Q.1 – Q.20 Carry One Mark Each

1. The reaction shown below is an example of

$$\text{Austenite} \rightleftharpoons \text{Ferrite} + \text{Cementite}$$

(A) Eutectoid (B) Eutectic (C) Peritectic (D) None of these

2. Which of the following mode of metal transfer is preferred in overhead welding?

(A) Gravitational mode (B) Projected mode
(C) Repelled mode (D) Short circuited mode

3. For a counter flow heat exchanger, if heat capacity rate of both fluid is equal then temperature difference between hot and cold fluid along the length

(A) Vary exponentially
(B) Remains constant
(C) Vary linearly
(D) Vary linearly for half of the length and vary exponentially for other half

4. Which is correct for same free stream velocity?

(A) Surface shear stress in turbulent boundary layer is greater than laminar boundary layer
(B) Surface shear stress in turbulent boundary layer is smaller than laminar boundary layer
(C) Surface shear stress in turbulent boundary layer is equal to laminar boundary layer
(D) None of the above

5. Which of the following welding process is based on joules law of heating?

(A) Arc welding (B) Electron Beam Welding
(C) Resistance welding (D) LASER Beam Welding

6. A strip is to be rolled from a thickness of 30 mm to 15 mm using a two high mill having rolls of diameter 300 mm. The coefficient of friction for unaided bite is:

(A) 0.35 (B) 0.5 (C) 0.25 (D) 0.07

7. Which of the following can not be negative?

(A) Change in entropy of the system (B) Change in enthalpy of the system
(C) Change in energy of the system (D) None

8. If y=f(x) be the solution of the equation $\frac{dy}{dx} = \frac{x^2}{x^2+1}$ such that, y=0 when x=0 then the value of f(1) is

(A) 1 (B) $\frac{1}{4}(4-\pi)$ (C) $\frac{\pi}{4}+1$ (D) $4(4-\pi)$

9. Two fair dice are thrown twice
A and B are two events
A : First toss is sum 5 or 3 B : Second toss is 7
Then P(A or B) is,

(A) $\frac{1}{6}$ (B) $\frac{5}{36}$

(C) $\frac{11}{36}$ (D) None of the above

10. For what value of λ the following system of equations have non-trivial solution

$\lambda x + 3y + 5z = 0$

$2x - 4\lambda y + \lambda z = 0$

$-4x + 18y + 7z = 0$

(A) 1 or 3 (B) -1 or 3 (C) 1 or -3 (D) -1 or -3

11. $\lim_{x \to 1} \frac{x^2 - 1}{|x - 1|} =$

(A) 2 (B) -2 (C) 0 (D) doesn't exist

12. Statement 1: every continuous function is differentiable
Statement 2: Differentiable function must be continuous.
Which of the statement is/are true?

(A) 1 (B) 2 (C) both (D) none

13. A self-service store employs one cashier at its counter. Nine customers arrive on an average every 5 minutes while the cashier can serve 10 costumers in 5 minutes. Assuming poison distribution for arrival rate and exponential distribution for service rate, find the average number of customers in the queue.

(A) 6.7 (B) 7.8 (C) 9.6 (D) 8.1

14. The demand for a commodity is 100 units per day. Every time an order is placed, a fixed cost of Rs. 400 is incurred. Holding cost is Rs. 0.08 per unit per day. If the lead-time is 13days, then the re-order point is

(A) 100 units (B) 200 units (C) 300 units (D) 350 units

15. Match the list I with list II

	List I		**List II**
P	Basic shaft	I	Lower deviation is zero
Q	Basic hole	II	Lower limit of hole
R	Go limit	III	Upper deviation is zero
S	Not go limit	IV	Upper limit of hole

