

Test Booklet
Series

A

Paper No.

17

Written Test Paper, 2021

MASTER SKILL INSTRUCTOR
(MECHANICAL)

Test Booklet No.

Name of Applicant Answer Sheet No.

Application No. : SVSU/2020/Estt/NT/ Signature of Applicant :

Date of Examination: **26 / 12 / 2021**

Signature of the Invigilator(s)

1.

Time of Examination :

2.

Duration : 60 Minutes]

[Maximum Marks : 50

IMPORTANT INSTRUCTIONS

- (i) The question paper is in the form of Test-Booklet containing **50 (Fifty)** questions. All questions are compulsory. Each question carries four answers marked (A), (B), (C) and (D), out of which only one is correct.
- (ii) On receipt of the Test-Booklet (Question Paper), the candidate should immediately check it and ensure that it contains all the pages, i.e., **50** questions. Discrepancy, if any, should be reported by the candidate to the invigilator immediately after receiving the Test-Booklet.
- (iii) A separate Answer-Sheet is provided with the Test-Booklet/Question Paper. On this sheet there are **50** rows containing four circles each. One row pertains to one question.
- (iv) The candidate should write his/her Application number at the places provided on the cover page of the Test-Booklet/Question Paper and on the Answer-Sheet and NOWHERE ELSE.
- (v) No second Test-Booklet/Question Paper and Answer-Sheet will be given to a candidate. The candidates are advised to be careful in handling it and writing the answer on the Answer-Sheet.
- (vi) For every correct answer of the question **One (1) mark will be awarded**. For every unattempted question, Zero (0) mark shall be awarded. **There is no Negative Marking**.
- (vii) Marking shall be done only on the basis of answers responded on the Answer-Sheet.
- (viii) To mark the answer on the Answer-Sheet, candidate should **darken** the appropriate circle in the row of each question with Blue or Black pen.
- (ix) For each question only **one** circle should be **darkened** as a mark of the answer adopted by the candidate. If more than one circle for the question are found darkened or with one black circle any other circle carries no mark, the question will be treated as cancelled.
- (x) The candidates should not remove any paper from the Test-Booklet/Question Paper. Attempting to remove any paper shall be liable to be punished for use of unfair means.
- (xi) Rough work may be done on the blank space provided in the Test-Booklet/Question Paper only.
- (xii) *Mobile phones (even in Switch-off mode) and such other communication/programmable devices are not allowed inside the examination hall.*
- (xiii) No candidate shall be permitted to leave the examination hall before the expiry of the time.

DO NOT OPEN THIS QUESTION BOOKLET UNTIL ASKED TO DO SO.

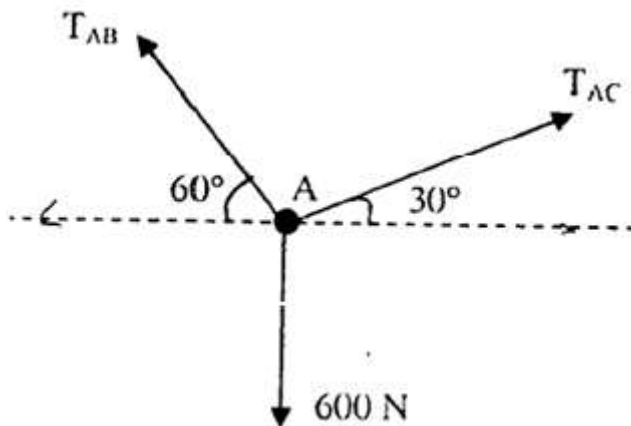
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17 / 1

1. If the maximum and minimum resultant forces of two forces acting on a particle are 40 kN and 10 kN respectively, then the two forces in question would be:

- (A) 25 kN and 15 kN
- (B) 20 kN and 20 kN
- (C) 20 kN and 10 kN
- (D) 20 kN and 5 kN

2. If point A is in equilibrium under the action of the applied forces, the values of tension T_{AB} and T_{AC} are respectively



- (A) 520 N and 300 N
- (B) 300 N and 520 N
- (C) 150 N and 450 N
- (D) 150 N and 450 N

3. A car moving with uniform acceleration covers 450 m in a 5 second interval, and covers 700 m in the next 5 second interval. The acceleration of the car is:

- (A) 7 m/s^2
- (B) 50 m/s^2
- (C) 25 m/s^2
- (D) 10 m/s^2

4. A mechanical system can be said to be conservative if the:

- (A) potential energy of the -system remains constant
- (B) kinetic energy of the system remains constant
- (C) sum of the kinetic and potential energies remains constant
- (D) linear momentum remains constant

