ENTRANCE TEST-2019

000341

SCHOOL OF ENGINEERING

M.TECH. IN MECHANICAL ENGINEERING

Total Questions : 60

Question Booklet Series | A |

Time Allowed : 70 Minutes

Roll No:

Instructions for Candidates:

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 the 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 Answer Sheet, including answers to questions, are to be recorded in the Original Copy only.

4. Choose the correct / most appropriate response for each question among the options A, B, C and D and darken the circle of the appropriate response completely. The incomplete darkened circle is not correct read by the OMR Scanner and no complaint to this effect shall be entertained.

5. 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.

6. Do not darken more than one circle of options for any question. A question with more than one darkened response shall be considered wrong.

7. 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.

8. Only those candidates who would obtain positive score in Entrance Test Examination shall be eligible for admission.

9. Do not make any stray mark on the OMR sheet.

10. Calculators and mobiles shall not be permitted inside the examination hall.

11. Rough work, if any, should be done on the blank sheets provided with the question booklet.

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12. OMR Answer sheet must be handled carefully and it should not be folded or mutilated in such case it will not be evaluated.

13. Ensure that your OMR Answer Sheet has been signed by the Invigilator and the candidate himself/herself.

14. 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.

1) The lengths of links of 4 bar linkage with revolute pairs only are p, q. r and s units. Given that p<q<r<s. which of these links should be fixed one. for obtaining a "double crank" mechanism?

   a) Link of length p
   b) Link of length q
   c) Link of length r
   d) Link of length s

2) The number of degrees of freedom of a planar linkage with 8 links and 9 simple revolute joints is
   a) 1
   b) 2
   c) 3
   d) 4

3) Mobility of a statistically indeterminate structure is
   a) ≤ -1
   b) 0
   c) 1
   d) ≥ 2

4) In a CAM drive, it is essential to offset the axis of a follower to
   a) Increase the side thrust between the follower and CAM
   b) To avoid the jamming of translating follower in its bearing guide
   c) Take care of space limitation
   d) Reduce the cost

5) For a CAM follower mechanism with a reciprocating roller follower, in which of the following cases the follower has a constant acceleration?
   a) Cycloidal motion
   b) Simple harmonic motion
   c) Parabolic motion
   d) Polynomial motion

6) With the increase in the thickness of insulation around a circular pipe, heat loss to surroundings due to
   a) Convection increases, while as conduction decreases
   b) Convection decreases, while as conduction increases
   c) Convection and conduction increases
   d) Convection and conduction decreases

7) In case of one-dimensional heat conduction in a medium with constant properties. T is the temperature at position x, at time t. Then $\frac{\partial T}{\partial t}$ is proportional to

   (a) $\frac{T}{x}$

   (b) $\frac{\partial T}{\partial x}$

   (c) $\frac{\partial^2 T}{\partial x \partial t}$

   (d) $\frac{\partial^2 T}{\partial x^2}$

8) The value of Biot Number is very small(less than 0.01) when
   (a) The convective resistance of the fluid is negligible
   (b) The conductive resistance of the fluid is negligible
   (c) The conductive resistance of the solid is negligible
   (d) None of these

9) For the same inlet and outlet temperatures of hot and cold fluids, the LMDT is

   (a) Greater for parallel flow heat exchanger than counter flow heat exchanger
   (b) Greater for counter flow heat exchanger than parallel flow heat exchanger
   (c) Same for both counter and parallel flow heat exchangers.
   (d) Dependent on the properties of the fluids.