(A) $P - IV, Q - II, R - I, S - III$ (B) $P - II, Q - IV, R - III, S - I$

(C) $P - I, Q - III, R - IV, S - II$ (D) $P - III, Q - I, R - II, S - IV$

16. Throttling process is

(A) Reversible process

(B) Irreversible process

(C) Reversible in the beginning and irreversible at the end of process

(D) None of these

17. Which of the following defines IC engine most appropriately?
(A) Product of combustion is used as working substance
(B) Combustion of fuel takes place inside the cylinder
(C) Petrol or diesel is used as fuel
(D) Works on diesel or otto cycle

18. Which of the following is true for otto, duel and diesel cycles for same compression ratio and same amount of heat discharge? (η represents efficiency)

(A) $\eta_{otto} > \eta_{dual} = \eta_{diesel}$ (B) $\eta_{otto} < \eta_{dual} < \eta_{diesel}$

(C) $\eta_{otto} > \eta_{dual} > \eta_{diesel}$ (D) $\eta_{otto} = \eta_{dual} = \eta_{diesel}$

19. A turbine is working under a head of 200m. The power developed by the turbine is 100KW and discharge through turbine is $0.125 m^3/sec$. What will be the ratio of unit power to unit discharge for the turbine?

(A) 4000 (B) 16000 (C) 160×10^3 (D) 800×10^3

20. The sonic velocity for a fluid of specific gravity 0.8 and bulk modulus of $15{,}600 kgf/cm^2$ will be

(A) 1383 m/s (B) 441.5 m/s (C) 4.41 m/s (D) None of these

Q.21 – Q.75 Carry Two Marks Each

21. If it is given that, $A + B + C = \pi$ then the value of the determinant,

$$\begin{vmatrix} -1 & \cos C & \cos B \\ \cos C & -1 & \cos A \\ \cos B & \cos A & -1 \end{vmatrix}$$ is

(A) $\cos^2 B \sin^2 B$ (B) 1

(C) $-\cos C$ (D) None of these

22. The following system of equations:

$x - 2y + 3z = 3$
$2x + y - z = 9$
$-3x - 4y + 5z = -8$ has

(A) unique solution (B) infinite solution

(C) finite number of solutions (D) no solution

23. The equation of the integral curve that passes through (1, 2) of the differential equation $y' = \frac{2x}{y^2 + 1}$ is

(A) $2\left(x^2 - 1\right) = y^3 - 3y$ (B) $3x^2 + 11 = y^3 + 3y$

(C) $y^3 + 1 = 3x^2 + 17$ (D) None of the above

24. Let x bc a random variable whose distribution is as follows:

$$F_x(t) = \begin{cases} 0 \text{ for } t < 0 \\ 1 + e^{2t} \text{ for } t \geq 0 \end{cases}$$

The value of $P\left(x \leq \frac{1}{3}\right)$ is

(A) 3.00 (B) 2.95

(C) 0.56 (D) None of the above

25. Evaluate the following limit:

$\lim_{x \to \infty} \left(3^x + 3^{2x}\right)^{1/x}$

(A) 1 (B) 12 (C) 9 (D) ∞

26. The second approximation for the root of the equation $3x = \cos x + 1$ between 0 and 1 with $x_0 = 0.6$ by Newton Raphson method is:

(A) 0.607 (B) 0.517 (C) 0.606 (D) 0.350

27. Laplace transform of $e^t\left(\frac{\sin t}{t}\right)$ is

(A) $\tan^{-1}(s-1)$ (B) $\cot^{-1}(s-1)$

(C) $\cos^{-1}(s-1)$ (D) $\text{cosec}^{-1}(s-1)$

Common Data Questions No: 28 & 29

The cutting and thrust force during machining of mild steel being found to be 450N and 150N respectively. The shear angle is found to be 40^0 and width of work piece under cutting is 3mm. Ultimate shear stress is 380N/mm^2

28. The uncut thickness is

(A) 0.14mm (B) 0.21mm (C) 0.28mm (D) 0.248mm

29. What will be rake angle if chip thickness is 0.20mm?

(A) 8.54^0 (B) 12.34^0 (C) 14.73^0 (D) 16.67^0

30. Which of the following statements for the electric discharge machining process is not true

E- Source of energy is electric spark

F- Thermal energy is used for machining process

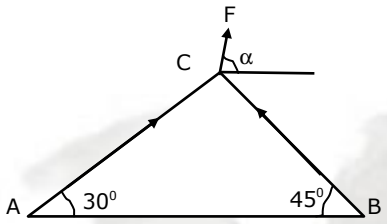
G- Chemical energy is used for machining process

H- Metal removal takes place because of corrosive reaction

I- Metal removal takes place because of fusion.