5. A solid uniform metal bar of diameter D and length L is hanging vertically from its upper end. The elongation of the bar due to self weight is:

- (A) Directly proportional to L and inversely proportional to D^2
- (B) Directly proportional to both L and D^2
- (C) Directly proportional of L but independent of D
- (D) Directly proportional of L^2 but independent of D

6. In a biaxial state of stress, normal stresses are $\sigma_x = 900 \text{ N/mm}^2$, $\sigma_y = 100 \text{ N/mm}^2$ and shear stress $\tau = 300 \text{ N/mm}^2$. The maximum principal stress is:
- (A) 800 N/mm^2
 (B) 1000 N/mm^2
 (C) 1200 N/mm^2
 (D) 1400 N/mm^2
7. Slenderness ratio of a column is defined as the ratio of its length to its:
- (A) Least radius of gyration
 (B) Least lateral dimension
 (C) Maximum lateral dimension
 (D) Maximum radius of gyration
8. A cantilever beam of rectangular cross-section is subjected to a load W at its free end. If the depth of the beam is doubled and the load is halved, the deflection of the free end as compared to original deflection will be:
- (A) Half
 (B) One-eighth
 (C) One-sixteenth
 (D) Double
9. In automobiles, Hook's joint is used between which of the following:
- (A) Clutch and gear box
 (B) Gear box and differential
 (C) Axle and wheel
 (D) Differential and wheels
10. A standard gear has an outside diameter of 96 mm and module 3 mm. The number of teeth on the gear is:
- (A) 32
 (B) 30
 (C) 16
 (D) 15
11. A slider sliding at 10 cm/s on a link which is rotating at 60 r.p.m. is subjected to Coriolis acceleration of magnitude:
- (A) $40 \pi^2 \text{ cm/s}^2$
 (B) $30 \pi^2 \text{ cm/s}^2$
 (C) $40 \pi \text{ cm/s}^2$
 (D) $30 \pi \text{ cm/s}^2$
12. The minimum number of teeth on the pinion to operate without interference in standard full-height involute teeth gear mechanism with 20° pressure angle is:
- (A) 14
 (B) 12
 (C) 24
 (D) 18

13. A simple pendulum of length 5 m, with a bob of mass 1 kg, is in simple harmonic motion as it passes through its mean position; the bob has a speed of 5 m/s. The net force on the bob at the mean position is:

- (A) zero
- (B) 2.5 N
- (C) 5 N
- (D) 25 N

14. A vibratory system consists of a mass 12.5 kg, a spring of stiffness 1000 N/m, and a dashpot with damping coefficient of 15 Ns/m. The value of critical damping of the system is:

- (A) 0.223 Ns/m
- (B) 17.88 Ns/m
- (C) 71.4 Ns/m
- (D) 223.6 Ns/m

15. Consider the following statements:

1. One way of improving vibration isolation is to decrease the mass of the vibrating object.
2. For effective isolation, the natural frequency of the system should be far less than the exciting frequency.

Which of the statements given above is/are correct?

- (A) 1 only
- (B) 2 only
- (C) Both 1 and 2
- (D) Neither 1 nor 2

16. The factor of safety in design is the ratio of:

- (A) yield stress/working stress
- (B) tensile stress/working stress
- (C) compressive stress/working stress
- (D) bearing stress/working stress

17. A cast-iron bedplate for a pump has a crack length of 100 μm . If the Young's modulus of cast iron is 210 GN/m² and the specific surface energy is 10 J/m², the fracture strength required will be nearly:

- (A) $1.0 \times 10^8 \text{ N/m}^2$
- (B) $1.2 \times 10^8 \text{ N/m}^2$
- (C) $1.4 \times 10^8 \text{ N/m}^2$
- (D) $1.6 \times 10^8 \text{ N/m}^2$