10) Air enters through a counter flow heat exchanger at 70°C and leaves at 40°C. Water enters at 30°C and leaves at 50°C. The LMDT in degree C is

   (a) 5.65
   (b) 14.43
   (c) 19.52
   (d) 20.17

11) In centrifugal casting, the impurities are
   a) Uniformly distributed
   b) Forced towards the outer surface
   c) Trapped near the mean radius of the casting
   d) Collected at the centre of the casting

12) Which of the following Arc welding processes does not use consumable electrodes
   a) GMAW
   b) GTAW
   c) Submerged Arc Welding
   d) None of the above

13) In an orthogonal machining operation, the chip thickness and the uncut thickness are equal to 0.45 mm. If the tool rake angle is zero degree, the shear plane angle is
   a) 45°
   b) 35°
   c) 30°
   d) 60°

14) The rake angle in a drill
   a) Increases from centre to periphery
   b) Decreases from centre to periphery
   c) Remains constant
   d) Does not influence drilling operation

15) With reference to the NC Machines, which of the following statement is wrong?
   a) Both open-loop and closed-loop control systems are used.
   b) Paper tapes, floppy tapes and cassettes are used for data storage.
   c) Digitizers may be used as interactive input devices.
   d) Post processor is an item of hardware.

16) Optimum spark timing gives
   (a) Higher mean effective pressure
   (b) Higher efficiency
   (c) Both (a) and (b)
   (d) None of the above

17) Octane number of natural gas is
   a) 60-80
   b) 80-100
   c) Greater than 100
   d) Less than 60

18) Venturi in the carburettor results in
   a) Decrease of the air velocity
   b) Increase of the air velocity
   c) Decrease of fuel flow
   d) Increase of manifold vacuum

19) Knocking takes place in CI engines
   a) At the start of combustion
   b) At the end of combustion
   c) During combustion
   d) None of the above

20) Decreasing the cooling water temperature in SI engines the knocking tendency
   a) Increases
   b) Decreases
   c) Not affected
   d) None of the above.

21) The normal stress is the same in all directions at a point in a fluid only when:
   a) The fluid is frictional
   b) The fluid is frictionless and incompressible
   c) The fluid has zero viscosity and is at rest
   d) One fluid layer has no motion relative to adjacent layer

22) Resultant pressure of the liquid in case of an immersed body acts through which one of the following?
   a) Centre of gravity
   b) Centre of pressure
   c) Metacentre
   d) Centre of buoyancy

23) A metacentric height of a passenger ship is kept lower than that of a naval or a cargo ship because
   a) Apparent weight will increase
   b) Otherwise it will be neutral equilibrium
   c) It will decrease the frequency of rolling
   d) Otherwise it will sink and be totally immersed

24) The components of velocity in a two dimensional frictionless incompressible flow are u= t^2 + 3y and v = 3t + 3x. What is the approximate resultant total acceleration at the point (3,2) and t=2?
   a) 5
   b) 49
   c) 59
   d) 54

25) The predominant forces acting on an element of fluid in the boundary layer over a flat plate placed in a uniform stream include
   a)   Inertia and Pressure forces
   b)   Viscous and Pressure forces
   c)   Viscous and Body forces
   d)   Viscous and Inertia Forces

26) The number of components (C), phases (P) and degrees of freedom (F) are related by Gibbs phase rule as
   a) C-P-F=2
   b) F-C-P=2
   c) C+F-P=2
   d) P+F-C=2

27) Which one of the following thermodynamic processes approximate the steaming of food in a pressure cooker?
   a) Isenthalpic
   b) Isobaric
   c) Isochoric
   d) Isothermal

28) The Internal energy of certain system is a function of temperature alone and is given by the formula E = 25 + 0.25t kJ. If this system executes a process for which the work done by it per degree temperature increases is 0.75 kN-m, the heat interaction per degree temperature increases, in kJ is
   a) -1.0
   b) -0.5
   c) 0.5
   d) 1.0

29) A tank containing air is stirred by a paddle wheel. The work input to the paddle wheel is 9000 kJ and the heat transferred to the surrounding from the tank is 3000 kJ. The external work done by the system is
   (a) Zero
   (b) 3000 kJ
   (c) 6000 kJ
   (d) 9000 kJ

