

Sr. No. ....13311.....

**ENTRANCE TEST-2024**  
**2-Year M Tech Programme**  
**Design Engineering/Mechanical Engineering**

Total Questions : 60  
Time Allowed : 70 Minutes

Roll No.

--	--	--	--	--	--

1. Write your roll number in the space provided at the top of this page of question booklet and fill up the necessary information in the spaces provided on OMR Answer sheet.
2. OMR Answer sheet has an original copy and a candidate's copy glued beneath it at the top. While making entries in the original copy, candidate should ensure that the two copies are aligned properly so that the entries made in the original copy against each item are exactly copied in the candidate's copy.
3. All entries in the OMR answers sheet including answers to questions are to be recorded in the original/Carbon copy.
4. Use only blue/ black ball point pen to darken the circle of correct / most appropriate response. In no case gel/ ink pen or pencil should be used.
5. Do not darken more the one circle of option for any question. A question with more than one darkened response shall be considered wrong.
6. There will be negative marking for wrong answers. Each wrong answer will lead to the deduction of 0.25 marks from the total score of the candidate.
7. Only those candidates who would obtain positive score in entrance test examination shall be eligible for admission.
8. Do not make any stray mark on the OMR sheet.
9. Calculators and mobiles shall not be permitted inside the examination hall.
10. Rough work, if any, should be done on the blank sheets provided with the question booklet.
11. OMR answer sheet must be handled carefully and it should not be folded or mutilated in such case it will not be evaluated.
12. Ensure that your OMR Answer sheet has been signed by the invigilator and the candidate himself/herself.
13. At the end of the examination hand over the OMR answer sheet to the invigilator who will first tear off the original OMR sheet in presence of the candidate and hand over the candidate's copy to the candidate.
14. If any of the information in the response Sheet/Question Paper has been found missing or not mentioned as stated above the candidate is solely responsible for that lapse.

SEAL



1. Let A be a  $5 \times 5$  matrix with real entries such that the sum of the entries in each row of A is 1. Then the sum of all the entries in  $A^3$  is
  - a) 3
  - b) 15
  - c) 5
  - d) 125
2. For the function  $f(x,y)=\sin(xy)$ , the point (0,0) is
  - a) Saddle point
  - b) Minima
  - c) Maxima
  - d) Constant
3. The signature of the O.D.E  $y'+Py=Qy^n$ ,  $n \neq 1$ 
  - a) Bernoulli's equations
  - b) Gaussian's equations
  - c) Bessel's equations
  - d) Legendre's equations
4. Cauchy Riemann equations are
  - a) Necessary condition for a function to be analytic
  - b) Sufficient condition for a function to be analytic
  - c) Both a and b
  - d) None of the above
5. A box contains 5 brown and 4 white socks. A man pulls out two socks. The probability they are of the same color is
  - a)  $1/3$
  - b)  $3/5$
  - c)  $5/18$
  - d)  $4/9$
6. By Simpson's  $\frac{1}{3}$  rule, the value of  $\int_1^7 dx/x$  is
  - a) 1.358
  - b) 1.958
  - c) 1.625
  - d) 1.458
7. Air standard diesel cycle has a compression ratio of 14 and cut off takes place at 6% of the stroke. What is the cut off ratio?
  - a) 0.60
  - b) 0.78
  - c) 1.78
  - d) None of the above