(A) E and G only (B) G and H only (C) E and I only (D) G and F only

31. Two ropes are tied together at C. If the maximum permissible stress (tensile) in rope AC and BC is 400 N/mm^2 and 600 N/mm^2 respectively, what is the maximum force F which may be applied at C. The area of each rope is $20mm^2$



(A) 12.5N (B) 12.5KN (C) 13.5N (D) 13.5KN

32. The value of α (angle of inclination) in the above problem is

(A) 97.12° clock wise (B) 82.87° anti clock wise

(C) 97.12° clock wise or 82.87° anti clock wise (D) None of these

33. A hydraulic turbine is running at 125 r.p.m. and the turbine has an overall efficiency of 90% under the discharge of $12m^3/sec$. What will be the specific speed of turbine if power developed by turbine is 750KW?

(A) 100 (B) 200 (C) 300 (D) 400

34. Choose the correct statement from the following

I Runner is a part of turbine

II Impeller is a part of reaction turbine

III Draft tube is a part of reaction turbine

IV Cavitation phenomenon can occur anywhere i.e. either at inlet or outlet of rotor

V Specific speed of turbine is given as $\frac{N\sqrt{P}}{H^{3/4}}$ where N, P and H has usual meaning

(A) I, III and IV only (B) II, IV and V only

(C) I, II and III only (D) All are true

35. Hot oil with a capacity rate of 2000W/K flows through a double pipe heat exchanger. It enters at 425^0C and leaves at 350^0C whereas cold fluid enters at 25^0C and leaves at 200^0C. If the overall heat transfer co-efficient is 800W/m^2K then what will be the ratio of heat exchanger area when it is used as parallel flow to counter flow arrangement

(A) 0.937 (B) 0.735 (C) 0.689 (D) 1.067

36. Consider the statements given below

1. Emmissivity does not depend on surface characteristics.
2. Emmisivity of metallic surfaces decreases with temperature
3. Emmisivity is dependent on formation of oxide layer
4. Emmisivity of non-metallic surfaces increases with temperature
5. Polished metallic surfaces have low emmisivity

Which of the above statements are not true

(A) 1, 2 and 5 only (B) 1, 2 and 4 only (C) 2, 3 and 5 only (D) all are false

37. The co-efficient of steadiness for a flywheel is 25 and the minimum speed of the flywheel is 750 r.p.m. The maximum fluctuation of speed for the flywheel is

(A) 15.5 r.p.m. (B) 25.6 r.p.m. (C) 30 r.p.m. (D) 45 r.p.m

38. The gear and pinion made of different material mesh externally. The number of teeth on gear and pinion is 75 and 50 respectively .The tooth form factor is given by the relation $y = 0.154 - \frac{0.912}{\text{Number of teeth}}$. The permissible stresses for the pinion and gear material are 140 and 115N/mm^2 respectively. Based on above data, Lewis equation will be applied to

(A) pinion (B) gear

(C) both pinion and gear (D) none of these

39. What will be the ratio of strength factor (Gear to Pinion) for the above problem?

(A) 1.165 (B) 0.858 (C) 0.307 (D) none of these

40. What will be the effect on eccentricity ratio for a hydrodynamic journal bearing if there is increase in the diameter of journal (Assume other parameters as constant)

(A) it will increase (B) it will decrease

(C) it will remain same (D) none of these

41. The braking torque for a single band brake is 1575 Nm and the band brake has a contact of 270º. The diameter of drum on which band brake is working is 600mm and thickness of band is given by the relation $t = .0005d$, where d is diameter of drum. What will be the value of tension on the slack side if drum is rotating clockwise? The co-efficient of friction is 0.25

(A) 7579.52Nm (B) 2332.26N (C) 5247.36 (D) None of these

42. The slenderness ratio for a column hinged at both end is 75. What will be the percentage change in slenderness ratio for the column if end condition is changed to one end fixed and other hinged.

