1. **A hydraulic press has a ram of 15 cm diameter and plunger of 1.5 cm. It is required to lift a mass of 1000kg. The force required on plunger is nearly equal to**

   a) 100N b) 1000N c) 10000N d) 10N

2. **If the stream function is given by $\Psi = 3xy$, then the velocity at a point (2,3) will be**

   a) 7.21 unit b) 18 unit c) 10.82 unit d) 54 unit

3. **The correct sequence of the centrifugal pump components through which the fluid flows is**

   a) Impeller, Suction pipe, Foot valve and strainer, Delivery pipe
   b) Foot valve and strainer, Suction pipe, Impeller, Delivery pipe
   c) Impeller, Suction pipe, Delivery pipe, Foot valve and strainer
   d) Suction pipe, Delivery pipe, Impeller, Foot valve and strainer

4. **The relation pV^{γ} = constant, where γ is the ratio of the specific heats of ideal gas, is applicable to**

   a) Any adiabatic process b) Only reversible adiabatic process
   c) Only irreversible adiabatic process d) Only isothermal process

5. **Across a normal shock**

   a) static pressure and the static temperature rise b) entropy remains constant
   c) velocity and static pressure decrease d) density and temperature decrease

6. **A necessary precaution in selection of pumps for parallel operations is that**

   a) H-Q characteristics of both should be identical
   b) Both pumps should be centrifugal type
   c) Both pumps should be identical
   d) There should not be change from positive to negative slope in H-Q curve

7. **A metallic cube of side 10 cm, density 6.8 gm/cc is floating in liquid mercury** *(density 13.6gm/cc)*, **with 5 cm height of cube exposed above the mercury level. Water** *(density 1 gm/cc)* **is filled over this, to submerge the cube fully. The new height of cube exposed above mercury level is**

   a) 4.6 cm b) 5.4 cm c) 5.0 cm d) 5.8 cm

8. **The pressure drop for a relatively low Reynolds number flow in a 600 mm, 30 m long pipeline is 70kPa. What is the wall shear stress?**

   a) 0 Pa b) 1400 Pa c) 700 Pa d) 350 Pa

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9. **The radiative heat transfer rate per unit area (W/m2) between two plane parallel grey surfaces** *(emissivity 0.9)* **maintained at 400 K and 300 K is** (Stefan Bottzman constant $\sigma = 5.67 \times 10^{-6} W/m^2K^4$)

a) 1020 b) 464 c) 812 d) 567

10. **At the eye tip of a centrifugal impeller, blade velocity is 200 m/s while the uniform axial velocity at the inlet is 150 m/s. If the sonic velocity is 300 m/s, then the inlet Mach number of the flow will be**

a) 0.75 b) 0.66 c) 0.90 d) 0.83

11. **The transition Reynolds number for flow over a flat plate is $5*10^5$. What is the distance from the leading edge at which transition will occur for flow of water with a uniform velocity of 1m/s?** (For water, the kinematic viscosity, $\nu = 0.86*10^{-6}$ m^2/s)

a) 0.43 m b) 1 m c) 43 m d) 103 m

12. **For a reciprocating water pump having cylinder dia** d **and crank radius** r**, if** W **is the weight of water lifted, the coefficient of discharge is**

a) $\frac{W}{\pi d^2 r}$ b) $\frac{2W}{\gamma \pi d^2 r}$ c) $\frac{W}{\gamma d^2 r}$ d) $\frac{W}{\gamma \pi d^2}$

13. **Both free vortex and forced vortex can be expressed mathematically in terms of tangential velocity V at the corresponding radius r. Choose the correct combination**

	Free vortex	Forced vortex
a)	V = r x const.	Vr = const.
b)	V^2 x r = const.	V = r x const.
c)	V x r = const.	V^2 = r x const.
d)	V x r = const.	V = r x const.

