## Additional Problems For Self Practice (APSP)

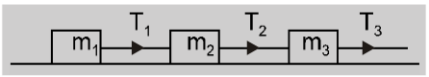
# PART-I : PRACTICE TEST PAPER

**Max. Marks : 120** **Max. Time : 1 Hr.**

### Important Instructions :

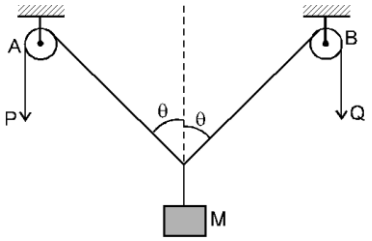
1. The test is of **1 hour** duration and max. marks 120.
2. The test consists **30** questions, **4 marks** each.
3. Only one choice is correct **1 mark** will be deducted for incorrect response. No deduction from the total score will be made if no response is indicated for an item in the answer sheet.
4. There is only one correct response for each question. Filling up more than one response in any question will be treated as wrong response and marks for wrong response will be deducted accordingly as per instructions 3 above.

**1.** Three blocks of masses $m_1$, $m_2$ and $m_3$ are connected by massless strings as shown on a frictionless table. They are pulled with a force $T_3 = 40$ N. If $m_1 = 10$ kg, $m_2 = 6$ kg and $m_3 = 4$ kg, the tension $T_2$ will be-




(1) 20 N (2) 40 N (3) 10 N (4) 32 N

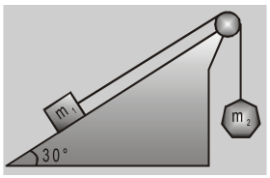
**2.** In the arrangement shown in fig. the ends P and Q of an unstretchable string move downwards with uniform speed U. Pulleys A and B are fixed. Mass M moves upwards with a speed.




(1) 2 U cos θ
(2) U cos θ
(3) 2 U/cos θ
(4) U/cos θ

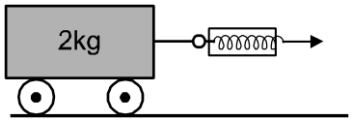
**3.** A particle is moving with a constant speed along a straight line path. A force is not required to :
(1) increase its speed (2) decrease its momentum
(3) change the direction (4) keep it moving with uniform velocity

**4.** A block of mass $m_1 = 2$ kg on a smooth inclined plane at angle 30° is connected to a second block of mass $m_2 = 3$ kg by a cord passing over a frictionless pulley as shown in fig. The acceleration of each block is- (assume g = 10 m/sec$^2$)



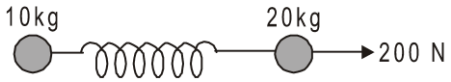

(1) 2 m/sec$^2$ (2) 4 m/sec$^2$
(3) 6 m/sec$^2$ (4) 8 m/sec$^2$

**5.** A massless spring balance is attached to 2 kg trolley and is used to pull the trolley along a flat surface as shown in the fig. The reading on the spring balance remains at 10 kg during the motion. The acceleration of the trolley is (Use g = 9.8 ms$^{-2}$)



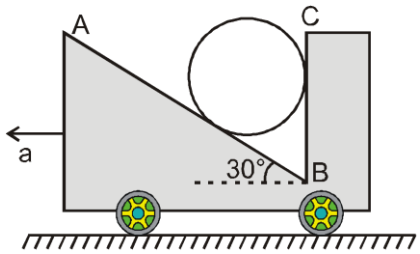

(1) 4.9 ms$^{-2}$ (2) 9.8 ms$^{-2}$ (3) 49 ms$^{-2}$ (4) 98 ms$^{-2}$

**6.** Two masses of 10 kg and 20 kg respectively are connected by a massless spring as shown in figure. A force of 200 N acts on the 20 kg mass at the instant when the 10 kg mass has an acceleration of 12 ms$^{-2}$ towards right, the acceleration of the 20 kg mass is :




(1) 2 $ms^{-2}$ (2) 4$ms^{-2}$ (3) 10$ms^{-2}$ (4) 20$ms^{-2}$

**7.** A cylinder rests in a supporting carriage as shown. The side AB of carriage makes an angle 30° with the horizontal and side BC is vertical. The carriage lies on a fixed horizontal surface and is being pulled towards left with an horizontal acceleration '*a*'. The magnitude of normal reactions exerted by sides AB and BC of carriage on the cylinder be $N_{AB}$ and $N_{BC}$ respectively. Neglect friction everywhere. Then as the magnitude of acceleration *'a* ' of the carriage is increased, pick up the correct statement :