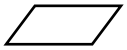
(A) decreases by 50% (B) increases by 50%

(C) decreases by 29.28% (D) increases by 29.28%

43. A thin cylindrical shell when subjected to an internal pressure changes its length by 5% and diameter by 3% If the original volume of cylindrical shell is 75 cm^3 then what will be the change in volume of shell due to internal pressure.

(A) 9.75cm^3 (B) 1.5cm^3 (C) 6cm^3 (D) 8.25cm^3

44. Match List I with List II

	List I		**List II**
E	Profile of a line	I	
F	Profile of a surface	II	
G	Circular run out	III	
H	Cylindricity	IV	
		V	
		VI	

(A) $E-III, F-IV, G-I, H-II$ (B) $E-IV, F-III, G-II, H-I$

(C) $E-III, F-IV, G-V, H-VI$ (D) $E-IV, F-III, G-VI, H-V$

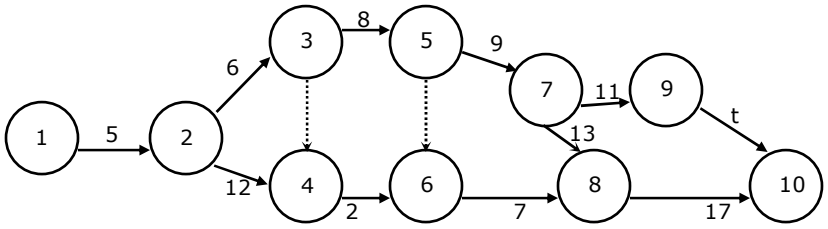
45. Match List I with List II

	List I		**List II**
P	Autocollimator	I	Length bar
Q	Stylus Probe	II	Straightness
R	Newall Measuring Machine	III	Angular difference
S	Taut wire method	IV	Surface finish

(A) $P-IV, Q-III, R-I, S-II$ (B) $P-IV, Q-III, R-II, S-I$

(C) $P-III, Q-IV, R-I, S-II$ (D) $P-III, Q-IV, R-II, S-I$

46. Consider the network shown below.



What should be the value of t if path 1-2-3-5-7-9-10 is critical path of the network?

(A) t>7 (B) t<7 (C) t>19 (D) t<19

47. The estimated duration of times for an activity in the PERT network under the worst and best environment is 10 days and 4 days respectively. The variance of the activity is

(A) 6 days (B) 10 days (C) 4 days (D) 1 day

Common Data for Question No: 48, 49 & 50

The temperature distribution across a large concrete slab 120cm thick, heated from one side as measured by thermocouple approximates to the following relation: $T = 120 - 75x + 8x^2 + 12x^3 - 7x^4$ where T is in ^0C, x is in meters, considering the area of cross-section as $5m^2$, thermal conductivity as 1.2 W/mK and thermal diffusivity as $1.77 \times 10^{-3} m^2/h$

48. The heat energy stored in unit time is

(A) 376.272W (B) 188.136W (C) 135.936W (D) 73.728W

49. Rate of temperature change at both ends of plate is

(A) $28.32 \times 10^{-3}\ ^0C/h, -78.16 \times 10^{-3}\ ^0C/h$

(B) $94.02 \times 10^{-3}\ ^0C/h, 68.16 \times 10^{-3}\ ^0C/h$

(C) $28.32 \times 10^{-3}\ ^0C/h, -32.85 \times 10^{-3}\ ^0C/h$

(D) $28.32 \times 10^{-3}\ ^0C/h, 94.02 \times 10^{-3}\ ^0C/h$

50. The rate of heating or cooling will be minimum at

(A) 0.214m (B) 0.428m (C) 0.857m (D) 1.071m

51. If a gas of volume $6000cm^3$ and at a pressure of 100kPa is compressed quasi-sta tically according to PV^2 = constant until the volume becomes $2000cm^3$, determine the work transfer from the system