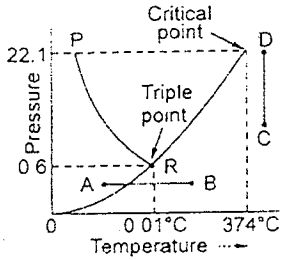
14. **A bucket of water is hanging from a spring balance. An iron piece is suspended into water without touching sides of bucket from another support. The spring balance reading will**

a) Remain same b) Decrease
c) Increase d) Increase/decrease depending on depth of immersion

15. **A single-stage impulse turbine with a diameter of 120 cm runs at 3000 rpm. If the blade speed ratio is 0.42, then, the inlet velocity of steam will be**

a) 79 m/s b) 188 m/s c) 450 m/s d) 900 m/s

16. **The critical point and triple point data for water are,**
$T_c = 374^0C$, $P_c = 22.1$ Mpa, $T_T = 0.01^0C$, $P_T = 0.6$ kPa
Indicate the phase change that will occur in following cases,
(i) Ice at 0.5 kPa is heated isobarically
(ii) Water vapour at 400^0C is compressed isothermally



a) (i) along AB, (ii) along CD
b) (i) along CD, (ii) along AB
c) (i) along OD, (ii) along PR
d) (i) along RD, (ii) along OR

17. **The ratio of specific heats of a gas is 1.4 and the value of specific heat at constant pressure is 7.0 $cal/mole^0C$. The difference between specific heat at constant pressure and specific heat at constant volume will be (in $cal/mole^0C$)**

a) 1.4 **b)** 1.7 **c)** 5.0 **d)** 2.0

18. **The coefficient of linear expansion of a solid is L. The volume V of a cube of this solid on being heated by 1^0C will change by**

a) VL **b)** $3VL$ **c)** $3L$ **d)** $\frac{VL}{3}$

19. **Two springs of equal length but having stiffness of 10 N/mm and 15 N/mm support a mass of 2 tonnes in series. Find the frequency of vibration**

a) $\frac{1}{2\pi}\sqrt{3}$ Hz **b)** $\frac{1}{2\pi}\sqrt{10}$ Hz **c)** $\frac{1}{2\pi}\sqrt{15}$ Hz **d)** $\frac{1}{2\pi}\sqrt{2}$ Hz

20. **Ratio of pitch circle diameter in millimeters to the number of teeth, is known as**

a) Module **b)** Circular pitch **c)** Diametral pitch **d)** Clearance

21. **Two particles with masses in the ratio 1:4 are moving with equal kinetic energies. The magnitude of their linear momentums will conform to the ratio**

a) 1:8 **b)** $1:\sqrt{2}$ **c)** $\sqrt{2}:1$ **d)** 1:2

22. **Which of the following stresses are associated with the tightening of a nut on a stud?**
1. Tensile stresses due to stretching of stud
2. Bending stresses of stud
3. Transverse shear stresses across threads
4. Torsional shear stresses in threads due to frictional resistance

Select the correct answer using the codes given below:

a) 1,2 and 3 **b)** 1,2 and 4 **c)** 1,3 and 4 **d)** 2,3 and 4

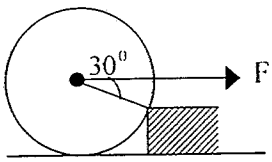
23. **A flywheel weighs $\frac{981}{\pi} kg$ and has a radius of gyration of 100 cm. It is given a spin of 100 rpm about its horizontal axis. The whole assembly is rotating about a vertical axis at 6 rad/sec. The gyroscopic couple experienced will be**

a) 2,000 kgm b) 19,620 kgm c) 20,000 kgm d) 1,962 kgm

24. **Determine the diameter of solid shaft which will transmit 90kw at 160 rpm, if the shear stress in the shaft is limited to 60 N/mm^2**

a) 50 mm b) 60 mm c) 77 mm d) 70 mm

25. **A roller of weight W is rolled over the wooden block shown in the given figure. The pull required just to cause the said motion is**



a) W / 2 b) $\sqrt{3}$ W c) W d) 2W

26. **For one-dimensional isentropic flow in a diverging passage, if the initial static pressure is P_1, and the initial Mach number is M_1 ($M_1 < 1$), then for the downstream flow**

a) $M_2 < M_1$; $P_2 < p_1$ b) $M_2 > M_1$; $P_2 > p_1$
c) $M_2 < M_1$; $P_2 > p_1$ d) $M_2 > M_1$; $P_2 < p_1$