**M.Tech Design Engineering/ Mechanical Engineering**

8. The thermodynamic cycle used in aircraft refrigeration is
  - a) reversed Carnot
  - b) reversed Brayton
  - c) Vapour Compression cycle
  - d) reversed Stirling
9. Which of the following statements is/are correct in reference to the introduction stage of the Product Life Cycle?
  - a) The market size for the product is small
  - b) The sales of product are low
  - c) The cost of research ,development and marketing are high
  - d) All of the above
10. Which of the following is not a quantitative technique of forecasting?
  - a) Exponential smoothing analysis
  - b) moving average method
  - c) Weighted average method
  - d) Delphi technique
11. Buying of goods or material for production in a way that they are delivered directly on the manufacturing facility of the company is called
  - a) economic order purchasing
  - b) just in time purchasing
  - c) annual purchasing
  - d) both a & b
12. The decision model to calculate optimal quantity of inventory to be ordered is known as
  - a) efficient order quantity
  - b) economic order quantity
  - c) efficient order quality
  - d) economic order quality
13. A high contact ratio value usually implies (with reference to gears)
  - a) a more uniform performance of geared wheels
  - b) increase in load transmission capacity
  - c) decrease in load transmission capacity
  - d) both a and b
14. Determine the approximate number of teeth in a 20 degree involute spur gear so that the base circle diameter will be equal to the dedendum circle diameter.
  - a) 25
  - b) 45
  - c) 67
  - d) 21



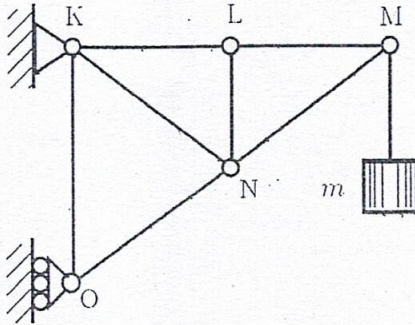
15. The characteristics of underdamped system of motion are
- a) amplitude decreases with time
  - b) amplitude increases with time
  - c) amplitude is constant with time
  - d) none of the given
16. The ratio of max displacement of forced vibration to deflection due to static force is defined as
- a) damping factor
  - b) magnification factor
  - c) logarithmic decrement
  - d) vibration isolation
17. Metallic bonding is
- a) Directional in nature
  - b) Non directional in nature
  - c) Directional in nature for FCC crystal structure
  - d) Directional in nature for BCC crystal structure
18. Which of the following is correct combination of metal and corresponding crystal structure
- a) Aluminum=FCC, Nickel=FCC, Gold= FCC
  - b) Aluminum=BCC, Nickel=FCC, Gold= FCC
  - c) Aluminum=FCC, Nickel=BCC, Gold= FCC
  - d) Aluminum=FCC, Nickel=FCC, Gold= BCC
19. Which one of the following statements is **TRUE**?
- a) The 'GO' gage controls the upper limit of a hole
  - b) The 'NO GO' gage controls the lower limit of a shaft
  - c) The 'GO' gage controls the lower limit of a hole
  - d) The 'NO GO' gage controls the lower limit of a hole
20. Which one of the following instruments is widely used to check and calibrate geometric features of machine tools during their assembly?
- a) Ultrasonic probe
  - b) Coordinate Measuring Machine (CMM)
  - c) Laser interferometer
  - d) Vernier calipers
21. NC contouring is an example of
- a) continuous path positioning
  - b) point-to-point positioning
  - c) absolute positioning
  - d) incremental positioning



22. Number of minimum control points required to generate a quadratic B-spline curve

- a) 2
- b) 3
- c) 4
- d) 5

23. The figure shows a pin jointed plane truss loaded at the point M by hanging a mass of 100 Kg. The member LN of the truss is subjected to a load of



- a) 490 Newton in compression
- b) 490 Newton in Tension
- c) Zero Newton
- d) 980 Newton in compression

24. The product of inertia of a semicircle of radius 2 mm about its diameter is

- a) 0
- b)  $\sqrt{2}$  mm<sup>4</sup>
- c) 6 mm<sup>4</sup>
- d) 3 mm<sup>4</sup>

25. A steel bolt passes through a brass tube and nuts and washers are provided on both ends. The area of cross section of steel bolt is 500 mm<sup>2</sup> and that of brass tube is 1000 mm<sup>2</sup>. When nut is tightened on threaded portion of the bolt a tensile stress of 200 N/mm<sup>2</sup> is induced in steel. If  $E_{\text{Steel}} = 2 E_{\text{Brass}}$  the stress developed in the brass tube would be