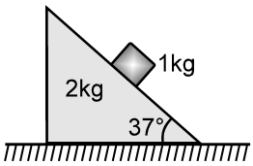



(1) $N_{AB}$ increases and $N_{BC}$ decreases. (2) Both $N_{AB}$ and $N_{BC}$ increase.
(3) $N_{AB}$ remains constant and $N_{BC}$ increases. (4) $N_{AB}$ increases and $N_{BC}$ remains constant.

**8.** Newton's Third law is equivalent to the-
(1) law of conservation of linear momentum (2) law of conservation of angular momentum
(3) law of conservation of energy (4) law of conservation of energy and mass

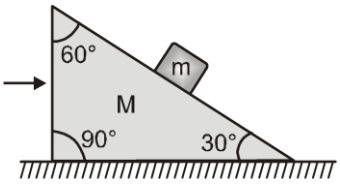
**9.** We can derive newton's-
(1) second and third laws from the first law
(2) first and second laws from the third law
(3) third and first laws from the second law
(4) all the three laws are independent of each others.

**10.** Figure shows a wedge of mass 2kg resting on a frictionless floor. A block of mass 1 kg is kept on the wedge and the wedge is given an acceleration of 5 m/$sec^2$ towards right. Then :




(1) block will remain stationary w.r.t. wedge
(2) the block will have an acceleration of 1 m/$sec^2$ w.r.t. the wedge
(3) normal reaction on the block is 11 N
(4) net force acting on the wedge is 2 N

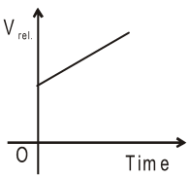
**11.** A triangular block of mass M rests on a smooth surface as shown in figure. A cubical block of mass *m* rests on the inclined surface. If all surfaces are frictionless, the force that must be applied to M so as to keep *m* stationary relative to M is :




(1) Mg tan 30° (2) *m*g tan 30°
(3) (M+*m*)g tan 30° (4) (M+*m*)g cos 30°

**12.** An object kept on a smooth inclined plane of inclination θ with horizontal can be kept stationary relative to the incline by giving a horizontal acceleration to the inclined plane, equal to :
(1) g sin θ (2) g cos θ (3) g tan θ (4) none of these.

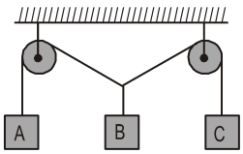
**13.#** A particle is observed from two frames $S_1$ and $S_2$. The graph of relative velocity of $S_1$ with respect to $S_2$ is shown in figure . Let $F_1$ and $F_2$ be the pseudo forces on the particle when seen from $S_1$ and $S_2$ respectively . Which one of the following is not possible ?




(1) $F_1 = 0$ , $F_2 \neq 0$ (2) $F_1 \neq 0$ , $F_2 = 0$

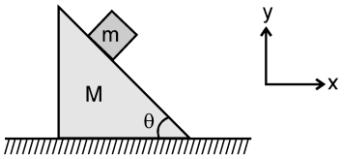
(3) $F_1 \neq 0$ , $F_2 \neq 0$ (4) $F_1 = 0$ , $F_2 = 0$

**14.** Three blocks A , B and C are suspended as shown in the figure. Mass of each block A and C is m. If system is in equilibrium and mass of B is M , then :



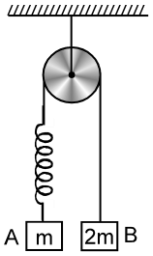

(1) M = 2 m (2) M < 2 m
(3) M > 2 m (4) M = m

**15.** Consider the shown arrangement. Assume all surfaces to be smooth. If 'N' represents magnitude of normal reaction between block and wedge then acceleration of 'M' along horizontal equals:



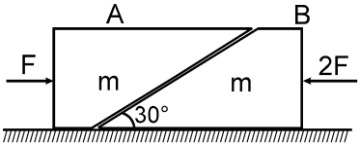

(1) $\frac{N\sin\theta}{M}$ along + ve-x-axis (2) $\frac{N\cos\theta}{M}$ along-ve x-axis
(3) $\frac{N\sin\theta}{M}$ along – ve x-axis (4) $\frac{N\sin\theta}{m+M}$ along –ve x-axis