27. **In a furnace made of bricks,**
Inside heat transfer coefficient = 35 W/m^{2}K
Outside heat transfer coefficient = 25 W/m^{2}K
Thermal conductivity of bricks (15 cm thick) = 0.15 W/mK
The overall heat transfer coefficient (in W/m^{2}K) will be closer to the

a) Inside heat transfer coefficient
b) Outside heat transfer coefficient
c) Thermal conductivity of bricks
d) Heat transfer coefficient based on the thermal conductivity of the bricks alone.

28. **Two systems have the same wet bulb temperature of $20^0 C$. System 'A' has Dry bulb temperature of 25^{0}C since it has a relative humidity of 65%. System 'B' has a relative humidity of 30%. What will be its dry bulb temperature**

a) 33^{0}C b) 25^{0}C c) 27^{0}C d) 22^{0}C

29. **Four rods with different radii r and length l are connected to two reservoirs at different temperature. Which one of them will conduct most heat?**

a) $r = 2cm \& l = 2m$ b) $r = 1cm \& l = 1m$ c) $r = 2cm \& l = \frac{1}{2}m$ d) $r = \frac{1}{2}cm \& l = \frac{1}{2}m$

30. **A 1000 kg vehicle travelling at 80 m/s impacts a plunger attached to a piston-cylinder arrangement. If all of the energy of the vehicle is absorbed by the 20 kg of liquid contained in the cylinder, what is the maximum temperature rise of the liquid? (The specific heat of the liquid is 4.0 kJ/kg.^{0}C)**

a) 55^0C **b)** 40^0C **c)** 45^0C **d)** 50^0C

31. **In the Van der Waal's gas equation** $\left(p+\frac{a}{v^2}\right)(v-b)=RT$ **the constant 'a' is introduced to compensate for**

a) Reduction in specific volume **b)** Inter-molecular forces
c) Reduction in specific heat **d)** All of the above

32. **The centrifugal tension in belts**

a) Increase power transmission upto certain speed and then decreases
b) Increases power transmission
c) Does not affect power transmission
d) Reduces power transmission

33. **In nodular iron, graphite is in the form of**

a) Spheroids **b)** Nodular carbide **c)** Flakes **d)** Cementite

34. **Corrosion resistance of steel increases by addition of**

a) Vanadium, aluminium **b)** Sulpher, phosphorus, lead
c) Chromium and nickel **d)** Tugsten, molybdenum, vanadium, chromium

35. **Phenomenon of progressive extension of material with time at constant load is called**

a) Plasticity **b)** Creep **c)** Yield **d)** Breaking

36. **Rivets are made of**

a) Soft material **b)** Ductile material **c)** Hard material **d)** Brittle material

37. **Addition of copper to aluminium results in**

a) Precipitation hardening system **b)** Corrosion resistance
c) Grain refinement **d)** High machinability

38. **A Hooke's joint is used to connect two**

a) Coplanar & Nonparallel shafts **b)** Non coplanar & Nonparallel shafts
c) Coplanar & Parallel shafts **d)** All the 3 above

39. In a hardness test, L is load in kg, D is diameter of ball in mm and d is diameter of indentation in mm. Brinell Hardness Number is expressed by the equation

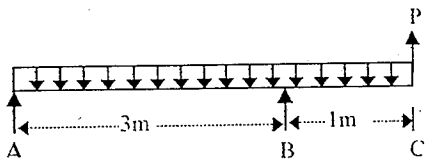
a) $BIIN = \dfrac{L}{\pi D(D-\sqrt{D^2-d^2})}$ b) $BIIN = \dfrac{2L}{\pi D(D-\sqrt{D^2-d^2})}$

c) $BIIN = \dfrac{L}{\pi d(D-\sqrt{D^2-d^2})}$ d) $BIIN = \dfrac{2L}{\pi d(D-\sqrt{D^2-d^2})}$

