

Test Booklet

Series

A

Paper No.

13

Written Test Paper, 2021

**SENIOR 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.

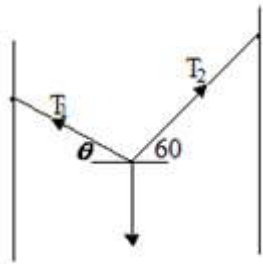
[P.T.O.

13 / 1

1. A bullet enters a plank of 30 mm thickness with a velocity of 100 m/s and emerges out from the plank with a velocity of 50 m/s. What is the minimum thickness of the plank so that the bullet remains embedded in the plank?

- (A) 100 mm
- (B) 80 mm
- (C) 60 mm
- (D) 40 mm

2. A weight W is supported by two cables as shown in the given figure. The tension in the cable making angle θ will be the minimum when the value of θ is

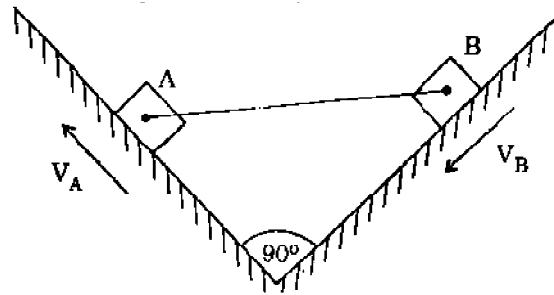


- (A) 0°
- (B) 30°
- (C) 45°
- (D) 60°

3. The inertia force in a system is directed at

- (A) zero degrees to the acceleration
- (B) 45 degrees to the acceleration
- (C) 90 degrees to the acceleration
- (D) 180 degrees to the acceleration

4. In the given configuration of the mechanism as shown in the figure, $V_A = 40$ m/s and $V_B = 80$ m/s. The magnitude of velocity of slider B relative to the slider A is



- (A) 30 m/s
- (B) 40 m/s
- (C) 50 m/s
- (D) 60 m/s

5. The deformation of a bar under its own weight as compared to that when subjected to a direct axial load equal to its own weight will be

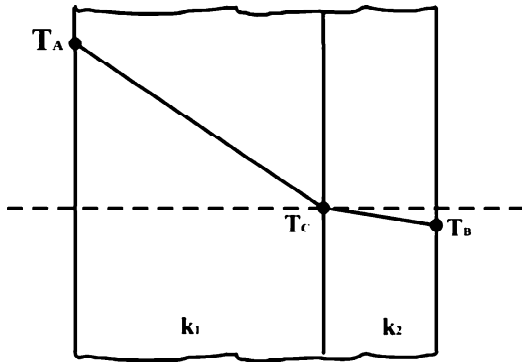
- (A) The same
- (B) One-fourth
- (C) Half
- (D) Double

6. A body is subjected to a direct tensile stress of 300 MPa in one plane accompanied by a simple shear stress of 200 MPa. The maximum normal stress on the plane will be
- (A) 100 MPa
 (B) 200 MPa
 (C) 300 MPa
 (D) 400 MPa
7. The buckling load for a column hinged at both ends is 10 kN. If the ends are fixed, the buckling load changes to
- (A) 40 kN
 (B) 30 kN
 (C) 20 kN
 (D) 10 kN
8. **Assertion (A):** In a simply supported beam subjected to a concentrated load P at mid-span, the elastic curve slope becomes zero under the load.
Reason (R): The deflection of the beam is the maximum at mid-span.
- (A) Both A and R are individually true and R is the correct explanation of A
 (B) Both A and R are individually true but R is NOT the correct explanation of A
 (C) A is true but R is false
 (D) A is false but R is true
9. What is the number of instantaneous centres of rotation for a 6-link mechanism?
- (A) 5
 (B) 10
 (C) 15
 (D) 20
10. Geneva mechanism is used to transfer components from one station to the other in
- (A) an inline transfer machine
 (B) a rotary transfer machine
 (C) a linked line
 (D) an unlinked flow line
11. A body in motion will be subjected to Coriolis acceleration when that body is
- (A) in plane rotation with variable velocity
 (B) in plane translation with variable velocity
 (C) in plane motion which is a resultant of plane translation and rotation
 (D) restrained to rotate while sliding over another body