- a) 400 N/mm<sup>2</sup>
- b) 50 N/mm<sup>2</sup>
- c) 300 N/mm<sup>2</sup>
- d) 100 N/mm<sup>2</sup>

26. A solid shaft, 80 mm in diameter is subjected to a twisting moment of  $48 \times 10^5$  Nmm. The maximum intensity of shear stress induced will be approximately

- a) 23.9 N/mm<sup>2</sup>
- b) 47.8 N/mm<sup>2</sup>
- c) 71.7 N/mm<sup>2</sup>
- d) 95.6 N/mm<sup>2</sup>



27. The locus of the standard liquid line and standard vapor line meets at
- Boiling point
  - Ice Point
  - Critical pint
  - Triple point
28. 400 J of work is done on a gas to reduce its volume by compression adiabatically. What is the change in the internal energy of the gas
- +400 J
  - 400 J
  - +500 J
  - 500 J
29. A heat exchange process in which the product of pressure and volume remains constant is known as
- Throttling process
  - Isentropic process
  - Adiabatic process
  - Hyperbolic process
30. The solidification time of a spherical casting of 200 mm diameter is 1078 second then what will be its solidification factor
- $9.1 \times 10^6 \text{ s/m}^2$
  - $1.2 \times 10^6 \text{ s/m}^2$
  - $0.97 \times 10^6 \text{ s/m}^2$
  - None of the above
31. Cold shuts are casing defects
- Which occur due to some sand shearing from the cope surfaces
  - Caused by two streams of metals that are too cold to fuse properly
  - Which occur due to discontinuity in metal casting resulting from hindered contraction
  - Which take the form of internal voids or surface depression due to excessive gaseous material not able to escape
32. Which of the following components is mainly manufactured by performing metal forging?
- Engine connecting rod
  - Engine block
  - Piston
  - Crankcase
33. A non-dimensional number usually related with natural convection heat transfer is
- Weber number
  - Prandtl number
  - Reynold number
  - Grashoff number



34. The dimensional formula for Thermal resistance is given by
- $[M^{-1}L^{-2}T^3K]$
  - $[M L^{-2} T K^{-1}]$
  - $[M^{-1}L^{-1}T^3K]$
  - $[M^{-1}L^{-1}T^{-3}K]$
35. Air flows (laminar) over a heated flat plate, ( $Pr = 0.7$ ), if  $\delta$  is the hydrodynamic boundary layer thickness and  $\delta_t$  thermal boundary layer then
- $\delta < \delta_t$
  - $\delta > \delta_t$
  - $\delta = 0.99 \delta_t$
  - $\delta^2 > \delta_t$
36. Identify the units of heat transfer coefficient
- $W/m^3.K$
  - $(W/m^2).K$
  - $W.m^2/K$
  - $W/(m^2.K)$
37. In an ultrasonic machining (USM) process, the material removal rate (MRR) is plotted as a function of the feed force of the USM tool. With increasing feed force, the MRR exhibits the following behavior
- First increases and then decreases
  - Increases linearly
  - Decreases linearly
  - Does not change
38. For a merchant circle diagram? Which of the following assumption is not valid.
- Segmented form of chips
  - Continuous Chips
  - Cutting edge remains sharp
  - No built up edge
39. Force exerted by tool on chip normal to tool face is known as
- Cutting force
  - Frictional resistance
  - Backing up force
  - Shear force
40. The value of Poisson's ratio depends upon
- Material of test specimen
  - Magnitude of load
  - Nature of load; tensile or compressive
  - cross section and dimension of the test piece
41. During inelastic collision of two particles, which one of the following is conserved?
- total linear momentum only
  - total kinetic energy only
  - both linear momentum and kinetic energy
  - neither linear momentum nor kinetic energy



