PUNJAB TECHNICAL UNIVERSITY
JALANDHAR

Max. Marks: 90   **Time: 90 Mins.**

Entrance Test for Enrollment in Ph.D. Programme

Important Instructions
➢ *Fill all the information in various columns, in capital letters, with blue/black ball point pen.*
➢ *Use of calculators is not allowed. Use Blue/Black ball point pen for attempting the questions.*
➢ *All questions are compulsory. No negative marking for wrong answers.*
➢ *To attempt a question, make a tick mark (√) at the right option/answer.*
➢ *Each question has only one right answer.*
➢ *Questions attempted with two or more options/answers will not be evaluated.*

Subject *(Engg./Arch./Pharm./Mgmt./Sciences)*   **ENGINEERING**

Discipline / Branch   **CIVIL (CE)**

Name

Father's Name

Roll No.   Date : **10-07-2010**

Signature of Candidate

Signature of Invigilator

1. As per IS 456-2000, the relation between modulus of rupture f_{cr} and characteristic compressive strength f_{ck} of concrete is
   a) $f_{cr} = 0.35\sqrt{f_{ck}}$
   b) $f_{cr} = 0.5\sqrt{f_{ck}}$
   c) $f_{cr} = 0.7\sqrt{f_{ck}}$
   d) $f_{cr} = 1.2\sqrt{f_{ck}}$

2. As per IS 456-2000, the modulus of elasticity of concrete E_c in MPa can be taken as
   a) $E_c = 5700\sqrt{f_{ck}}$
   b) $E_c = 570\sqrt{f_{ck}}$
   c) $E_c = 5000\sqrt{f_{ck}}$
   d) $E_c = 500\sqrt{f_{ck}}$
   where f_{ck} is the characteristic compressive strength of concrete.

3. Modulus of rupture of concrete is a measure of
   a) flexural tensile strength
   b) direct tensile strength
   c) split tensile strength
   d) both b & c

4. If the actual depth of neutral axis in a reinforced concrete beam is less than the limiting depth of neutral axis, the beam is called
   a) balanced section
   b) under reinforced
   c) over reinforced
   d) none of the above

5.	The assumption – *plane sections normal to the beam axis remain plan after bending* – made in the Limit State Design of reinforced concrete beams implies
a) in an initially straight beam, stress varies linearly over the depth of the section
b) in an initially straight beam, deflection varies linearly over the depth of the section
c) in an initially straight beam, strain varies linearly over the depth of the section
d) both a & c

6.	For a cantilever of effective depth of 500 mm, the maximum span to satisfy the vertical deflection limit is
a) 3.5 m
b) 4.0 m
c) 5.0 m
d) 7.0 m

7.	Which of the following statement is incorrect
a) Minimum cross sectional area of longitudinal reinforcement in a column is 0.8%
b) Longitudinal reinforcing bars in a column should not be less than 12 mm in diameter
c) The number of longitudinal bars in a circular column should not be less than four
d) all the above

8.	Which of the following statement is incorrect
a) Higher Vee-Bee time shows lower workability of concrete
b) Higher slump shows higher workability of concrete
c) Higher compacting factor shows higher workability of concrete
d) None of the above

9.	A slab is designed as a one way slab if the ratio of long span to short span is
a) less than 1.0
b) between 1.0 and 1.5
c) between 1.5 and 2.0
d) greater than 2.0

10.	In limit state method of design of flexure members, the maximum compressive stress in concrete for design purpose is taken as
a) $0.370 \, f_{ck}$
b) $0.406 \, f_{ck}$
c) $0.446 \, f_{ck}$
d) $0.670 \, f_{ck}$
where f_{ck} is the characteristic compressive strength of concrete.