18. The stress-concentration factor (K) is:
- (A) Ratio of maximum stress occurring near discontinuity to average stress at critical section.
 - (B) Ratio of minimum stress occurring near discontinuity to average stress at critical section.
 - (C) Ratio of average stress at critical section to minimum stress occurring near discontinuity.
 - (D) Ratio of average stress at critical section to maximum stress occurring near discontinuity
19. In the beginning of engagement of a centrifugal clutch:
- (A) the centrifugal force on shoe is equal to spring force
 - (B) the centrifugal force on shoe is less than spring force
 - (C) the centrifugal force on shoe is slightly more than spring force
 - (D) none of the above
20. In Newtonian fluids, the shear stress is:
- (A) directly proportional to the viscosity
 - (B) inversely proportional to the viscosity
 - (C) directly proportional to the deformation rate
 - (D) directly proportional to the shear strain
21. The Bernoulli's constants for points lying on the same stream line and those which lie on other stream lines will have the same value, if the flow is:
- (A) incompressible
 - (B) steady
 - (C) irrotational
 - (D) uniform
22. The supply head of a pipe is 21 kPa. For maximum power transmission, the loss of head due to friction is equal to (if $w = 10 \text{ kN/m}^3$):
- (A) 2 m
 - (B) 1 m
 - (C) 9.81 m
 - (D) 0.7 m
23. The maximum velocity in fully developed laminar pipe flow is:
- (A) Half of average velocity
 - (B) Two-third of average velocity
 - (C) Twice of average velocity
 - (D) Equal of average velocity

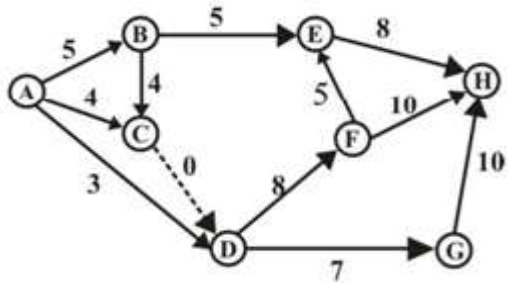
24. Two insulating materials of thermal conductivity K and $3K$ are available for lagging a pipe carrying a hot fluid. If the radial thickness of each material is the same:
- (A) Material with higher thermal conductivity should be used for the inner layer and one with lower thermal conductivity for the outer
 - (B) Material with lower thermal conductivity should be used for the inner layer and one with lower thermal conductivity for the outer
 - (C) It is immaterial in which sequence insulating materials are used
 - (D) It is not possible to judge unless numerical value of dimensions are given
25. For effective working of fins, the thickness of the fins should be:
- (A) Large
 - (B) Small
 - (C) Unpredictable
 - (D) Thickness of fin doesn't affect fin effectiveness
26. An electric flat-plate square heater of sides 10 cm provides 100 W powers from each side. If the heater is assumed black, its temperature is approximately:
- (A) 648°C
 - (B) 648 K
 - (C) 6480 K
 - (D) 6480°C
27. What is the equivalent emissivity for radiant heat exchange between a small body (emissivity = 0.4) in a very large enclosure (emissivity = 0.5)?
- (A) 0.5
 - (B) 0.4
 - (C) 0.2
 - (D) 0.1
28. The law which provides the basis of temperature measurement is:
- (A) Third law of thermodynamics
 - (B) Second law of thermodynamics
 - (C) First law of thermodynamics
 - (D) Zeroth law of thermodynamics
29. Which of the following is not a point function of the system:
- (A) Temperature
 - (B) Pressure
 - (C) Specific volume
 - (D) Heat
30. A mixture of gases expands from 0.03 m^3 to 0.06 m^3 at constant pressure of 1 MPa and absorbs 84 kJ of heat during the process. The change in internal energy of the mixture is:
- (A) 30 kJ
 - (B) 54 kJ
 - (C) 84 kJ
 - (D) 114 kJ

31. Increase in entropy of a system represents:
- (A) Decrease of temperature
 - (B) Increase of pressure
 - (C) Increase of temperature
 - (D) Degradation of energy
32. A 6-cm diameter horizontal stationary water jet having a velocity of 40 m/s strikes a vertical plate. The force needed to hold the plate if it moves away from the jet at 20 m/s is nearly:
- (A) 1365 N
 - (B) 1270 N
 - (C) 1130 N
 - (D) 1080 N
33. Consider the following statements in respect to Kaplan Turbine:
- (1) It is a reaction turbine
 - (2) It is an impulse turbine
 - (3) It has adjustable blades
- (A) 1, 2 and 3
 - (B) 2 and 3 only
 - (C) 1 and 2 only
 - (D) 1 and 3 only
34. If compression ratio is kept same then thermal efficiency of:
- (A) Otto cycle is less than Dual cycle
 - (B) Otto cycle is same as that for Diesel cycle
 - (C) Otto cycle is less than that of Diesel cycle
 - (D) Otto cycle is more than that of Diesel cycle
35. For the same maximum pressure and temperature of Otto, diesel and dual combustion air standard cycles:
- (A) the compression ratios will be the same
 - (B) the heat supplied to the cycles will be the same
 - (C) the air standard efficiency will have the same value
 - (D) the heat rejected by the engine will be the same
36. Which of the following is incorrect for Rankine vapor power cycle?
- (A) It has two reversible adiabatic and two reversible isobaric processes.
 - (B) Its efficiency is dependent on mean temperature of addition and temperature of heat rejection.
 - (C) Constant pressure heat rejection takes place in the turbine.
 - (D) The efficiency of Rankine cycle can be increased by increasing the degree of superheat at constant pressure.