40. Circumferential and longitudinal strains in the cylindrical boiler under internal steam pressure are ε_1 and ε_2 respectively. Change in the volume of the boiler cylinder per unit volume will be

a) $\varepsilon_1^2\varepsilon_2$ b) $\varepsilon_1\varepsilon_2^2$ c) $2\varepsilon_1+\varepsilon_2$ d) $\varepsilon_1+2\varepsilon_2$

41. An overhung beam ABC of length 4m is supported at A and B 3m apart. It is loaded with UDL of 5 kN/m along its entire length. Find the value of load 'P' at C such that the reactions at A and B are equal and opposite.



a) P=10 kN b) P=30 kN c) P=20 kN d) P=25 kN

42. If two gears have moment of inertias as I_1 and I_2 respectively and mesh with a speed ratio $\omega_2/\omega_1 = n$, then equivalent moment of inertia of both gears referred to first one is

a) $n^2I_1+I_2$ b) I_1+nI_2 c) nI_1+I_2 d) $I_1+n^2I_2$

43. A uniform circular ring of mass M and radius r is rotating with an angular speed ω about an axis passing through its center and perpendicular to the plane of the ring. Two identical beads, each of mass m, somehow get attached at two diametrically opposite points. The rotational speed of the ring will become

a) $\dfrac{\omega M}{M+2m}$ b) $\dfrac{\omega M}{M+m}$ c) $\dfrac{2\omega M}{M+2m}$ d) ω

44. An electric lift is moving downward with an acceleration of g/3. the vertical force between a passenger in the lift and its floor is equal to

a) 3/4 of the passenger's weight b) 2/3 of the passenger's weight

c) Passenger's weight d) 4/3 of the passenger's weight

45. **A body of mass 10kg moving with a velocity of 1 m/s is acted upon by a force of 50 N for two seconds. The final velocity of the body is**

a) 22m/sec b) 1 m/sec c) $\sqrt{21}$ m/sec d) 11m/sec

46. **Proof resilience may be defined as**

a) Work done in straining the material
b) Max. strain energy that can be stored in a material per unit volume
c) Max. strain energy that can be stored in a material under elastic condition
d) Max. load which can be applied to a member

47. **A plane intersects the co-ordinate axes at $x = 2/3, y = 1/3, z = 1/2$. What is the Miller index of this plane?**

a) (932) b) (432) c) (364) d) (423)

48. **Relationship between modulus of elasticity E, modulus of rigidity G and Poisson's ratio μ is**

a) G=E/2(1+μ) b) G=E (2-μ) c) E=G (1+μ) d) G=E/1+μ

49. **A bar of Length L, area A and Young's modulus E is subjected to a pulling force P. The strain energy stored in the bar is**

a) $\frac{PL^2}{AE}$ b) $\frac{PL^2}{2EI}$ c) $\frac{P^2L}{2AE}$ d) $\frac{P^2L}{AE}$

50. **What is the expression for crippling load for a column of length L, with one end fixed and other end free?**

a) $P = \pi^2 EI/4L^2$ b) $P = \pi^2 EI/L^2$ c) $P = 2\pi^2 EI/L$ d) $4\pi^2 EI/L^2$

51. **A Mohr's circle reduces to a point when the body is subjected to**

a) Pure shear
b) Uniaxial stress only
c) Equal & opposite axial stresses on two mutually perpendicular planes, the planes being free of shear.
d) Equal axial stresses are on two mutually perpendicular planes, the planes being free of shear.