(A) -1.2KJ (B) -1.2MJ (C) 1.2KJ (D) 1.2MJ

52. Match the list

	A		B
A.	Brayton cycle	i.	2 Isobaric processes
B.	Otto cycle	ii.	2 isothermal processes
C.	Diesel cycle	iii.	2 isochoric processes
D.	Carnot cycle	iv.	1 constant volume and 1 constant pressure process

(A) $A-(i), B-(iv), C-(iii), D-(ii)$ (B) $A-(iii), B-(i), C-(iv), D-(ii)$

(C) $A-(i), B-(iii), C-(iv), D-(ii)$ (D) $A-(i), B-(iii), C-(ii), D-(iv)$

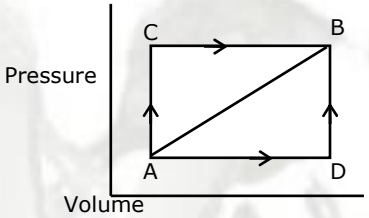
53. When a system is taken from state A to state B along the path A-C-B, 180 kJ heat flows into the system and it does 130 kJ of work (as shown in figure). How much heat will flow into the system along the path ADB if the work done by it along the path is 40 kJ?

(A) 40 kJ

(B) 60 kJ

(C) 90 kJ

(D) 135 kJ



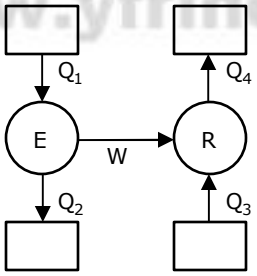
54. Match List I with List II:

LIST I	**LIST II**
(A) Critical activity to be crashed	(1) It has float
(B) Critical activity	(2) It has least cost slope
(C) Dummy activity	(3) It maintains logic of network
(D) Sub-critical activity	(4) It has no float

(A) A-1 B-4 C-3 D-2 (B) A-3 B-4 C-1 D-2

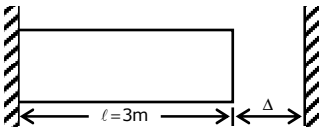
(C) A-2 B-4 C-3 D-1 (D) A-4 B-2 C-1 D-2

55. In the figure shown E is the heat engine with efficiency of 0.4 and R is the refrigerator. Given that $Q_2 + Q_4 = 3Q_1$, the co-efficient of performance of the refrigerator is



(A) 5 (B) 4.5 (C) 3 (D) 5.5

56. A bronze bar 3m long with a cross-sectional area of 320mm^2 is placed between two rigid walls as shown in figure. At a temperature of –20ºC, gap Δ is 2.5mm. Then the temperature at which the compressive stress in the bar will be σ = 35MPa is ($\alpha = 18 \times 10^{-6}$ /^{0} C, E = 80GPa)



(A) 50.6ºC (B) 51.3ºC
(C) 48.1ºC (D) 54.7ºC

57. Two bars each of length l and of the same material are subjected to the same axial tensile force P. The first bar has a uniform diameter 2d. The second bar has a diameter d for a length $\ell/3$ and a diameter '2d' for the remaining length. The ratio of strain energies of the two bars is _____