12. Twenty degree full depth involute profiled 19-tooth pinion and 37-tooth gear are in mesh. If the module is 5 mm, the centre distance between the gear pair will be
- (A) 140 mm
(B) 160 mm
(C) 180 mm
(D) 190 mm
13. The natural frequency of a spring-mass system on earth is ω_n . The natural frequency of this system on the moon is ($g_{\text{moon}} = g_{\text{earth}}/6$) is
- (A) ω_n
(B) $0.408 \omega_n$
(C) $0.204 \omega_n$
(D) $0.167 \omega_n$
14. A vibrating machine is isolated from the floor using springs. If the ratio of excitation frequency of vibration of machine to the natural frequency of the isolation system is equal to 0.5, then transmissibility of ratio of isolation is
- (A) 1/2
(B) 3/4
(C) 4/3
(D) 2
15. In a multi-rotor system of torsional vibration maximum number of nodes that can occur is
- (A) two
(B) equal to the number of rotor plus one
(C) equal to the number of rotors
(D) equal to the number of rotors minus one
16. S-N curve represents the:
- (A) Fracture toughness (on y-axis) and numbers of fully reversed stress cycle (on x-axis)
(B) Resilience (on y-axis) and numbers of fully reversed stress cycle (on x-axis)
(C) Fatigue strength (on y-axis) and numbers of fully reversed stress cycle (on x-axis)
(D) Hardness (on y-axis) and numbers of fully reversed stress cycle (on x-axis)
17. The fatigue strength of mild steel is:
- (A) Lower than the yield strength
(B) More than the yield strength
(C) More than its tensile strength
(D) Lower than its tensile strength

18. A machine component is subjected to a flexural stress, which fluctuates between 300 MN/m^2 and -150 MN/m^2 . Taking the yield strength = 0.55 of the ultimate strength, endurance strength = 0.50 of the ultimate strength and factor of safety to be 2, the value of the minimum ultimate strength according to modified Goodman relation will be
- (A) 1100 MN/m^2
 (B) 1175 MN/m^2
 (C) 1050 MN/m^2
 (D) 1125 MN/m^2
19. Total torque transmitted by a single plate clutch (both sides are effective) with axial spring load of 1 kN, inner radii 10 cm and outer radii 15 cm will be [Consider coefficient of friction as 0.5, assuming uniform wear]?
- (A) 75 N-m
 (B) 100 N-m
 (C) 125 N-m
 (D) 150 N-m
20. Viscosity of the gas
- (A) decreases with increases in temperature
 (B) increases with increase in temperature
 (C) remains same with increase in temperature
 (D) may increase or decrease with increase in temperature depending upon the atomic structure of the gas
21. The Bernoulli's equation written in conventional form represents total energy per unit of a certain quantity. Identify this quantity.
- (A) energy per unit volume
 (B) energy per unit mass
 (C) energy per unit weight
 (D) energy per unit specific weight
22. The time taken to empty a filled tank to a height 'h' above its flat base through an orifice in the base varies as the following power of 'h'.
- (A) 1
 (B) $1/2$
 (C) -0.5
 (D) $1/3$
23. A pipe having a length 200 m and 200 mm diameter with friction factor 0.015 is to be replaced by a 400 mm diameter pipe of friction factor 0.012 to convey the same quantity of flow. The equivalent length of the new pipe for the same head loss will
- (A) 8300 m
 (B) 8200 m
 (C) 8100 m
 (D) 8000 m

24. The temperature variation under steady heat conduction across a composite slab of two materials of conductivities k_1 and k_2 is shown in the figure. Then which one of the following statements holds?



- (A) $k_1 > k_2$
 (B) $k_1 = k_2$
 (C) $k_1 = 0$
 (D) $k_1 < k_2$
25. By which of the following modes of heat transfer, Heat is mainly transferred from an insulated pipe to the surrounding still air
- (A) conduction
 (B) Radiation
 (C) forced convection
 (D) natural convection

26. Two spheres A and B of same material have radii 1 m and 4 m and temperature 4000 K and 2000 K respectively. Which one of the following statements is correct? The energy radiated by sphere A is
- (A) greater than that of sphere B
 (B) less than that of sphere B
 (C) equal to that of sphere B
 (D) equal to double that of sphere B

27. If one radiation shield is placed between two infinite parallel radiating plane surfaces, then the amount of heat radiated becomes
- (A) One third
 (B) Half
 (C) One fourth
 (D) One sixth

28. Thermodynamic work is the product of
- (A) Two intensive properties
 (B) Two extensive properties
 (C) An intensive property and change in an extensive property
 (D) An extensive property and change in an intensive property

