Part – A
Subject Specific (Engineering Discipline)
Mechanical Engineering
Model Question Paper - 50 Marks

1. Center of gravity of a thin hollow cone lies on the axis at a height of
(a) one-fourth of the total height above base
(b) one-third of the total height above base
(c) one-half of the total height above base
(d) three-eighth of the total height above the base

2. A trolley wire weighs 1.2 kg per meter length. The ends of the wire are attached to two poles 20 meters apart. If the horizontal tension is 1500 kg find the dip in the middle of the span
(a) 2.5 cm
(b) 3.0 cm
(c) 4.0 cm
(d) 5.0 cm

3. Which one of the following statements is not correct
(a) the tangent of the angle of friction is equal to coefficient of friction
(b) the angle of repose is equal to angle of friction
(c) the tangent of the angle of repose is equal to coefficient of friction
(d) the sine of the angle of repose is equal to coefficient to friction
(e) none of the

4. If three forces acting in different planes can be represented by a triangle, these will be in
(a) non-equilibrium
(b) partial equilibrium
(c) full equilibrium
(d) unpredictable

5. The M.I. of hollow circular section about a central axis perpendicular to section as compared to its M.I. about horizontal axis is
(a) same
(b) double
(c) half
(d) four times

6. In ideal machines
(a) mechanical advantage is greater than velocity ratio
(b) mechanical advantage is equal to velocity ratio
(c) mechanical advantage is less than velocity ratio
(d) mechanical advantage is unity

7. The intensity of stress which causes unit strain is called
(a) unit stress
(b) bulk modulus
(c) modulus of rigidity
(d) modulus of elasticity

8. The value of modulus of elasticity for mild steel is of the order of
(a) $2.1 \times 105 \text{ kg/cm}^2$
(b) $2.1 \times 106 \text{ kg/cm}^2$
(c) $2.1 \times 107 \text{ kg/cm}^2$
(d) $0.1 \times 1O6 \text{ kg/cm}^2$ (<?) $3.8 \times 106 \text{ kg/cm}^2$.

9. The energy absorbed in a body, when it is strained within the elastic limits, is known as
(a) strain energy
(b) resilience
(c) proof resilience
(d) modulus of resilience

10. The maximum strain energy that can be stored in a body is known as
(a) impact energy
(b) resilience
(c) proof resilience
(d) modulus of resilience

11. A beam is loaded as cantilever. If the load at the end is increased, the failure will occur
(a) in the middle
(b) at the tip below the load
(c) at the support
(d) anywhere

12. Diamond riveted joint can be adopted in the case of following type of joint
(a) butt joint
(b) lap joint
(c) double riveted lap joints
(d) all types of joints

13. Longitudinal stress in a thin cylinder is
(a) equal to the hoop stress
(b) twice the hoop stress
(c) half of the hoop stress
(d) one-fourth of hoop stress
(e) four times the hoop

14. Shear stress induced in a shaft subjected to tension will be
(a) maximum at periphery and zero at center
(b) maximum at center
(c) uniform throughout
(d) average value in center

15. Oldham's coupling is the
(a) second inversion of double slider crank chain
(b) third inversion of double slider crank chain
(c) second inversion of single slider crank chain
(d) third inversion of slider crank chain

16. Elements of pairs held together mechanically is known as
(a) closed pair
(b) open pair
(c) mechanical pair
(d) rolling pair

17. The Ackermann steering mechanism is preferred to the Davis type in automobiles
     because
(a) the former is mathematically accurate
(b) the former is having turning pair
(c) the former is most economical
(d) the former is most rigid

18. Creep in belt drive is due to
(a) material of the pulley
(b) material of the belt
(c) larger size of the driver pulley
(d) uneven extensions and contractions due to varying tension

19. In S.H.M., acceleration is proportional to
(a) velocity
(b) displacement
(c) rate of change of velocity
(d) all of the above

20. Cam size depends upon
(a) base circle
(b) pitch circle
(c) prime circle
(d) outer circle

21. The rate of increase of velocity with respect to change in the position of fluid particle in a flow field is called as
(a) local acceleration
(b) temporal acceleration
(c) convective acceleration
(d) all of the above

22. The study of force which produces motion in a fluid is called as
(a) fluid statics
(b) fluid dynamics
(c) fluid kinematics
(d) none of the above