11.	As per IS 456 – 2000, the maximum strain in concrete at the outermost compression fibres in the limit state method of design of flexural members is
a) 0.0020
b) 0.0035
c) 0.0050
d) 0.0065

12.	The maximum compressive stress in concrete in Limit State Method of design of flexure members as per IS 456 – 2000 is based upon a partial safety factor of
a) 1.15
b) 1.50
c) 1.85
d) 2.20

13. The bond between reinforcement and concrete in a beam can most economically be increased by
a) increasing the depth of the beam
b) using thinner bars but more in number
c) using thicker bars but less in number
d) providing vertical stirrups

14. If the nominal shear stress τ_v exceeds the design shear strength of concrete τ_c, the shear reinforcement as per IS 456 – 2000 shall be provided to carry a shear stress equal to
a) τ_v
b) τ_c
c) $\tau_v - \tau_c$
d) $\tau_v + \tau_c$

15. Due to circumferential action of the spiral reinforcement in a spirally reinforced concrete column
a) capacity of the column is decreased
b) ductility of the column is decreased
c) capacity of the column is decreased but ductility is increased
d) both the capacity and ductility of column increase

16. With the increase in rate of loading during testing, the compressive strength of concrete
a) increases
b) decreases
c) remains unchanged
d) none of the above

17. Side face reinforcement in a beam as per IS 456 – 2000 is required to be provided if the depth of the web of the beam exceeds
a) 750 mm
b) 300 mm
c) 500 mm
d) none of the above

18. High carbon content in steel causes
a) decrease in tensile strength but increase in ductility
b) increase in tensile strength and decrease in ductility
c) decrease in both tensile strength and ductility
d) increase in both tensile strength and ductility

19. Which of the following statement is correct
a) Elastic modulus of high tensile steel in nearly the same as that of mild steel
b) Elastic modulus of high tensile steel is more than that of mild steel
c) Carbon content in high carbon steel is less than that in mild steel
d) None of the above

20. The property of the fresh concrete in which the ingredients separate out from each other while placing concrete is called
a) segregation
b) compaction
c) shrinkage
d) bulking

21. The compressive strength of 100 mm cube as compared to 150 mm cube is always
    a) less
    b) more
    c) equal
    d) none of the above

22. The displacement produced due to a unit load is called
    a) flexibility
    b) stiffness
    c) static indeterminacy
    d) kinematic indeterminacy

23. For a cantilever subjected to a uniformly distributed load W per meter run over its entire span L, the maximum bending moment is
    a) WL
    b) $\frac{1}{2}WL$
    c) $\frac{1}{2}W^2L$
    d) $\frac{1}{2}WL^2$

24. Stress may be defined as
    a) the load per unit area
    b) the internal resistance offered by the material per unit length
    c) the internal force acting on the material per unit area
    d) the internal resisting force per unit area

25. Principal planes are the planes on which maximum stress is the
    a) shear stress
    b) normal stress
    c) tangential stress
    d) temperature stress

26. Wherever the bending moment is maximum, the shear force is
    a) also maximum
    b) minimum
    c) zero
    d) none of the above

27. The maximum deflection of simply supported beam of span l carrying a concentrated load W at the centre is
    a) $\frac{Wl^3}{12EI}$
    b) $\frac{Wl^3}{24EI}$
    c) $\frac{Wl^3}{36EI}$
    d) $\frac{Wl^3}{48EI}$

28. At the point of contraflexure
    a) the stress is maximum
    b) the shear force is zero
    c) the bending moment is zero
    d) none of the above

29. For a masonry dam of base width B, to avoid tension, the eccentricity of loading e should be
    a) more than B/6
    b) less than B/6
    c) equal to B/6
    d) equal to zero

30. Neutral axis of a beam is the axis at which
    a) the shear force is zero
    b) the moment of inertia is zero
    c) the bending stress is zero
    d) the bending stress is maximum

31. The true stress is based upon
    a) original area of cross section
    b) final area of cross section
    c) instantaneous area of cross section
    d) none of the above

32. The ratio of the volume of voids to the total volume of soil is
    a) void ratio
    b) degree of saturation
    c) air content
    d) porosity

33. Dry mass density of soil is equal to
    a) mass of solids to the total volume of soil
    b) mass of solids to the volume of solids
    c) density of soil in dried condition
    d) none of the above

34. At shrinkage limit, the soil is
    a) dry
    b) partially saturated
    c) saturated
    d) none of the above

35. Capillary rise in a small tube is due to
    a) cohesion
    b) adhesion
    c) both cohesion and adhesion
    d) none of the above

36. The permeability of the soil varies
    a) inversely as square of grain size
    b) as square of grain size
    c) as grain size
    d) inversely as void ratio

37. Quick sand is
a) a type of sand
b) a condition in which a cohesionless soil loses its strength due to upward flow of water
c) a condition in which a cohesive soil loses its strength
d) none of the above