29. The pressure of air in an automobile tyre at temperature of 27°C is 1.75 bar (gauge). Due to running the temperature of air in the rises to 87°C . What will be the gauge pressure during this running? [$P_{\text{atm}} = 1.01$ bar, volume of tyre is assumed constant]
- (A) 2.302 bar
 (B) 2.914 bar
 (C) 1.677 bar
 (D) 3.180 bar
30. Which of the followings is correct statement?
- (A) Entropy of isolated system always decreases
 (B) Energy always degrades during the real process
 (C) Energy always destroyed during the real process
 (D) Heat transfer through a finite temperature difference is reversible process
31. The entropy may be expressed as a function of
- (A) Pressure and temperature
 (B) Temperature and volume
 (C) Heat and work
 (D) Internal energy
32. A nozzle at the end of an 80 mm hose pipe produces a jet 40 mm in diameter. When it is discharging the water 1200 Lpm, the force on the joint at the base of the nozzle will be
- (A) 220 N
 (B) 230 N
 (C) 240 N
 (D) 250 N
33. Francis turbine is usually used for
- (A) low head installation up to 30 m
 (B) medium head installation from 30 m to 180 m
 (C) high head installation above 180
 (D) all heads
34. The volume of charge that can be available in an engine after suction, if the clearance volume is 20 cc and swept volume is 300 cc. Consider mechanical efficiency and volumetric efficiency of engine as 90% and 80% respectively:
- (A) 260 cc
 (B) 250 cc
 (C) 240 cc
 (D) 230 cc

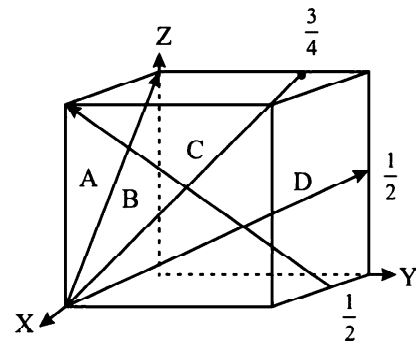
35. For same power and same speed, the flywheel of a four-stroke engine as compared to two-stroke I.C. engine will be :
- (A) smaller
 (B) bigger
 (C) same size
 (D) dependent on other engine parameters

36. The efficiency of superheated Rankine cycle is higher than that of simple Rankine cycle because
- (A) The enthalpy of main steam is lower for super heat cycle
 (B) The mean temperature of heat addition is higher for super heat cycle
 (C) The temperature of steam in condenser is high
 (D) The quality of steam in condenser is low

37. A Carnot cycle operates between temperature of 727°C and 227°C , the efficiency of the engine is:
- (A) 70%
 (B) 60%
 (C) 40%
 (D) 50%

38. Austempering of steels results in greater
- (A) hardness
 (B) toughness
 (C) brightness
 (D) ductility

39. In the figure shown below, Miller indices $[021]$ have the direction of :



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

40. While cooling, a cubical casting of side 40 mm undergoes 3%, 4% and 5% volume shrinkage during the liquid state, phase transition and solid state respectively. The volume of metal compensated from the riser is :
- (A) 7%
 (B) 6%
 (C) 5%
 (D) 9%

41. The ratio of aluminium and iron oxide used in thermit welding is
- (A) 1 : 3
 - (B) 3 : 1
 - (C) 2 : 1
 - (D) 1 : 2
42. Which of the following abrasive will be used for grinding tool steel and high speed steel
- (A) Diamond
 - (B) SiC
 - (C) Al_2O_3
 - (D) Boron Carbide
43. Which of the following method cannot be used for manufacturing internal gears?
- (A) Casting
 - (B) Die casting
 - (C) Broaching
 - (D) Hobbing
44. Tool life in turning will decrease by maximum extent if the following is doubled
- (A) depth of cut
 - (B) cutting velocity
 - (C) tool rake angle
 - (D) feed
45. In transition fit,
- (A) tolerance zones of hole and shaft overlap
 - (B) tolerance zone of hole is completely below that of shaft
 - (C) tolerance zone of hole is entirely above that of shaft
 - (D) none of the above
46. Sine bars are specified by
- (A) Its total length
 - (B) Centre distance between rolls
 - (C) size of rollers
 - (D) Distance between rollers and upper distance
47. Which M-code is used for command "Flood coolant on" in CNC
- (A) M02
 - (B) M03
 - (C) M08
 - (D) M11
48. If the demand for an item is doubled and the ordering cost is halved, the economic order quantity for the item will be
- (A) A half of the earlier quantity
 - (B) Double of the earlier quantity
 - (C) Triple of the earlier quantity
 - (D) Will remain unchanged

49. Delphi technique is used in

- (A) Forecasting
- (B) Inventory management
- (C) Quality planning
- (D) Material handling

50. Critical path is obtained in PERT analysis by joining events having :

- (A) Maximum slack
- (B) Minimum slack
- (C) Negative slack
- (D) Zero slack

ROUGH WORK

ANSWER KEY- Senior Skill Instructor (Mechanical)

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