

Set: Msc. Practice Test - Set C

1. One root of the equation $2x^2+5x+(4-k)=0$ has one root equal to zero then $k=$
 - a. 6
 - b. -1
 - c. 5
 - d. 4
2. if the roots of the equation $x^2+x+1=0$ are α and β , then the value of $\alpha^2+\beta^2=$
 - a. -1
 - b. 2
 - c. 1
 - d. 0
3. If the difference of the roots of $x^2+2px+q=0$ be equal to the difference of the roots of $x^2+2qx+p=0$ then
 - a. $P+q+1=0$
 - b. $P+q-4=0$
 - c. $P=q+3$
 - d. $P^2+q^2=1$
4. If the sum of the roots of the equation $x^2+px+q=0$ is m times their difference then
 - a. $P(m^2+1)=4mq$
 - b. $P(m^2+1)=m^2q^2$
 - c. $P(m-1)=4mq$
 - d. $P^2(m^2-1)=4m^2q$
5. The value of p under the condition when x^3-px+3 is divided by $(x-2)$, then the remainder is 5 is
 - a. $P=-4$
 - b. $P=-1$
 - c. $P=3$
 - d. $P=2$
6. In the equation $ax^2+bx+c=0$ if a is not equal to $b, b=0$ then the roots are:
 - a. Equal in magnitude but opposite in sign
 - b. Reciprocals of each other
 - c. Equal
 - d. Reciprocals but opposite in sign
7. if α, β be the roots of the equation $(x-a)(x-b)=c$, c is not equal to 0 then the roots of the equation $(x-\alpha)(x-\beta)+c=0$ are
 - a. a, b
 - b. b, c
 - c. α, β
 - d. c, a

8. If one of the root of the equation $x^2 - px + q = 0$ be in the ratio 2:3 then

- a. $2p^2 = 9q$
- b. $6p^2 = 25q$
- c. $3q^2 = 25p$
- d. $4q^2 = 9p^2$

9. If the roots of the equation $x^2 + x + 1 = 0$ are α and β and the roots of the equation $x^2 + px + q = 0$ are $\frac{\alpha}{\beta}$ and $\frac{\beta}{\alpha}$ then $p =$

- a. -1
- b. $\frac{1}{2}$
- c. 2
- d. 1

10. If -4 is the root of the equation $x^2 + px - 4 = 0$ and the equation $x^2 + px + q = 0$ has equal roots then $q =$

- a. $\frac{2}{7}$
- b. $\frac{9}{4}$
- c. $\frac{2}{9}$
- d. $\frac{5}{4}$

11. $\lim_{x \rightarrow 1} \frac{\log x}{x - 1}$

- a. $\log 1$
- b. e
- c. 1
- d. -1

12. If $\lim_{x \rightarrow 3} \frac{x^n - 3^n}{x - 3} = 27$ and n is a positive then n =

- a. 4
- b. 6
- c. 5
- d. 3


13. $\lim_{x \rightarrow 0} \frac{3^x - 2^x}{\log 3 - \log 2}$

- a. $\frac{\log 4}{\log 3}$
- b. $\frac{\log 4}{\log 2}$
- c. $\frac{\log 3}{\log 2}$

d.