37. A Carnot refrigerator works between the temperatures of 200 K and 300 K. If the refrigerator receives 1 kW of heat, the work requirement will be:
- (A) 0.5 kW
 (B) 1.0 kW
 (C) 1.5 kW
 (D) 2.5 kW
38. Eutectic reaction for Iron-carbon system occurs at:
- (A) 600°C
 (B) 723°C
 (C) 1130°C
 (D) 1430°C
39. Which is the isothermal reversible reaction in which a solid phase is converted into two or more intimately mixed solids on cooling?
- (A) Peritectoid
 (B) Peritectic
 (C) Eutectic
 (D) Eutectoid
40. If a cube of 100 mm dimension is to be made of Aluminium (shrinkage allowance = 10 mm/m). What will be the dimension of the wooden pattern? Assume only shrinkage allowance.
- (A) 101 mm × 101 mm × 101 mm
 (B) 100 mm × 100 mm × 100 mm
 (C) 99 mm × 99 mm × 99 mm
 (D) 102 mm × 102 mm × 102 mm
41. For spot welding of 1 mm thick sheet with a current flow time of 0.2 s, the heat generated is 1000 J. If the effective resistance is 200 μ ohm, the current required is:
- (A) 6000 A
 (B) 3000 A
 (C) 4000 A
 (D) 5000 A
42. In turning operation, the typical ratio of heat generated in chip, tool and work piece is in the order of:
- (A) 70 : 20 : 10
 (B) 10 : 70 : 20
 (C) 10 : 20 : 70
 (D) 70 : 10 : 20

43. The time taken to face a work piece of 80 mm diameter for the spindle speed of 90 rpm and cross feed of 0.3 mm/rev will be:
- (A) 3.48 min
 - (B) 2.48 min
 - (C) 1.48 min
 - (D) 0.48 min
44. The rake angle of a cutting tool is 10° , shear angle 35° and cutting velocity 25 m/min. What is the chip velocity along tool face?
- (A) 11.8 m/min
 - (B) 15.8 m/min
 - (C) 19.8 m/min
 - (D) 23.8 m/min
45. The following is true for "GO" and "NO GO" gauges:
- (A) Plug gauge can measure the dimension of a hole
 - (B) Wear allowance is provided on "NO GO" end
 - (C) "GO" end is smaller than "NO GO" end
 - (D) Gauge tolerance is 10% of manufacturing tolerance
46. Auto collimators are used to check:
- (A) only straightness
 - (B) only flatness
 - (C) both flatness and straightness
 - (D) roundness
47. Which G - code is used for command "Rapid move to specific coordinate position" in CNC:
- (A) G00
 - (B) G01
 - (C) G02
 - (D) G03
48. When ordering cost is increased to 16 times, the EOQ will be increased to:
- (A) 2 times
 - (B) 3 times
 - (C) 4 times
 - (D) 5 times
49. Which one of the following is not a causal forecasting method?
- (A) Trend adjusted exponential smoothing
 - (B) Econometrics models
 - (C) Linear regression
 - (D) Multiple regression

50. For the network shown in the given figure, the earliest expected completion time of the project is



- (A) 20 days
- (B) 23 days
- (C) 27 days
- (D) 30 days

ROUGH WORK

Master Skill Instructor (Mechanical)

1. A	26. B
2. A	27. B
3. D	28. D
4. C	29. D
5. D	30. B
6. B	31. D
7. A	32. C
8. C	33. D
9. B	34. D
10. A	35. D
11. C	36. C
12. D	37. A
13. A	38. C
14. D	39. D
15. C	40. A
16. A	41. D
17. B	42. A
18. A	43. C
19. A	44. B
20. C	45. D
21. C	46. B
22. D	47. A
23. C	48. C
24. *****	49. A
25. B	50. D

Note:- Question No. 24 is moved out.