30) When steam flows through a throttle valve and remains wet at exit
   a) Its temperature and Quality increases
   b) Its temperature decreases but Quality increases
   c) Its temperature increases but Quality decreases
   d) Its temperature and Quality decreases

31) Constant pressure lines in superheated region of the Mollier diagram will have
   a)   A positive slope
   b)   A negative slope
   c)   Zero slope
   d)   Both positive and negative slope

32) A jet of oil with relative density 0.7 strikes normally a plate with a velocity of 10m/s. The jet has an area of 0.03 m². The force exerted by plate on the jet is
   a)   210 N
   b)   2.1 kN
   c)   20.6 kN
   d)   206 N

33) Kaplan Turbine is
   a)   A high head mixed flow turbine
   b)   A low head axial flow turbine
   c)   An outward flow reaction turbine
   d)   An impulse inward flow turbine

34) A Francis turbine working at 400 rpm has a unit speed of 50 rpm and develops 500 kW of power. The effective head under which this machine operates is
   a)   62.5
   b)   64
   c)   40
   d)   100

35) The speed ratio of a Pelton wheel operating under a head of 900 m is 0.45. The peripheral velocity of the turbine wheel in m/s is
   a) 28
   b) 96
   c) 42
   d) 60

36) It is given that the actual demand is 59 units, a previous forecast 64 units and smoothening factor 0.3. what will be the forecast for next period using exponential smoothing

   a) 36.9 units
   b) 57.5 units
   c) 60.5 units
   d) 62.5 units

37) Which of the following is the measure of forecast error
   a) Mean absolute deviation
   b) Trend value
   c) Moving average
   d) Price fluctuation

38) In inventory control theory, the Economic Order Quantity (EOQ) is
   a) Average level of inventory
   b) Optimum lot size
   c) Lot size corresponding to break even analysis
   d) Capacity of a warehouse

39) In ABC analysis, an item requires
   a) No safety stock
   b) Low safety stock
   c) Moderate safety stock
   d) High safety stock

40) If M is the number of constraints in a linear programming problem with two variables x and y and non-negativity constraints x > 0, y > 0. The feasible region in the graphical solution will be surrounded by how many lines
   a) M
   b) M+1
   c) M+2
   d) M+3

41) For a Rhombohedral space lattice, which one of the following is correct
   a) $\alpha = \beta = \gamma = 90^0$
   b) $\alpha = \beta = \gamma \neq 90^0$
   c) $\alpha = \gamma = 90^0 \neq \beta$
   d) $\alpha \neq \beta \neq \gamma \neq 90^0$

42) Consider the following regarding their crystal structure
   I) Alpha Iron
   II) Aluminium
   III) Nickel
   IV) Zinc
   Which of these have FCC structure?
      a) I and II
      b) II and III
      c) III and IV
      d) I, II, III and IV

43) Addition of magnesium to cast iron increases its
   a) Hardness
   b) Ductility and strength in tension
   c) Corrosion resistance
   d) Creep strength

44) Pearlite consists of
   a) 6.67% C and 93.33% ferrite
   b) 12% Fe and 87% cementite
   c) 13% C and 87% ferrite
   d) 13% cementite and 87% ferrite

45) Which one of the following is an austenitic stabilizer
   a) Chromium
   b) Tungsten
   c) Nickel
   d) Molybdenum

46) A small element at the critical section of a component is in a bi-axial state of stress while the two principal stresses are 360 MPa and 140 MPa. The maximum working stress in MPa according to distortion energy theory is
   a) 220
   b) 110
   c) 314
   d) 330

47) A 60 mm long and 6 mm thick fillet weld carries a steady load of 15 kN along the weld. The shear strength of the weld material is 200 MPa. The factor of safety is
   a) 2.4
   b) 3.4
   c) 4.8
   d) 6.8