$$\frac{\log 3 - \log 2}{\log 4 - \log 3}$$

14. $\lim_{x \rightarrow 0} \frac{5^x - 1}{4^x - 1} =$

a.  Invalid Equation

b. $\frac{\log 5}{\log 4}$

c. $5 \log 4$

d. $\log(5/4)$

15. $\lim_{x \rightarrow 0} 2 \sin\left(\frac{2}{x}\right)$

a. 0

b. 1

c. -1

d. 2

16. $\lim_{x \rightarrow 0^+} \frac{\sin x}{\sqrt{x}}$

a. does not exist

b. 1

c. -1/2

d. 0

17. If $f(x) = x : x < 0$ $= 1 : x = 0$ $= x^2 : x > 0$ $\lim_{x \rightarrow 0} f(x) =$

a. 2

b. 1

c. 0

d. does not exist

18. $\lim_{x \rightarrow 0} \frac{2 \sin x - \sin 2x}{x^3}$

a. -2

b. 1/2

c. 0

d. 1

19. $\lim_{x \rightarrow \frac{\pi}{2}} (\pi - 2x) \tan x =$

a. 0

b. 1/2

c. 2

d. 1

20. $\lim_{x \rightarrow 3^+} \frac{|x - 3|}{x - 3}$

- a. 2
- b. 0
- c. -1
- d. 1

21. $\lim_{t \rightarrow 0} (1 - at)^{1/t}$

- a. $e^{-1/a}$
- b. e
- c. e^a
- d. e^{-a}

22. $\lim_{x \rightarrow 0} \frac{1 - \cos x}{\sqrt{1 + x} - 1}$

- a. -1
- b. 0
- c. 1
- d. 1/2

23. $\lim_{x \rightarrow 0} \frac{(1 - \cos 2x) \sin 5x}{x^2 \sin 3x}$

- a. 1/5
- b. 2/3
- c. 5/2
- d. 10/3

24. $\lim_{x \rightarrow 1} \frac{\sin(e^{x-1} - 1)}{\log x}$

- a. 0
- b. 1
- c. $e \cos x$
- d. -1

25. $\lim_{x \rightarrow 0} \frac{\tan x}{x}$

- a. π
- b. 1
- c. ∞
- d. 0

26. In how many ways 11 cricket players be chosen from 20 players if Sachin and dhoni are not included?

- a. ${}^{22}C_{11}$
- b. ${}^{18}C_{11}$
- c. ${}^{11}C_2$

d. ${}^{20}C_2$

27. The number of ways in which a student can answer 7 questions out of 12 questions in which questions number 5 is compulsory is:

a. ${}^{11}C_6$

b. ${}^{12}C_7$

c. ${}^{12}C_6$

d. ${}^{12}C_5$

28. In how many ways 52 cards can be equally distributed among 4 students?

a. $\frac{52!}{13!}4$

b. $52! \times 4!$

c. ${}^{52}C_{13} \times {}^{39}C_{13} \times {}^{26}C_{13}$

d. ${}^{13}C_4 \times 4!$

29. Let the harmonic mean and the geometric mean of two positive numbers be in the ratio 4 : 5. The two numbers are in the ratio

a. 2 : 1

b. 4 : 1

c. 3 : 1

d. 1 : 1

30. Calculate the sum of the arithmetic series $3 + 7 + 11 + \dots + 123$.

a. 1953

b. 3906

c. 7560

d. 141

31. One of the solutions of $\sum_{k=0}^4 \binom{4}{k} (x)^{4-k} (-2)^k = 1$

a. 2

b. 1

c. 0

d. 4

32. A takes twice as much time as B or thrice as much time as C to finish a piece of work. Working together, they can finish the work in 2 days. B can do the work alone in:

a. 6 days

b. 12 days

c. 4 days

d. 8 days

33. Sam purchased 20 dozens of toys at the rate of Rs. 375 per dozen. He sold each one of them at the rate of Rs. 33. What was his percentage profit?

a. 5.6

- b. 4.5
- c. 3.5
- d. 6.5

34. The product of complex numbers $(4,3)$ and $(5,-6)$ is ?

- a. $(38,-9)$
- b. $(18,3)$
- c. $(18,-3)$
- d. $(38,9)$

35. A works twice as fast as B. If B can complete a work in 12 days independently, the number of days in which A and B can together finish the work in :

- a. 8 days
- b. 6 days
- c. 4 days
- d. 18 days

36. Some articles were bought at 6 articles for Rs. 5 and sold at 5 articles for Rs. 6. Gain percent is:

- a. 44%
- b. 33.33 %
- c. 35%
- d. 30%

37. The least perfect square, which is divisible by each of 21, 36 and 66 is:

- a. 214434
- b. 213444
- c. 231444
- d. 214344

38. Which from the following set has closure property with respect to addition ?

- a. $\{1,1\}$
- b. $\{1,-1\}$
- c. $\{0\}$
- d. $\{1\}$

39. Which from the following set has closure property w.r.t multiplication ?

- a. $\{-1, -1\}$
- b. $\{0, -1\}$
- c. $\{1, -1\}$
- d. $\{-1\}$

40. The logical form of $(A \cap B)' = A' \cap B'$ is?

- a. $\sim p \cap \sim q = \sim(p \cap q)$
- b. $\sim(p \cap q) = \sim p \cap \sim q$
- c. $\sim p \cap \sim q = \sim(p \cap q)$
- d. $\sim(p \cap q) = \sim p \cap \sim q$