**16.** In the figure a block 'A' of mass 'm' is attached at one end of a light spring and the other end of the spring is connected to another block 'B' of mass 2m through a light string. 'A' is held and B is in static equilibrium. Now A is released. The acceleration of A just after that instant is 'a'. In the next case, B is held and A is in static equilibrium. Now when B is released, its acceleration immediately after the release is 'b'. The value of a/b is : (Pulley, string and the spring are massless)



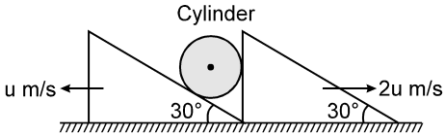

(1) 0 (2) $\frac{1}{2}$
(3) 2 (4) undefined

**17.** Two blocks 'A' and 'B' each of mass 'm' are placed on a smooth horizontal surface. Two horizontal force F and 2F are applied on the two blocks 'A' and 'B' respectively as shown in figure. The block A does not slide on block B. Then the normal reaction acting between the two blocks is : (A and B are smooth)



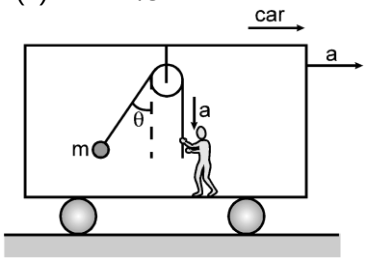

(1) F (2) F/2 (3) $\frac{F}{\sqrt{3}}$ (4) 3F

**18.** In the system shown in figure assume that cylinder remains in contact with the two wedges. The velocity of cylinder is -




(1) $\sqrt{19-4\sqrt{3}}\,\frac{u}{2}$ m/s (2) $\frac{\sqrt{13}\,u}{2}$ m/s (3) $\sqrt{3}\,u$ m/s (4) $\sqrt{7}\,u$ m/s

**19.** A bob is hanging over a pulley inside a car through a string. The second end of the string is in the hand of a person standing in the car . The car is moving with constant acceleration 'a' directed horizontally as shown in figure . Other end of the string is pulled with constant acceleration ' a ' (relative to car) vertically. The tension in the string is equal to

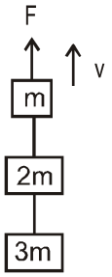



(1) $\sqrt{g^2+a^2}$ m (2) m $\sqrt{g^2+a^2}$ – ma

(3) $m\sqrt{g^2 + a^2}$ + ma (4) m(g + a)

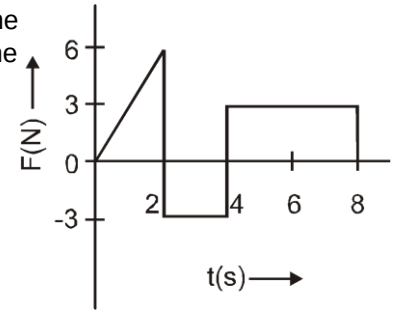
**20.** A sphere is accelerated upwards by a cord whose breaking strength is four times its weight. The maximum acceleration with which the sphere can move up without breaking the cord is :
(1) g (2) 3g (3) 2g (4) 4g

**21.** Three blocks with masses m, 2 m and 3m are connected by strings as shown in the figure. After an upward force F is applied on block m, the masses move upward at constant speed v. What is the net force on the block of mass 2m? (g is the acceleration due to gravity)




(1) 2mg
(2) 3 mg
(3) 6 mg
(4) zero

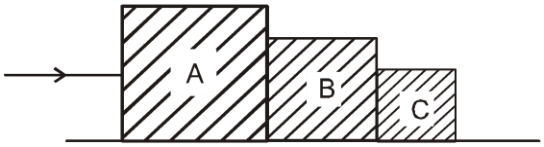
**22.** The force 'F' acting on a particle of mass 'm' is indicated by the force-time graph shown below. The change in momentum of the particle over the time interval from zero to 8 s is :