48) Stresses in a screw thread are estimated by considering the thread to be
   a) Long cantilever beam projecting from the pitch cylinder
   b) Long cantilever beam projecting from the root cylinder
   c) Short cantilever beam projecting from the root cylinder
   d) Short cantilever beam projecting from the pitch cylinder

49) In heavy duty gears heat treatment of gears is necessary to
   a) Avoid interference
   b) Prevent noisy operation
   c) Minimize wear of gear tooth
   d) Provide resistance against impact loading on gear tooth

50) In the formulation of Lewis equation for toothed gearing it is assumed that tangential tooth load acts on the
   a) Pitch point
   b) Tip of the tooth
   c) Root of the tooth
   d) Whole face of the tooth

51) An overhanging beam ABC is supported at points A and B as shown in the figure given below
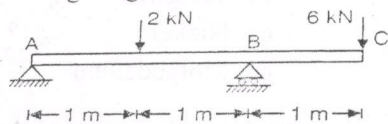
The maximum bending moment and the points where it occurs is

   a) 6 kN.m at the right support
   b) 6 kN.m at the left support
   c) 4.5 kN.m at the right support
   d) 4.5 kN.m at the midpoint between the supports

52) Four vertical columns of same material, height and weight have the same end conditions. Which cross section will carry the maximum load
   a) Solid circular section
   b) Thin hollow circular section
   c) Solid square section
   d) I-Section

53) A cantilever beam 2m in length is subjected to a uniformly distributed load of 5Kn/m. If E= 200GPa and I = 100 cm^4, the strain energy stored in the beam will be
   a) 7
   b) 12
   c) 8
   d) 10

54) A copper rod of 2 cm diameter is completely encased in a steel tube of inner diameter 2 cm and outer diameter 4 cm. Under an axial load the stress in the steel tube is 100 N/mm^2. If $E_s = 2E_c$, then the stress in the copper rod is
   a) 50 N/mm^2
   b) 33.33 N/mm^2
   c) 100 N/mm^2
   d) 300 N/mm^2

55) Two strain gauges fixed along the principal directions on a plane surface of a steel member recorded strain values of 0.0013 tensile and 0.0013 compressive respectively. Given that the value of $E = 2 \times 10^5$ MPa and $v = 0.3$, the largest normal and shearing stresses at this point are
   a) 200 MPa and 200 MPa
   b) 400 MPa and 200 MPa
   c) 260 MPa and 260 MPa
   d) 260 MPa and 520 MPa

56) A circular disc of radius R rolls without slipping at a velocity V. The magnitude of velocity at point P is
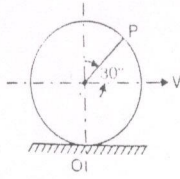
a) $\sqrt{3}\,V$

b) $\frac{\sqrt{3}}{2}\,V$

c) $\frac{V}{2}$

d) $\frac{2V}{\sqrt{3}}$

57) In a statically determinate plane truss the number of joints (j) and the number of members (m) are related by

a) $j = 2m - 3$

b) $m = 2j + 1$

c) $m = 2j - 3$

d) $m = 2j - 1$

58) Consider a truss PQR loaded at P with force F as shown in the figure given below
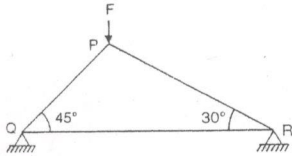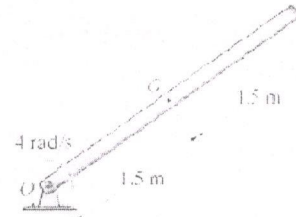

The tension in the member QR is

a) 0.5 F

b) 0.63 F

c) 0.73 F

d) 0.87 F

59) The coefficient of restitution of a perfectly plastic impact is

a) Zero

b) 1

c) 2

d) Infinite

60) The angular momentum of the 100 kg rod given below about point o is

a) 1000 Kg.m^2/s

b) 1500 Kg.m^2/s

c) 1300 Kg.m^2/s

d) 1200 Kg.m^2/s