41. If a function $f : A \rightarrow B$ is such that $\text{Ran } f = B$ then f is a/an ?

- a. none of these
- b. into function
- c. onto function
- d. injective

42. Which from the following set has closure property w.r.t addition ?

- a. $\{0\}$
- b. $\{1, -1\}$
- c. $\{1, 1\}$
- d. $\{1\}$

43. If the number of elements in a set S are 5. Then the number of elements of the power set $P(S)$ are ?

- a. 6
- b. 16
- c. 32
- d. 5

44. The inverse of $q \rightarrow p$ is?

- a. $\sim q \rightarrow \sim p$
- b. none of these
- c. $\sim p \rightarrow \sim q$
- d. $\sim p \rightarrow q$

45. If a function $f: A \rightarrow B$ is such that $\text{Ran } f = B$, then f is a/an ?

- a. onto function
- b. injective
- c. into function
- d. none of these

46. What is n , if A is a singular matrix ?

- a. 5
- b. 6
- c. 8
- d. 7

47. Seemingly inconsequential changes in sea temperature due to global warming eventually result in declines in fish and seabird populations. A rise of just two degrees prevents the vertical mixing of seawater from different strata. This restricts the availability of upwelling nutrients to phytoplankton. Since zooplankton, which feed upon phytoplankton, feed the rest of the food chain, the declines are inevitable. The boldface portion plays which one of the following roles in the argument?

- a. It is offered in support of the idea that global warming poses a threat to all organisms
- b. It is a hypothesis supported by the fact that phytoplankton feed on upwelling nutrients.
- c. It is intended to provide an example of the ways in which the vertical mixing of seawater affects feeding habits.
- d. It helps show how global temperature changes affect larger sea animals directly.

48. Officials of the Youth Hockey League and parents of players in the league have become concerned with the number of flagrant fouls occurring during league games. This past season, the number of flagrant fouls was double the number from the season before. League officials plan to reduce the number of such fouls during the coming season by implementing mandatory suspensions for players who commit flagrant fouls. Which of the following statements, if true, provides the best evidence that the officials' plan will be effective?

- a. Most players in the league strive to be selected for the All-Star team, and league rules state that no player with a record of suspension shall be selected for the All-Star team.
- b. Most serious injuries occurring during league games are a direct result of flagrant fouls.
- c. League referees have been trained to recognize flagrant fouls and to report incidents involving such fouls.
- d. Parents of players in the league are in support of mandatory suspensions for flagrant fouls.

49. Profits for one of Company X's flagship products have been declining slowly for several years. The CFO investigated and determined that inflation has raised the cost of producing the product but consumers who were surveyed reported that they weren't willing to pay more than the current price. As a result, the CFO recommended that the company stop producing this product because the CEO only wants products whose profit margins are increasing. The answer to which of the following questions would be most useful in evaluating whether the CFO's decision to divest the company of its flagship product is warranted?

- a. Will the rest of Company X's management team agree with the CFO's recommendation?
- b. Is there a way to alter the manufacturing or distribution processes in order to reduce the cost to produce the flagship product?
- c. Are there additional features which could be added to the product and for which consumers might be willing to pay a higher price?
- d. Does the company have new and profitable products available with which to replace the flagship product?

50. On average, residents of City X devote a greater percentage of their yearly incomes to housing costs than do residents of City Y, though the costs of insurance and fuel generally are exorbitant in both commuter-heavy cities. Yet in Wealth Magazine's annual list of the country's least affordable cities, City Y is deemed less affordable than City X. Which of the following, if true, best explains the contrast described above?

- a. The average price of a new house is higher in City X than in City Y.
- b. A number of high-priced restaurants and boutiques have recently opened in City Y.
- c. Unlike City Y, City X has an efficient and inexpensive public transportation system.
- d. Several large businesses have recently relocated from City Y to City X.

51. The "Doppler effect" refers to the perceived change in pitch that occurs when the source of a sound is in motion relative to the observer. For example, the siren on a passing police car will sound higher than its true pitch as the car approaches, sound the same as its true pitch as the car passes, and sound lower than its true pitch as the car travels away from the observer. If two trains pass each other going opposite directions on parallel east-west tracks, which of the following observations provides another illustration of the effect described above?