52. **Power screws are used to convert**

a) Linear motion to rotary motion b) None of these c) Both a & b d) Rotary motion into translatory motion

53. **Following gases are used in tungsten inert gas welding**

a) CO_2 and H_2 b) Argon and neon c) Argon and helium d)) Helium and neon

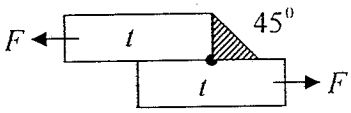
54. **The force required to punch a 25 mm hole in a mild steel plate 10 mm thick, when ultimate shear stress of the plate is 500 N/mm^2 will be nearly**

a) 78kN b) 393kN c) 98kN d) 158kN

55. **One-half length of 50mm diameter steel rod is solid while the remaining half is hollow having a bore of 5 mm. The rod is subjected to equal and opposite torque at its ends. If the maximum shear stress in solid portion is τ, the maximum shear stress in the hollow portion is:**

a) $\frac{15}{16}\tau$ b) τ c) $\frac{4}{3}\tau$ d) $\frac{16}{15}\tau$

56. **Two metal plates of thickness 't' & width 'w' are joined by a fillet weld of 45^0 as shown in fig. When subjected to a pulling force 'F' the stress induced in the weld will be**



a) $\frac{F}{wt}$ b) $\frac{F}{wtSin45}$ c) $\frac{F.Sin45}{wt}$ d) $\frac{2F}{wt}$

57. **Ring rolling is used**

a) To decrease the thickness and increase diameter b) To increase the thickness of a ring
c) For producing a seamless tube d) For producing large cylinder

58. **A bar of 20mm dia is tested in tension. It is observed that when a load of 38KN is applied the extension measured over a gauge length of 200mm is 0.12mm and contraction in diameter is 0.0036mm. Find the Poisson's ratio**

a) 0.2 b) 0.3 c) 0.25 d) 0.33

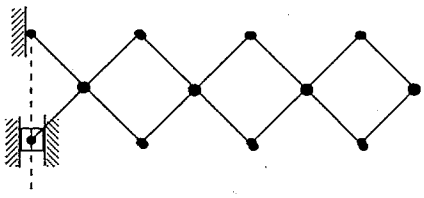
59. **A perfect frame has N joints. The number of members should not be less than**

a) 2N-1 b) 2N-2 c) 2N-3 d) 2N-5

60. **A cantilever beam of rectangular cross section is subjected to load at free end. If the depth of the beam is doubled and load is halved , deflection of the free end as compared to original will be**

a) 1/2 b) 1/8 c) 2 d) 1/16

61. The kinematic planar chain shown in the given figure is a



a) Structure
b) Mechanism with 2 degree of freedom
c) Mechanism with 1 degree of freedom
d) Mechanism with more than 2 degree of freedom

62. The machining process in which the work piece is dissolved into an electrolyte solution is called

a) Electro-chemical machining
b) Ultrasonic machining
c) Electro-discharge machining
d) Laser machining

63. In the metal forming process, the stresses encountered are

a) Greater than yield strength but less than ultimate strength
b) Less than yield strength of the material
c) Greater than the ultimate strength of the material
d) Less than the elastic limit

64. A grinding wheel is specified as 49 A 26 36 M 7 V 24. The number 36 stands for

a) Structure b) Grade c) Grit size d) Bond

65. In a fluid machinery, the relationship between saturation temperature and pressure decides the process of

a) Flow separation b) Cavitation c) Turbulent mixing d) Water hammer

66. Anodising is

a) A process of coating of zinc by hot dipping
b) A zinc diffusion process
c) A process used for making thin phosphate coatings on steel to act as a base or primer for enamels and paints
d) An oxidizing process used for aluminium and magnesium articles

67. The process layout is best suited where

a) Automation is employed
b) Mass production is envisaged
c) A few number of non-standardized units are to be produced
d) Machines are arranged according to sequence of operation