(A) $1/3$ (B) $1/2$ (C) $2/3$ (D) $3/2$

58. Match the following

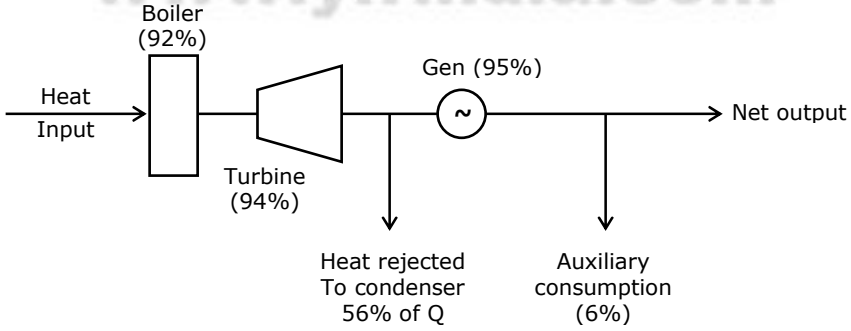
List – I	**List – II**
(a) Bending moment is constant	1. Shear force changes sign
(b) Bending moment is minimum or maximum	2. Slope of the shear force diagram is zero over the portion of beam
(c) Loading is constant	3. Shear force is zero
(d) Load is zero	4. Slope of shear force diagram is constant over the portion of beam

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

59. A machine mounted on springs and fitted with a dashpot has a mass of 60kg. There are three springs, each of stiffness 12N/mm. The amplitude of vibrations reduces from 45 to 8mm in two complete oscillations. Assuming that the damping force varies as velocity. Then the damping coefficient will be

(A) 0.5N/mm/s (B) 0.46N/mm/s (C) 0.36N/mm/s (D) 0.4N/mm/s

60. The efficiencies of various components in a thermal plant is shown in figure. The over all plant efficiency will be



(A) 36% (B) 38% (C) 34% (D) 40%

61. Match List I with List II

	List I		List II
P	Annealing	I	Bainitic structure
Q	Normalizing	II	Martensite
R	Quenching	III	Coarse pearlite
S	Austempering	IV	Fine pearlite

(A) $P-III, Q-IV, R-II, S-I$ (B) $P-II, Q-III, R-I, S-III$

(C) $P-III, Q-IV, R-I, S-II$ (D) $P-IV, Q-III, R-II, S-I$

62. Match List I with List II

	List I		List II
E	Chaplets	I	Solidification techniques
F	Chills	II	Supporting members
G	Splash cores	III	Flow of molten metal
H	Runners	IV	Prevent flow of impurity to mould
		V	Creates hollow structure

(A) $E-I, F-II, G-IV, H-III$ (B) $E-I, F-II, G-V, H-IV$

(C) $E-II, F-I, G-IV, H-III$ (D) $E-II, F-I, G-V, H-IV$

63. Two castings of same metal having same surface area. One casting in the form of sphere and another is in the form of cube. The ratio of solidification time for the sphere to cube is

(A) 2.1 (B) 1.6 (C) 1.9 (D) 1.5

64. Which of the following is not true?
(i) TIG uses a non consumable electrode
(ii) In resistance welding contact resistance should be maximum between electrode and work
(iii) In EBW voltage drop should be lower than the Arc welding
(iv) LBW can be used for the welding of plastic materials

(A) (i) and (ii) (B) (ii) and (iii)
(C) (iii) and (iv) (D) (i) and (iv)

65. An annealed copper strip of 228mm wide and 25mm thick is rolled to a thickness of 20mm in one pass. The roll radius is 300mm and the rolls rotate at 100rpm. Then the power required in this operation is (assume two rolls system)

(A) 1340kW (B) 1220kW (C) 1760kW (D) 1010kW

66. In which of the following devices equation dQ=dU+dW can not be applied:

(i) Internal combustion Engine working on otto cycle

(ii) Internal combustion Engine working on diesel cycle

(iii) Gas Turbines

(iv) Steam Turbines

(A) (i) and (ii) (B) (ii) and (iii) (C) (iii) and (iv) (D) (i) and (iv)