(1) 24 Ns
(2) 20 Ns
(3) 12 Ns
(4) 6 Ns

**23.** A balloon with mass 'm' is descending down with an acceleration 'a' (where a < g). How much mass should be removed from it so that is starts moving up with an acceleration 'a' ?
(1) $\frac{2ma}{g+a}$ (2) $\frac{2ma}{g-a}$ (3) $\frac{ma}{g+a}$ (4) $\frac{ma}{g-a}$

**24.** Three blocks A, B and C of masses 4 kg, 2 kg and 1 kg respectively, are in contact on a frictionless surface, as shown. If a force of 14 N is applied on the 4 kg block then the contact force between A and B is :




(1) 6 N (2) 8 N (3) 18 N (4) 2 N

**25.** A player takes 0.1 s in catching a ball of mass 150 g moving with velocity of 20 m/s. The force imparted by the ball on the hands of the player is :
(1) 0.3 N (2) 3 N (3) 30 N (4) 300 N

**26.** An object of mass 3 kg is at rest. If a force $\vec{F} = (6t^2\,\hat{i} + 4t\,\hat{j})$ N is applied on the object, then the velocity of the object at t = 3 s is :
(1) $18\hat{i} + 3\hat{j}$ (2) $18\hat{i} + 6\hat{j}$ (3) $3\hat{i} + 18\hat{j}$ (4) $18\hat{i} + 4\hat{j}$

**27.** A lift of mass 1000 kg is moving upwards with an acceleration of 1 m/s$^2$. The tension developed in the string, which is connected to lift is : (g = 9.8 m/s$^2$)
(1) 9800 N (2) 10800 N (3) 11000 N (4) 10000 N

**28.** A man weighs 80 kg. He stands on a weighing scale in a lift which is moving upwards with a uniform acceleration of 5 m/s$^2$. What would be the reading on the scale ? (g = 10 m/s$^2$)
(1) 800 N (2) 1200 N (3) Zero (4) 400 N

**29.** A monkey of mass 20 kg is holding a vertical rope. The rope will not break when a mass of 25 kg is suspended from it but will break if the mass exceeds 25 kg. What is the maximum acceleration with which the monkey can climb up along the rope ? (g = 10 m/s$^2$)
(1) 25 m/s$^2$ (2) 2.5 m/s$^2$ (3) 5 m/s$^2$ (4) 10 m/s$^2$

**30.** A body of mass 10 kg is placed in a lift moving upward with an acceleration of 2m/s$^2$. The apparent weight of body is (g = 9.8 m/s$^2$)
(1) 118 N (2) 78 N (3) 98 N (4) 198 N

## Practice Test (JEE-Main Pattern)

**OBJECTIVE RESPONSE SHEET (ORS)**

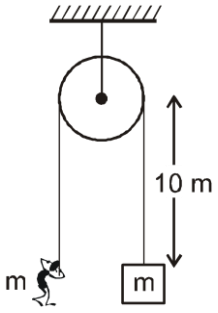
| Que. | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|---|
| Ans. | | | | | | | | | | |
| Que. | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |
| Ans. | | | | | | | | | | |
| Que. | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 |
| Ans. | | | | | | | | | | |

## PART - II : PRACTICE QUESTIONS

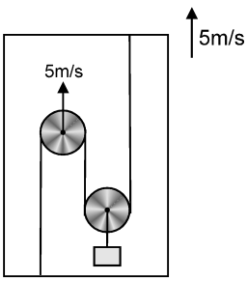
**Marked Questions can be used as Revision Questions.**

**1.** Two spring of spring constants $k_1$ and $k_2$ are joined in series. The effective spring constant of the combination is given by :
(1) $\sqrt{k_1k_2}$ (2) $(k_1 + k_2)/2$ (3) $k_1 + k_2$ (4) $k_1k_2/(k_1 + k_2)$

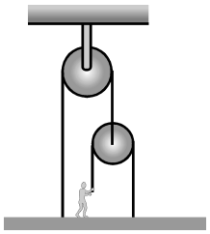
**2.** A boy and a block, both of the same mass 10 kg, are suspended at the same horizontal level, from each end of a light string that moves over a frictionless pulley as shown. The boy starts moving upwards with an acceleration 2.5 m/s$^2$ relative to the rope. Then the tension in the string will be : (g = 10 m/s$^2$)
(g = 10 m/s$^2$)
(1) 112.5 N
(2) 125 N
(3) 200 N
(4) 100 N




**3.** A lift is moving upwards with a constant speed of 5 m/s. The speed of one of the pulleys is 5 m/s as shown. Then the speed of second pulley is :
(1) 5m/s
(2) zero
(3) 7.5 m/s
(4) 10 m/s



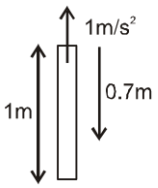
**4.** In the figure shown with what force must the man pull the rope to hold the plank in position? Weight of the man is 60 kg f. Neglect the weights of plank rope and pulley.