- a. If the eastbound train blows its horn as they pass, passengers on the westbound train will hear a sound that increases in pitch.
- b. If the eastbound train blows its horn as they pass, passengers on the westbound train will hear a sound that decreases in pitch.
- c. If the eastbound train blows its horn as they pass, passengers on the eastbound train will hear a sound that is steady in pitch.
- d. If the eastbound train blows its horn as they pass, passengers on the eastbound train will hear a sound that increases in pitch.

52. In a loaded beam, the point of contraflexure occurs at a section where

- a. bending moment is minimum
- b. bending moment is maximum
- c. bending moment is zero or changes sign
- d. shearing force is maximum

53. A ball of mass 1 kg moving with a velocity of 2 m/sec collides a stationary ball of mass 2 kg and comes to rest after impact. The velocity of the second ball after impact will be

- a. 1.0 m/sec
- b. zero
- c. 2.0 m/sec
- d. 0.5 m/sec

54. The maximum bending moment due to a moving load on a simply supported beam, occurs

- a. at the mid span
- b. at the supports
- c. anywhere on the beam
- d. under the load

55. A long vertical member, subjected to an axial compressive load, is called

- a. all the above
- b. a tie
- c. a strut
- d. a column

56. The slenderness ratio of a vertical column of a square cross-section of 2.5 cm sides and 300 cm length, is

- a. 360
- b. 240
- c. 416
- d. 200

57. If the beam is supported so that there are only three unknown reactive elements at the supports. These can be determined by using the following fundamental equation of statics

- a. $\sum H = 0$; $\sum H = 0$
- b. $\sum V = 0$
- c. $\sum H = 0$; $\sum V = 0$; $\sum M = 0$
- d. $\sum H = 0$

58. Influence lines are drawn for structures

- a. statically determinate
- b. of any type
- c. none of these
- d. pin-jointed truss

59. In a shaft, the shear stress is not directly proportional to

- a. radius of the shaft
- b. angle of twist

- c. modulus of rigidity
- d. length of the shaft

60. There are two hinged semicircular arches A, B and C of radii 5 m, 7.5 m and 10 m respectively and each carries a concentrated load W at their crowns. The horizontal thrust at their supports will be in the ratio of

- a. $1 : 1\frac{1}{2} : 2$
- b. $2 : 1\frac{1}{2} : 1$
- c. none of these
- d. $1 : 1 : 2$

61. At yield point of a test piece, the material

- a. regains its original shape on removal of the load
- b. behaves in an elastic manner
- c. obeys Hooke's law
- d. undergoes plastic deformation

62. In plastic analysis, the shape factor for a circular section, is

- a. 1.5
- b. 1.6
- c. 1.75
- d. 1.7

63. A truss containing j joints and m members, will be a simple truss if

- a. $m = 2j - 3$
- b. $j = 3m - 2$
- c. $m = 3j - 2$
- d. $j = 2m - 3$

64. The density of soil can be increased

- a. All the above
- b. by elastic compression of soil grains
- c. by reducing the space occupied by air
- d. by expelling water from pores

65. A failure wedge develops if a retaining wall

- a. moves away from the backfill
- b. stresses equally by vertical and horizontal forces.
- c. moves towards the backfill
- d. sinks downwards

66. A critical hydraulic gradient may occur when

- a. all the above.
- b. seepage pressure is in upward direction
- c. effective pressure is zero
- d. flow is in upward direction

67. A compacted soil sample using 10% moisture content has a weight of 200 g and mass unit weight of 2.0 g/cm³. If the specific gravity of soil particles and water are 2.7 and 1.0, the degree of saturation of the soil is
- 11.1%
 - 55.6%
 - 69.6%
 - none of these
68. For determining the moisture content of a soil sample, the following data is available Weight of container = 260 g, Weight of soil sample and = 320 g container, Weight of soil sample (dried) and = 310 g container. The moisture content of the soil sample, is
- 20%
 - 25%
 - 15%
 - 18%
69. Maximum size of clay particles, is
- 0.04 mm
 - 0.08 mm
 - 0.002 mm
 - 0.06 mm
70. The phreatic line in an earth dam may be
- circular
 - all the above
 - parabolic
 - elliptical
71. Coulomb's wedge theory assumes that
- back fill is dry, cohesionless, homogeneous and isotropic
 - sliding wedge itself acts as a rigid body and the value of earth pressure is obtained by considering the limiting equilibrium of the wedge
 - all the above
 - slip surface is the plane which passes through the heel of the wall
72. Pick up the correct statement from the following:
- The cylindrical specimen of a soil is subjected to major principal stress till it fails due to shearing along the plane of the failure.
 - An unconfined compression test is a special case of direct shear test.
 - The confining pressure is maximum during an unconfined compression test.
 - An unconfined compression test is a special case of triaxial compression test
73. A soil has bulk density 2.30 g/cm³ and water content 15 per cent, the dry density of the sample, is
- 2.5 g/cm³
 - 1.5 g/cm³
 - 2.0 g/cm³
 - 1.0 g/cm²