67. A four cylinder engine running at 1200rpm delivers 20kW. The average torque when one cylinder was cut is 110Nm. If the calorific value of the fuel is 43MJ/kg and engine uses 360gms of gasoline per kWh. Then the mass of fuel consumption in kg/sec is

(A) $1\times10^{-3}\text{kg/s}$ (B) $2\times10^{-3}\text{kg/s}$

(C) $3\times10^{-3}\text{kg/s}$ (D) $2.6\times10^{-3}\text{kg/s}$

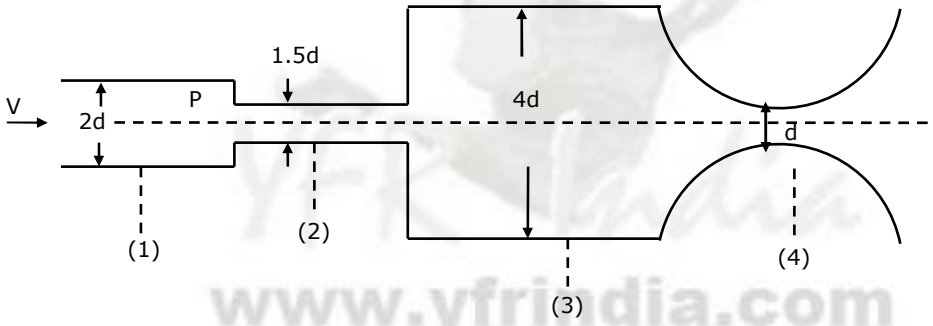
68. Match the following

List – I	**List - II**
a. Reynolds number	1. $\frac{\text{conductive resistance}}{\text{convective resistance}}$
b. Prandtl number	2. $\frac{\text{Kinetic viscosity}}{\text{Thermal diffusivity}}$
c. Nusselt number	3. $\frac{\text{Inertia force}}{\text{Viscous fource}}$
d. Gras hoff number	4. $\frac{\text{Inertia force}\times\text{Buoyancy force}}{(\text{Viscous fource})^2}$

(A) $1-a, b-2, c-3, d-4$ (B) $1-c, 2-b, , 3-a, 4-d$

(C) $1-c, 2-b, 3-d, 4-a$ (D) $1-b, 2-c, 3-a, 4-d$

69. Water flowing through a pipeline having four different diameters at 4 stations is shown in the figure.



The correct sequence of station numbers in the decreasing order of pressure is:

(A) 3, 1, 4, 2 (B) 1, 3, 2, 4 (C) 1, 3, 4, 2 (D) 3, 1, 2, 4

70. A cylinder of 0.12 m radius rotates concentrically inside a fixed hollow cylinder of 0.13 m radius. Both the cylinders are 0.3 m long. What will the viscosity of the

liquid which fills the space between the cylinders if a torque of 0.88 Nm is required to maintain an angular velocity of 2π rad/s.

(A) 0.123 (B) 0.216 (C) 0.291 (D) 0.397

71. The velocity profile in a laminar boundary layer is $\frac{u}{U} = 2\frac{y}{\delta} - \left(\frac{y}{\delta}\right)^2$ .The displacement thickness is equal to

(A) $\delta/3$ (B) $\delta/2$ (C) $^2/_3\delta$ (D) $^4/_3\delta$

72. Which of the following helps in achieving directional solidification of casting

1. Riser
2. Gating System
3. Chills
4. Chaplets
5. Padding

(A) 1, 2 and 3 (B) 2, 3 and 4 (C) 1, 3 and 5 (D) 1, 2, 3 and 5

Common Data for Question No: 73 & 74

A flywheel for a punch press must be capable of furnishing 2.7 KJ of energy during the ¼ revolution while the hole is being punched. The maximum speed of the flywheel is 200rev/min and the speed decreases 10% during the cutting stroke. The mean radius of rim is 915mm

73. What should be the total mass of the flywheel assuming that the mass of the flywheel is 1.15 times that of the rim? It has also been assumed that the flywheel rim contributes only 90% of the energy requirement.