68. The blank size of the gear of 3 mm module and 40 number of teeth is

a) 120 mm b) 123 mm c) 126 mm d) 129 mm

69. A bag contains 7 white, 6 red and 9 black balls. Two balls are drawn at random. The probability that both the balls will be black is

a) $\frac{1}{11}$ b) $\frac{12}{77}$ c) $\frac{5}{77}$ d) $\frac{9}{77}$

70. Match list – I (Machining Process) with list –II (Associated medium) and select the correct answer using the codes given below the lists

List – I (Machining Process)

A) Ultrasonic machining
B) EDM
C) ECM
D) EBM

List – II (Associated Medium)

1) Kerosene
2) Abrasive slurry
3) Vacuum
4) Salt solution

	A	B	C	D
a)	2	1	4	3
b)	2	3	4	1
c)	4	1	2	3
d)	4	3	2	1

71. The rake angle of a cutting tool is 15^0, shear angle 45^0 and cutting velocity 35 m/min. What is the velocity of chip along the tool face?

a) 25.3 m/min b) 27.3 m/min c) 28.5 m/min d) 23.5 m/min

72. The value of the determinant given below is

$$\begin{vmatrix} 1 & 1 & 1 & 1 \\ 1 & 1+a & 1 & 1 \\ 1 & 1 & 1-b & 1 \\ 1 & 1 & 1 & 1+c \end{vmatrix}$$

a) -abc b) abc c) 1 d) 0

73. The locus of the point Z satisfying the condition $\arg\frac{Z-1}{Z+1}=\frac{\pi}{3}$ is

a) $x^2-y^2-2\sqrt{3}y=0$ b) $x^2+y^2=1$
c) $x^2-y^2-2\sqrt{3}y-1=0$ d) $x^2+y^2-2\sqrt{3}y-1=0$

74. **In a simple micrometer with screw pitch 0.5 mm and divisions on thimble 50, the reading corresponding to 5 divisions on barrel and 12 divisions on thimble is**

a) 2.620 mm **b)** 2.512 mm **c)** 5.120 mm **d)** 5.012 mm

75. **It is required to cut screw threads of 2mm pitch on a lathe. The lead screw has a pitch of 6 mm. If the spindle speed is 60 rpm, then the speed of the lead screw will be**

a) 10 rpm **b)** 20 rpm **c)** 120 rpm **d)** 180 rpm

76. **If** $u = \log(\tan x + \tan y)$, **then** $\sin 2x\frac{\partial u}{\partial x} + \sin 2y\frac{\partial u}{\partial y}$ **is**

a) 1 **b)** -2 **c)** 2 **d)** -1

77. **The value of** λ **for which the equations** $2\lambda x - 3y + \lambda - 3 = 0$, $3x - 2y + 1 = 0$ **and** $4x - \lambda y + 2 = 0$ **are consistent is**

a) 3 or 6 **b)** 1 or 3 **c)** 2 or 6 **d)** 2 or 3

78. **If** $\vec{a} + \vec{b} + \vec{c} = \vec{0}$ **and** $|\vec{a}| = 3$, $|\vec{b}| = 5$, $|\vec{c}| = 7$, **then the angle between** $\vec{a}$ **and** $\vec{b}$ **is**

a) 45^0 **b)** 30^0 **c)** 90^0 **d)** 60^0

79. **The image of the point P(1,3,4) in the plane 2x – y + z = -3 is**

a) (-3, 5, -2) **b)** (-3, -5, 2) **c)** (3, -5, -2) **d)** (-3, 5, 2)

80. **Find a particular integral of the differential equation**

$(D^2 - 4D + 3)y = \sin 3x \cos 2x$

a) $\frac{1}{20}(10\cos 5x - 11\sin 5x) + \frac{1}{884}(\sin x - 2\cos x)$

b) $\frac{1}{884}(10\cos 5x - 11\sin 5x) + \frac{1}{20}(\sin x + 2\cos x)$

c) $\frac{1}{20}(10\cos 5x - 11\sin 5x) + \frac{1}{884}(\sin x + 2\cos x)$

d) $\frac{1}{884}(10\cos 5x + 11\sin 5x) + \frac{1}{20}(\sin x + 2\cos x)$