 & 0 & -2 \end{bmatrix} Y$, find the Y co-ordinates for (1, 2, -1) in X.
 - a) (0, -2, 0)
 - b) (-1, 3, 1)
 - c) (-1, -2, 0)
 - d) (-1, 3, 0)
2. Which of the following statements is true about the regression line?
 - a) A regression line is also known as the line of the average relationship
 - b) A regression line is also known as the estimating equation
 - c) A regression line is also known as the prediction equation
 - d) All of the above
3. If the values of two variables move in the same direction, _____
 - a) The correlation is said to be non-linear
 - b) The correlation is said to be linear
 - c) The correlation is said to be negative
 - d) The correlation is said to be positive
4. Which of the following are types of correlation?
 - a) Positive and Negative
 - b) Simple, Partial and Multiple
 - c) Linear and Nonlinear
 - d) All of the above
5. A is 5×5 matrix, all of whose entries are 1, then
 - a) A is not diagonalizable
 - b) A is idempotent
 - c) A is nilpotent
 - d) The minimal polynomial and the characteristics polynomial of A are not equal.
6. $T : R^3 \rightarrow R^3$ such that $T(a, b, c) = (0, a, b)$, for $(a, b, c) \in R^3$. Then $T + I$ is a zero of the polynomial:
 - a) t
 - b) t^2
 - c) t^3
 - d) None of above

7. $T : P_2(\mathbb{R}) \rightarrow P_3(\mathbb{R})$ such that $T(f(x)) = 2f'(x) + 3 \int_0^x f(t)dt$. Then rank of T is
- a) 1 b) 2 c) 3 d) 4

8. The minimal polynomial of $\begin{pmatrix} 2 & 1 & 0 & 0 \\ 0 & 2 & 0 & 0 \\ 0 & 0 & 2 & 0 \\ 0 & 0 & 0 & 5 \end{pmatrix}$ is

- a) $(x - 2)$
 b) $(x - 2)(x - 5)$
 c) $(x - 2)^2(x - 5)$
 d) $(x - 2)^3(x - 5)$

9. Number of linearly independent Eigen vectors of $\begin{pmatrix} 2 & 2 & 0 & 0 \\ 2 & 1 & 0 & 0 \\ 0 & 0 & 3 & 0 \\ 0 & 0 & 1 & 4 \end{pmatrix}$ is
- a) 1 b) 2 c) 3 d) 4

10. A is a 4-square matrix and $A^5 = 0$. Then

- a) $A^4 = I$ b) $A^4 = A$ c) $A^4 = 0$ d) $A^4 = -I$

11. Solve the following equations by Gauss Elimination Method.

$$x+4y-z = -5, \quad x+y-6z = -12, \quad 3x-y-z = 4$$

- a) $x = 1.64791, y = 1.14085, z = 2.08451$
 b) $x = 1.65791, y = 1.14185, z = 2.08441$
 c) $x = 1.64691, y = 1.14095, z = 2.08461$
 d) $x = 1.64491, y = 1.15085, z = 2.09451$

12. Find the values of x, y, z in the following system of equations by gauss Elimination Method. $2x + y - 3z = -10, -2y + z = -2, z = 6$

- a) 2, 4, 6
 b) 2, 7, 6
 c) 3, 4, 6
 d) 2, 4, 5

13. In Gauss Jordan method which of the following transformations are allowed?
- Diagonal transformation
 - Column transformation
 - Row transformation
 - Square transformation
14. Solve the equations using Gauss Jordan method.
- $$x + 2y + 6z = 15, \quad 3x + 4y + z = 16, \quad 6x - y - z = 20$$
- $x = 3.735, y = 0.795, z = 1.612$
 - $x = 3.735, y = 3.735, z = 1.612$
 - $x = 3.735, y = 1.612, z = 3.735$
 - $x = 1.612, y = 0.795, z = 3.735$
15. Gauss Seidal method is also termed as a method of _____
- Successive displacement
 - Eliminations
 - False positions
 - Iterations
16. Which of the following is not Dirichlet's condition for the Fourier series expansion?
- $f(x)$ is periodic, single valued, finite
 - $f(x)$ has finite number of discontinuities in only one period
 - $f(x)$ has finite number of maxima and minima
 - $f(x)$ is a periodic, single valued, finite
17. If the function $f(x)$ is odd, then which of the only coefficient is present?
- a_n
 - b_n
 - a_0
 - Everything is present
18. Find b_n if the function $f(x) = x^2$.
- finite value
 - infinite value
 - zero
 - can't be found
19. What is the coefficient of x^{101729} in the series expansion of $\cos(\sin(x))$?
- 0
 - $\frac{1}{101729!}$
 - $-\frac{1}{101729!}$
 - 1
20. The angle between Radius vector $r = a(1 - \cos(\frac{x}{a}))$ and tangent to the curve is ϕ given by _____
- $\phi = \pi/2$
 - $\phi = \pi$
 - $\phi = -\pi/2$
 - $\phi = 0$