(A) 69.6 kg (B) 80 kg (C) 149.6kg (D) 172.84kg

74. Co-efficient of speed fluctuation is

(A) 0.105 (B) 0.115 (C) 0.125 (D) 0.15

75. Which of the following will not be find in iron carbon equilibrium diagram:

(A) Pearlite (B) Cementite (C) Austenite (D) Martensite

Linked Answer Questions: Q.76 to Q.85 Carry Two Marks Each

Statement for Linked Questions: 76 and 77

A tank is connected to 3 pipelines P_1, P_2 and P_3 whose lengths are in the ratio 1:2:3 and diameter is also in the ratio 1:2:3. The sum of length for all the pipes is 18m and product of diameters is 20250 mm^3. It has been found that head loss due to friction in pipe P_1 is sum of head loss in P_2 and P_3. Assume same friction factor for all pipe lines.

76. What will be the value $\frac{Q_3}{Q_2}$ if $\frac{Q_1}{Q_2} = \frac{2}{3}$ where Q_i represents discharge in pipeline i.

(A) 17/3 (B) 3/17 (C) 17/2 (D) 2/17

77. The ratio $Q_1 : Q_2 : Q_3$ will be

(A) 2:3:17 (B) 3:2:17 (C) 17:2:1 (D) 1:17:3

Statement for Linked Questions: 78 & 79

In a 5kW cooling capacity refrigeration system operating on a simple vapour compression cycle, the refrigerant enters the evaporator with an enthalpy of 80 kJ/kg and leaving with an enthalpy of 200kJ/kg. The enthalpy of refrigerant after compression is 220kJ/kg.

78. Calculate the mass flow rate of refrigerant

(A) 0.0417kg/sec (B) 0.417kg/sec

(C) 0.0417kg/hr (D) 0.417kg/hr

79. Calculate the heat given by the refrigerant in condenser

(A) 5.84kJ/hr (B) 5.84kJ/min (C) 5.84kJ/s (D) none

Statement for Linked Questions: 80 & 81

A rotor has a mass of 12 kg and is mounted midway on a 24 mm diameter horizontal shaft supported at the ends by two bearings. The bearings are 1 m apart. The shaft rotates at 2400 rpm. The centre of the mass is 0.11 mm away from the geometric centre of the rotor. $E = 2 \times 10^{11} N/m^2$.

80. What will be the natural frequency of the system?

(A) 251.3 rad/sec (B) 114.2 rad/sec

(C) 152.1 rad/sec (D) 116.1 rad/sec.

81. Amplitude of steady state vibration is

(A) 1 mm (B) 0.5 mm (C) 0.32 mm (D) 0.139 mm

Statement for Linked Questions No: 82 & 83

A timber beam is freely supported on supports 6 metres apart. It carries a uniformly distributed load of 12KN per metre run and a concentrated load of 9 kN at 2.5 metre from the left support. Stress in timber should not exceed 8 N/mm^2.

82. Maximum bending moment in the beam will be:

(A) 65.8KNm (B) 78.2KNm (C) 91.7KNm (D) 88.3KNm

83. What should be the cross sectional area of beam if depth twice the width:

(A) $0.21\,m^2$ (B) $0.11\,m^2$ (C) $0.32\,m^2$ (D) $0.28\,m^2$

Statement for Linked Questions: 84 & 85

84. Mild speed is being machined with a tool rake angle 15°. The width of cut and uncut thickness are 1 mm and 0.1 mm respectively. The average value of the coefficient of friction between the tool and the chip is 0.4 and shear stress τ_s of the work material is 300 N/mm^2. What will be the shear angle?

(A) 83.2° (B) 5.66° (C) 41.6° (D) 11.32°

85. In above question, the cutting and thrust components of the machining force will be

(A) 675.4N, 80.5N (B) 80.5N, 675.4N

(C) 680.2N, 81.5N (D) 451.86N, 680.2N