74. For a clay slope of height of 10 m, the stability number is 0.05, $\gamma = 2.0 \text{ t/m}^3$, $C = 2.5 \text{ t/m}^2$, the critical height of the slope of the soil, is

- a. 15.0 m
- b. 25.0 m
- c. 4.0 m
- d. 12.5 m

75. Pick up the correct statement from the following

- a. At critical hydraulic gradient, the saturated sand becomes quick
- b. The critical gradient depends on the void ratio and the specific gravity
- c. The phenomenon of quicksand generally occurs in the cohesionless soil
- d. All the above

76. The following is the physical characteristic of sewage

- a. turbidity
- b. colour
- c. all the above
- d. odour

77. The laying of sewers is done with

- a. level
- b. magnetic compass
- c. clinometer
- d. theodolite

78. The use of coarse screens for the disposal of sewage, may be dispensed with by

- a. neither (a) nor (b)
- b. comminutor
- c. both (a) and (b)
- d. shredder

79. If D is the diameter of upper circular portion, the overall depth of New Egg shaped sewer section, is

- a. 1.625 D
- b. 1.350 D
- c. 1.450 D
- d. 1.250 D

80. In sewage having fully oxidised organic matter, the nitrogen exists in the form of

- a. nitrites
- b. free ammonia
- c. nitrates
- d. aluminoid nitrogen

81. Imhoff cone is used to measure

- a. total organic solids
- b. settleable solids
- c. total solids

d. total in organic solids

82. If the depletion of oxygen is found to be 2.5 mg/litre after incubating 2.5 ml of sewage diluted to 250 ml for 5 days at 20°C, B.O.D. of the sewage is

- a. 250 mg/l
- b. 200 mg/l
- c. 50 mg/l
- d. 100 mg/l

83. Assertion (A) : Discharging the effluents from the oxidation ponds just up stream of lakes or reservoirs is undesirable. Reason (R) : The discharged algae get settled in the reservoirs and cause anaerobic decomposition and other water qualities.

- a. Both A and R are true but R is not a correct explanation of A
- b. A is false but R is true.
- c. Both A and R are true and R is the correct explanation of A
- d. A is true but R is false

84. The coagulant widely used for sewage treatment, is

- a. ferric chloride
- b. chlorinated copperas.
- c. alum
- d. ferric sulphate

85. The sewer which transports the sewage to the point of treatment, is called

- a. house sewer
- b. out-fall sewer
- c. lateral
- d. branch sewer

86. To maintain aerobic biological activity, the moisture content of the compost mass should be about

- a. 60%
- b. 45%
- c. 50%
- d. 55%

List of Answers:

- | | | | | | | | | | | | |
|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 1. d | 2. a | 3. a | 4. d | 5. c | 6. a | 7. a | 8. b | 9. d | 10. b | 11. c | 12. d |
| 13. d | 14. b | 15. d | 16. a | 17. d | 18. b | 19. c | 20. d | 21. d | 22. b | 23. d | |
| 24. b | 25. b | 26. b | 27. a | 28. c | 29. b | 30. a | 31. b | 32. a | 33. a | 34. a | |
| 35. c | 36. a | 37. b | 38. c | 39. c | 40. b | 41. c | 42. a | 43. c | 44. a | 45. a | |
| 46. c | 47. d | 48. a | 49. b | 50. c | 51. b | 52. c | 53. a | 54. d | 55. d | 56. c | |
| 57. c | 58. b | 59. d | 60. d | 61. d | 62. d | 63. a | 64. a | 65. a | 66. a | 67. b | |
| 68. a | 69. c | 70. c | 71. c | 72. d | 73. c | 74. b | 75. d | 76. c | 77. a | 78. c | |
| 79. a | 80. c | 81. b | 82. a | 83. c | 84. a | 85. d | 86. d | | | | |