(1) 15 kg f
(2) 30 kg f
(3) 60 kg f
(4) none

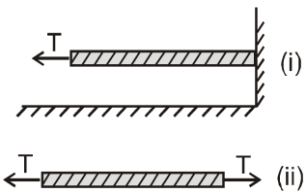
**5.** Ten one rupee coins are put on top of each other on a table. Each coin has a mass m kg. Then [Coins are counted from the top]
(1) the reaction of the 6th coin on the 7th coin is 4 mg
(2) the force on the 7th coin (counted from the bottom) due to all the coins on its top is 3 mg
(3) the force on the 7th coin by the eighth coin is 3mg
(4) none of these

**6.** A uniform rod of mass 10 kg and length 1m is being taken vertically up with an acceleration of $1m/s^2$ find tension in rod at 70 cm from upper end. (Take $g = 10\ m/s^2$)



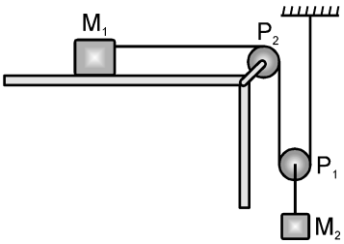

(1) 3 N (2) 30 N
(3) 110 N (4) 33 N

**7.** In the figure (i) an extensible string is fixed at one end and the other end is pulled by a tension T. In figure (ii) another identical string is pulled by tension 'T' at both the ends. The ratio of elongation in equilibrium of string in (i) to the elongation of string in (ii) is



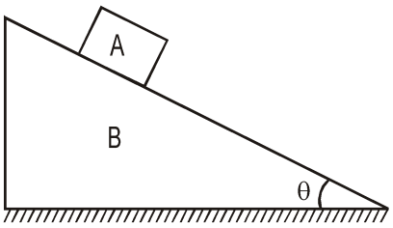

(1) 1 : 1 (2) 1 : 2
(3) 2 : 1 (4) 0

**8.** Blocks of mass $M_1$ and $M_2$ are connected by a cord which passes over the pulleys $P_1$ and $P_2$ as shown in the figure. If there is no friction, the acceleration of the block of mass $M_2$ will be:



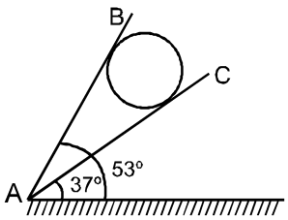

(1) $\frac{M_2 g}{(4M_1 + M_2)}$ (2) $\frac{2M_2 g}{(4M_1 + M_2)}$
(3) $\frac{2M_1 g}{(M_1 + 4M_2)}$ (4) $\frac{2M_1 g}{(M_1 + M_2)}$

**9.** A block is placed on a smooth wedge of inclination angle θ with the horizontal. What minimum acceleration should be given to the wedge in the horizontal direction so that the block starts moving up along the incline?



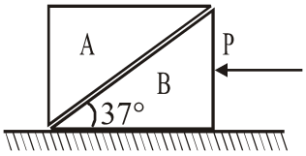

(1) > g cot θ (2) > g tan θ
(3) > g sin θ (4) > g cos θ

**10.** A sphere of mass m is held between two smooth inclined walls AB and AC. The normal reaction between wall AB and sphere is :




(1) $\frac{15mg}{7}$ (2) $\frac{30mg}{7}$
(3) $\frac{10mg}{7}$ (4) $\frac{20mg}{7}$

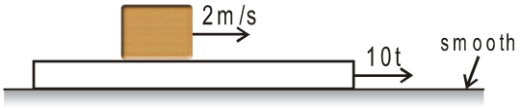
**11.** Blocks A and B each have same mass m = 1 kg. The largest horizontal force P (in newton) which can be applied to B so that A will not slip up on B. Find value of P. (Neglect any friction)




(1) 10 N (2) 5 N
(3) 25 N (4) 15 N

**Comprehension - 1**

A small block of mass 1 kg starts moving with constant velocity 2 m/s on a smooth long plank of mass 10 kg which is also pulled by a horizontal force F = 10 t N where t is in seconds and F is in newtons. (the initial velocity of the plank is zero).