23. Minor losses do not make any serious effect in
(a) short pipes
(b) long pipes
(c) both the short as well as long pipes
(d) cannot say

24. Superheated vapour behaves

(a) exactly as gas
(b) as steam
(c) as ordinary vapour
(d) approximately as a gas

25. Characteristic gas constant of a gas is equal to

(a) C/Cv
(b) Cv/Cp
(c) Cp - Cv
(d) Cp + Cv

26. An open system is one in which

(a) mass does not cross boundaries of the system, though energy may do so
(b) neither mass nor energy crosses the boundaries of the system
(c) both energy and mass cross the boundaries of the system
(d) mass crosses the boundary but not the energy

27. Which of the following is not the intensive property

(a) pressure   (b) temperature   (c) density   (d) heat

28. Which of the following processes is irreversible process
(a) isothermal
(b) adiabatic
(c) throttling
(d) all of the above

29. Otto cycle consists of following four processes
(a) two isothermals and two isentropics
(b) two isentropics and two constant volumes
(c) two isentropics, one constant volume and one constant pressure
(d) two isentropics and two constant pres-sures

30. Which of the following has least value of conductivity
(a) glass
(b) plastic
(c) rubber
(d) air.

31.   Heat transfer by radiation mainly depends upon
(a)   its temperature
(b)   nature of the body
(c)   kind and extent of its surface
(d)   all of the above

32.   A grey body is one whose absorptivity
(a)   varies with temperature
(b)   varies with wavelength of the incident ray
(c)   is equal to its emissivity
(d)   does not vary with temperature and. wavelength of the incident ray

33. LMTD in case of counter flow heat exchanger as compared-to parallel flow heat exchanger is
(a)   higher
(b)   lower
(c)   same
(d)   depends on the area of heat exchanger

34.The concept of overall coefficient of heat transfer is used in case of heat transfer by
(a)   conduction
(b)   convection
(c)   radiation
(d)   conduction and convection

35. The thermal diffusivity for solids are generally
(a) less than those for gases
(b) jess than those for liquids
(c) more than those for liquids and gases
(d) more or less same as for liquids and gases

36. A stud
  (a) has a head on one end and a nut fitted to the other
  (b) has head at one end and other end fits into a tapped hole in the other part to be joined
  (c) has both the ends threaded
  (d) has pointed threads

37. Shear stress theory is applicable for
  (a) ductile materials
  (b) brittle materials
  (c) elastic materials
  (d) all of the above

38. Taper usually provided on cotter is
  (a) 1 in 5
  (b) 1 in 10
  (c) 1 in 24
  (d) 1 in 40

39. When a nut is tightened by placing a washer below it, the bolt will be subjected tofollowing type of loads
  (a) compression
  (b) tension
  (c) shear
  (d) combined loads

40. Gear box is used
  (a) to produce torque
  (b) for speed reduction
  (c) to obtain variable speeds
  (d) to increase efficiency of system

41. Spring stiffness is
  (a) ratio of coil diameter to wire diameter
  (b) load required to produce unit deflection
  (c) its capability of storing energy
  (d) its ability to absorb shocks

42. In hydrodynamic bearings
   (a) the oil film pressure is generated only by the rotation of the journal
   (b) the oil film is maintained by supplying oil under pressure
   (c) do not require external supply of lubricant
   (d) grease is used for lubrication

43. If two springs are in parallel then their overall stiffness will be
   (a) half
   (b) same
   (c) double
   (d) unpredictable

44. Puck up the wrong statement about centrifugal pump
   (a) discharge a diameter
   (b) head a speed2
   (c) head a diameter
   (d) Power a speed3

45.The rated life of a bearing varies
   (a) directly as load
   (b) inversely as square of load
   (c) inversely as cube of load
   (d) inversely as fourth power of load

46. The rated life of a bearing varies
   (e) directly as load
   (f) inversely as square of load
   (g) inversely as cube of load
   (h) inversely as fourth power of load

47. In oiliness bearings
   (a) the oil film pressure is generated only by the rotation of the journal
   (b) the oil film is maintained by supplying oil under pressure
   (c) do not require external supply of lubricant
   (d) grease required to be applied after some intervals none of the above.