38. The coefficient of compressibility is the ratio of
a) change in void ratio to change in effective stress
b) volumetric change to change in effective stress
c) change in thickness to change in effective stress
d) strain to strain

39. The shear strength of soils is
a) proportional to angle of friction
b) proportional to cohesion of soil
c) decreases with an increase in the normal stress
d) none of the above

40. The reduction factor to the bearing capacity of a soil due to the water table just below the footing is
a) 0.5
b) 0.75
c) 1.0
d) 0.25

41. Bearing pressure distribution under a footing resting on clay is
a) uniform throughout
b) more at the edges as compared to that at the middle
c) less at the edges as compared that at the middle
d) none of the above

42. The negative skin friction on pile
a) enhances the net capacity of the pile
b) decreases the capacity of pile
c) increases the bearing load
d) none of the above

43. The most commonly used shape of a well foundation is
a) double –D well
b) circular well
c) double octagonal well
d) rectangular well

44. The stopping sight distance depends upon
a) total reaction time of the driver
b) speed of vehicle
c) efficiency of brakes
d) all the above

45. When distance traveled along the road surface is more than the circumferential movement of the wheels due to rotation, then results in
a) slipping
b) skidding
c) turning
d) revolving

46. Camber in road is provided for
    a) effective drainage
    b) counteracting the centrifugal force
    c) having proper sight distance
    d) none of the above

47. Bottommost layer of pavement is known as
    a) wearing course
    b) base course
    c) sub base course
    d) sub grade

48. The binder normally used in flexible pavement construction is
    a) cement
    b) lime
    c) bitumen
    d) none of the above

49. When the bituminous surfacing is done on already existing black top road, the type of treatment given is
    a) seal coat
    b) tack coat
    c) prime coat
    d) spray emulsion

50. Which of the following tests measures the toughness of road aggregates
    a) crushing strength test
    b) abrasion test
    c) impact test
    d) shape test

51. The viscosity of a gas
    a) decreases with increase in temperature
    b) increases with increase in temperature
    c) is independent of temperature
    d) none of the above

52. The viscosity of a liquid
    a) decreases with increase in temperature
    b) increases with increase in temperature
    c) is independent of temperature
    d) none of the above

53. Centre of buoyancy always
    a) coincides with the centre of gravity
    b) coincides with the centroid of the volume of fluid displaced
    c) remains above the centre of gravity
    d) remains below the centre of gravity

54. The stream lines and path lines are identical in
    a) uniform flow
    b) steady flow
    c) incompressible flow
    d) frictionless flow

55. The depth of flow over a broad crested weir is said to be critical, when
a) discharge is maximum
b) velocity is maximum
c) pressure is maximum
d) none of the above

56. In pipes connected in series
a) the head loss is same through each pipe
b) the discharge is same through each pipe
c) the discharge is more in the first pipe
d) none of the above

57. For maximum discharge in a circular channel, the hydraulic radius is approximately
a) 0.29 times the diameter of the channel
b) 0.40 times the diameter of the channel
c) 0.55 times the diameter of the channel
d) all the above

58. Which of the following is not a PERT event
a) site investigation started
b) sessional work completed
c) foundation digging completed
d) class is being attended

59. Which of the following does not represent an activity
a) site located
b) foundation is being dug
c) office area is being cleaned
d) invitations are being sent

60. In PERT network, the critical path
a) is always longest
b) is always shortest
c) may be longest
d) may be shortest

61. In moment distribution method, the sum of distribution factors off all the members meeting at any joint is always
a) zero
b) less than 1.0
c) 1.0
d) greater than 1.0

62. The carryover factor for moment in a prismatic member whose far end is fixed is
a) 0
b) 1/2
c) 3/5
d) 1

63. The carryover factor for moment in a prismatic member whose far end is hinged is
a) 0
b) 1/2
c) 3/5
d) 1

64. The moment required to rotate the near end of a prismatic beam through a unit angle without translation, the far end being simply supported, is
a) 3EI/L
b) 4EI/L
c) 2EI/L
d) EI/L
where EI is the flexural rigidity and L is the span of beam

65. The moment required to rotate the near end of a prismatic beam through a unit angle without translation, the far end being fixed, is
a) 3EI/L
b) 4EI/L
c) 2EI/L
d) EI/L
where EI is the flexural rigidity and L is the span of beam