**12.** Displacement of 1 kg block with respect to plank at the instant when both have same velocity is

(1) $4\frac{4}{3}$ m (2) 4 m (3) $\frac{8}{3}$ m (4) 2 m

**13.** The time ($t \neq 0$) at which displacement of block and plank with respect to ground is same will be :

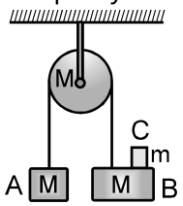
(1) 12 s (2) $2\sqrt{3}$ s (3) $3\sqrt{3}$ s (4) $\sqrt{3}/2$ s

**14.** Relative velocity of plank with respect to block when acceleration of plank is 4 m/s$^2$ will be -

(1) Zero (2) 10 m/s (3) 6 m/s (4) 8 m/s

**Comprehension - 2**

For the following system shown assume that pulley is frictionless, string is massless (m remains on M) :




**15.** The acceleration of the block A is :

(1) $\frac{mg}{2M+m}$ (2) $\frac{2mg}{2M+m}$ (3) $\frac{mg}{M+2m}$ (4) $\frac{Mg}{M+2m}$

**16.** Normal reaction on m is (force on C due to B).

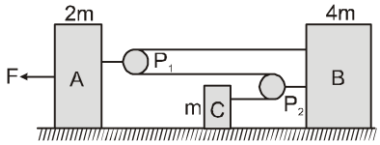
(1) $\frac{M\,mg}{2M+m}$ (2) $\frac{2Mmg}{2M+m}$ (3) $\frac{M\,mg}{M+2m}$ (4) $\frac{2M\,mg}{M+m}$

**17.** The force on the ceiling is

(1) $\frac{(M+m)\,mg}{2M+m}$ (2) $\frac{(6M+5m)\,mg}{M+m}$ (3) $\frac{(M+m)\,mg}{M+m}$ (4) $\frac{(6M+5m)\,Mg}{2M+m}$

**Comprehension - 3**

If block A is pulled by force F in the figure, assuming the surfaces and the pulleys $P_1$ and $P_2$ are all smooth and pulleys and string are light then :




**18.** Acceleration of block C :

(1) $\frac{4F}{21m}$ (2) $\frac{F}{7m}$ (3) $\frac{13F}{42m}$ (4) $\frac{11F}{42m}$

**19.** Acceleration of block B :

(1) $\frac{F}{7m}$ (2) $\frac{4F}{21m}$ (3) $\frac{13F}{42m}$ (4) $\frac{11F}{42m}$

**20.** Acceleration of block A :

(1) $\frac{F}{7m}$ (2) $\frac{4F}{21m}$ (3) $\frac{13F}{42m}$ (4) $\frac{11F}{42m}$

# APSP Answers

**PART - I**

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **1.** | (4) | **1.** | (4) | **3.** | (4) | **4.** | (2) | **5.** | (3) | **6.** | (2) | **7.** | (3) |
| **8.** | (1) | **9.** | (3) | **10.** | (3) | **11.** | (3) | **12.** | (3) | **13.** | (4) | **14.** | (2) |
| **15.** | (3) | **16.** | (3) | **17.** | (4) | **18.** | (4) | **19.** | (3) | **20.** | (2) | **21.** | (4) |
| **22.** | (3) | **23.** | (1) | **24.** | (1) | **25.** | (3) | **26.** | (2) | **27.** | (2) | **28.** | (2) |
| **29.** | (2) | **30.** | (1) | | | | | | | | | | |

**PART – II**

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **1.** | (4) | **2.** | (1) | **3.** | (1) | **4.** | (1) | **5.** | (2) | **6.** | (4) | **7.** | (1) |
| **8.** | (1) | **9.** | (2) | **10.** | (1) | **11.** | (4) | **12.** | (3) | **13.** | (2) | **14.** | (3) |
| **15.** | (1) | **16.** | (2) | **17.** | (4) | **18.** | (1) | **19.** | (1) | **20.** | (3) | | |