48. A material capable of absorbing large amount of energy before fracture is known as
   (a) ductility
   (b) toughness
   (c) resilience
   (d) shock proof

49. Rivets are made of following type of material
  (a) tough
  (b) hard
  (c) resilient
  (d) ductile

50. Whether any core is required in wire ropes
  (a) yes
  (b) no
  (c) sometimes
  (d) rarely

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:

    (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:

    (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) 5/7   (B) 5/4

    (C) 7/8   (D) 3/6

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

    (A) 45^0 (B) 55^0

    (C) 60^0 (D) 70^0

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 <u>he is working</u> 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.

(B) A method to reduce cross-talks

(C) Storage of data within the transmitting medium until the receiver is ready to receive

(D) A method to reduce the routing overhead

15) What is the name of the virus that fool a user into downloading and executing them by pretending to be   useful applications?

(A) Trojan Horses   (B) keylogger

(C) worm   (D) ransomware

16) Which among the following is NOT a web browser?

(A) SpaceTim

(B) NeoPlanet

(C) Sputnik

(D) MeeGo

17) Which of the following comprise the software components of a computer?

(A) Programs

(B) Keyboard

(C) BIOS

(D) Memory

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

(A) Layers an Lines   (B) Rows and Columns

(C) Layers and Planes   (D) Height and Width

19) Which of these IEEE standards represent wireless local area network?

(A) 802.11   (B) 802.3

(C) 802.12   (D) 802.1

20) Which of these protocols is used by TFTP for data transport?

    (A) TCP   (B) UDP

    (C) Both A&B   (D) None of the Above

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 : ___

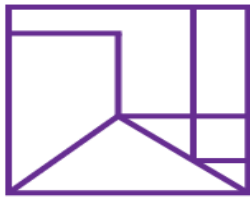   (A) 576   (B) 567

    (C) 512   (D) 520

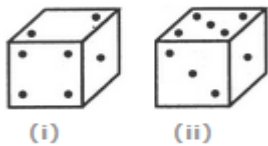25) Find the number of parallelograms.

   (A) 8

   (B) 10

   (C) 15

   (D) None of These

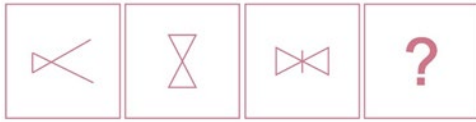26) How many triangles are there in the following figure?

   (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?
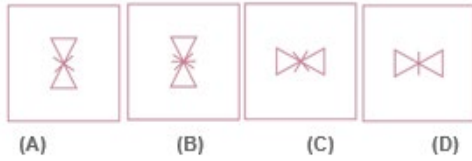

(i)   (ii)

   (A) 3   (B) 5

   (C) 6   (D) None of these

28) Questions Figures

Answer figures

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

(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

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. $T : R^3 \to R^3$ 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. $T: P_2(R) \to P_3(R)$ 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,   x+y-6z = -12,   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?

   a) Diagonal transformation

   b) Column transformation

   c) Row transformation

   d) Square transformation

14. Solve the equations using Gauss Jordan method.

   $x + 2y + 6z = 15$, $3x + 4y + z = 16$, $6x - y - z = 20$

   a) $x = 3.735, y = 0.795, z = 1.612$

   b) $x = 3.735, y = 3.735, z = 1.612$

   c) $x = 3.735, y = 1.612, z = 3.735$

   d) $x = 1.612, y = 0.795, z = 3.735$

15. Gauss Seidal method is also termed as a method of _____

   a) Successive displacement

   b) Eliminations

   c) False positions

   d) Iterations

16. Which of the following is not Dirichlet's condition for the Fourier series expansion?

   a) f(x) is periodic, single valued, finite

   b) f(x) has finite number of discontinuities in only one period

   c) f(x) has finite number of maxima and minima

   d) 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) a_n

   b) b_n

   c) a_0

   d) Everything is present

18. Find b_n if the function $f(x) = x^2$.

   a) finite value

   b) infinite value

   c) zero

   d) can't be found

19. What is the coefficient of x^{101729} in the series expansion of $\cos(\sin(x))$?

   a) 0   b) $1/101729!$ c) $-1/101729!$ d) 1

20. The angle between Radius vector $r=a(1-\cos\theta)$ and tangent to the curve is Ø given by _____

   a) Ø=π/ 2   b) Ø=π   c) Ø=−π/2   d) Ø=0