66. Which source of water, among the following is not a surface source
a) river
b) well
c) lake
d) ocean

67. Ground water is usually free from
a) suspended impurities
b) dissolved impurities
c) both (a) & (b)
d) none of the above

68. Safe water is one, which does not
a) contain pathogenic bacteria
b) have turbidity
c) have taste
d) none of the above

69. Water with pH equal to 7 is
a) acidic
b) alkaline
c) neutral
d) none of the above

70. The suitable method for disinfection of swimming pool water is
a) ultra violet rays treatment
b) lime treatment
c) chlorination
d) none of the above

71. Which of the following is the most read section of a thesis?
a) Title page
b) Table of contents
c) Abstract
d) Research Design

72. Which of the following is the most essential characteristic of a research worker?
    a) Sympathy
    b) Open mindedness
    c) Patience
    d) Emotional control

73. The decline of the British Empire should have spelt the decline of English. This statement is a/an
    a) fact
    b) advice
    c) opinion
    d) prejudice

74. The basic functions of communication is to
    a) inform people
    b) instruct people
    c) influence people
    d) all the above

75. The most important function of a teacher is to
    a) facilitate learning
    b) manage instructional resources
    c) coordinate curricular activities
    d) none of the above

76. Instructional objectives are useful to
    a) teachers
    b) students
    c) question paper setters
    d) all of the above

77. Which of the following is most likely a population as opposed to a sample
    a) respondents to a newspaper survey
    b) the first 5 students completing an assignment
    c) every third person to arrive at the bank
    d) registered voters in a county

78. The following are the durations (in minutes) of a sample of long-distance phone calls made within a country, reported by one long-distance carrier

Time (in Minutes)	Relative Frequency
0 but less than 5	0.37
5 but less than 10	0.22
10 but less than 15	0.15
15 but less than 20	0.10
20 but less than 25	0.07
25 but less than 30	0.07
30 or more	0.02

If 10 calls lasted 30 minutes or more, how many calls lasted less than 5 minutes
    a) 10
    b) 185
    c) 295
    d) 500

79. In a perfectly symmetrical bell-shaped "normal" distribution
   a) the arithmetic mean equals the median
   b) the median equals the mode
   c) the arithmetic mean equal the mode
   d) all the above

80. Which of the following is NOT a measure of central tendency?
   a) the arithmetic mean
   b) the geometric mean
   c) the mode
   d) the interquartile range

81. Which of the following is the easiest to compute?
   a) the arithmetic mean
   b) the median
   c) the mode
   d) the geometric mean

82. In its standardized form, the normal distribution
   a) has a mean of 0 and a standard deviation of 1.
   b) has a mean of 1 and a variance of 0.
   c) has an area equal to 0.5.
   d) cannot be used to approximate discrete probability distributions.

83. In testing a hypothesis using the χ^2 test, the theoretical frequencies are based on the
   a) null hypothesis.
   b) alternative hypothesis.
   c) normal distribution.
   d) none of the above.

84. In simple linear regression, the slope represents (X is the abscissa & Y is the ordinate)
   a) predicted value of Y when X = 0.
   b) the estimated average change in Y per unit change in X.
   c) the predicted value of Y.
   d) variation around the line of regression.

85. Given below is a set of observations
   21, 22, 31, 34, 31, 22, 17 and 26
   The median of the data is
   a) 24
   b) 21
   c) 34
   d) 31

86. Given below is a set observations.
   21, 22, 31, 31, 22, 17 and 26
   The median of the data is
   a) 22
   b) 21
   c) 34
   d) 31

87. The normal distribution has ------------- parameters
    a) 2
    b) 1
    c) 3
    d) None of the above

88. A campus program evenly enrolls graduate and post-graduate students. If a random sample of 4 students is selected from the program to be interviewed about the introduction of a new fast food outlet in the campus, what is the probability that all 4 students selected are graduate students?
    a) 0.0256
    b) 0.0625
    c) 0.16
    d) 1.00

89. Standard deviation of a data set
    a) is always positive
    b) is always negative
    c) can be negative or positive
    d) none of the above

90. The geometric mean of a data set 5, 5, 5, 5 is
    a) 2.5
    b) 10
    c) 5
    d) none of the above