**M.Tech Design Engineering/ Mechanical Engineering**

42. The use of computers to control the operation of production process is known as

- a) CAD
- a) CAE
- b) CAM
- c) CAO

43. For the given assembly: 25 H7/g8, match Group A with Group B

Group A	Group B
P. H	Shaft Type
Q. IT8	Hole Type
R. IT7	Hole Tolerance Grade
S. g	Shaft Tolerance Grade

- a) P-I, Q-III, R-IV, S-II
- b) P-I, Q-IV, R-III, S-II
- c) P-II, Q-III, R-IV, S-I
- d) P-II, Q-IV, R-III, S-I

44. Impurity defect results in

- a) generation of tensile stress field in material
- b) generation of compressive stress field in material
- c) generation of tensile and compressive stress field in material depending on size of impurity
- d) generation of shear stress field in material

45. Response of a system subjected to a suddenly applied nonperiodic force will be

- a) Periodic
- b) Transient
- c) Steady
- d) initially transient and then steady

46. Which of the following is not correct

- a) During descend cam doesn't apply any force on follower
- b) During ascend cam doesn't apply any force on follower
- c) Driving force in cam follower mechanism is strong function of pressure angle
- d) None of the given

47. Which of the following is not an inventory

- a) Machines
- b) Raw material
- c) Finished products
- d) Consumable tools



48. What is the correct sequence of the activities involved in production planning and control system?

- a) Routing-Dispatching-Scheduling-Loading
- b) Routing-Scheduling-Loading-Dispatching
- c) Loading-Dispatching-Routing-Scheduling
- d) Scheduling-Loading-Dispatching-Routing

49. Indication of amount of moisture in air is given

- a) DBT
- b) WBT
- c) DPT
- d) Saturation Temperature

50. The quadrature formulae  $\int_{-1}^1 f(dx) = \frac{1}{3} [f(-1) + 4f(0) + f(1)]$  with step length  $h=1.0$  is exact for polynomials of degree less than or equal to

- a) 2
- b) 3
- c) 4
- d) None of the above

51. A card is drawn from a pack of 100 cards numbered 1 to 100. The probability of drawing a number which is a square

- a) 1/18
- b) 1/10
- c) 1/2
- d) 1/9

52. Which of the following functions is analytic in complex plane where  $f(z)$

- a)  $Re\ z$
- b)  $Im\ z$
- c)  $Cot\ z$
- d) None of the above

53. Integrating factor of  $dy = e\ dy = \{e^{x-y} (e^x - e^y)\}dx$  is

- a)  $\theta$
- b)  $2\theta$
- c)  $3\theta$
- d)  $4\theta$

54. If  $f(x, y, z) = 3x^2y + 2y - 3z$ , then  $\nabla f =$

- a)  $(6x^2y, 3x^2, 3)$
- b)  $(6xy, 3x^2 + 2, 3)$
- c)  $(6xy, 3x^2, -3)$
- d)  $(6xy, 3x^2 + 2, -3)$



55. Which of the following is the eigen value of  $A = \begin{bmatrix} 1 & 2 & 2 \\ 1 & -2 & 5 \\ 2 & 5 & -3 \end{bmatrix}$

- a) 1
- b) 2
- c) 3
- d) 4

56. In a draft tube, the gradual increase in cross-sectional area is designed to:

- a) Reduce the velocity of water
- b) Increase the kinetic energy of water
- c) Increase the turbulence in the water
- d) Maintain constant pressure throughout the tube

57. Rotating shafts tend to vibrate violently in the transverse direction at a certain speed, this speed is called

- a) *whirling speed*
- b) whipping speed
- c) critical speed
- d) All of the above

58. A non-dimensional number usually related with natural convection heat transfer is

- a) Weber number
- b) Prandtl number
- c) Reynold number
- d) Grashoff number

59. The enthalpy of dry saturated steam with the increase in pressure

- a) Increases
- b) Decreases
- c) Remains constant
- d) First Increases then decreases

60. If Poisson's ratio of a material is 0.5, then the elastic modulus for the material is:

- a) three times its shear modulus
- b) four times its shear modulus
- c) equal to its shear modulus
- d) indeterminate