FIITJEE COMMON TEST

IIT – JEE, 2014

Paper Code
1827.1

PAPER I (PHASE – I)

QUESTION PAPERS + ANS. KEY

Time: 3 Hours **Maximum Marks: 210**

FIITJEE PHASE TEST-1

A. INSTRUCTION:

1. Read all instructions carefully. Check total pages and no. of questions of your booklet in each subject.
2. Write your Name, Enrolment number, Examination Centre, Question paper code, Batch code, Examination session in the boxes provided for STUDENT INFORMATION.
3. Darken the appropriate bubble under each digit of enrolment number, question paper code written by you on the OMR sheet.

B. QUESTION PAPER FORMAT:

1. The question paper consists of **Three parts (P,C,M in any order)**. Each part consists of Three Section.
2. **Section 1** contains 10 MULTIPLE CHOICE QUESTION. EACH QUESTION HAS 4 CHOICES (A) (B) (C) (D) out of which **only one is correct**.
3. **Section 2** contains **5 multiple choice questions**. Each question has 4 choices (A), (B), (C) and (D) for its answer, out of which **one** or **more** are correct.
4. **Section 3** contains **5** questions. The answer to each question is a **single** digit integer, ranging from 0 to 9 (both inclusive).

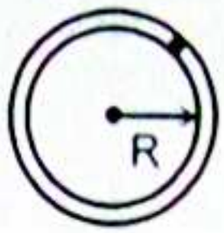
C. MARKING SCHEME:

1. For each question in **Section 1**, you will be awarded **3 marks** if you darken the bubble corresponding to the correct answer only and zero mark if no bubbles are darkened in all other cases minus one (–1) mark will be awarded in this section.
2. For each question in **Section 2** you will be awarded 4 marks if you darken all the bubbles corresponding to the correct answer only. In all other cases zero marks will be awarded. **No negative marks** will be awarded for any incorrect in the section.
3. For each question in **Section 3** you will be awarded 4 marks if you darken the bubbles corresponding to the correct answer only in all other cases zero (0) mark will be awarded. **No negative marks** will be awarded for incorrect answer in the section

SECTION – 3 : Integer Answer Type

This section contains **5 questions**. The answer to each question is a **single digit integer,** ranging from 0 to 9 (both inclusive).

16. A small sphere of mass m = 2kg and radius r = 0.5cm is moving in a smooth horizontal circular groove of radius R = 10m with constant speed of 5m/s find the work done on the sphere by the normal force exerted by the groove in 1 minute.



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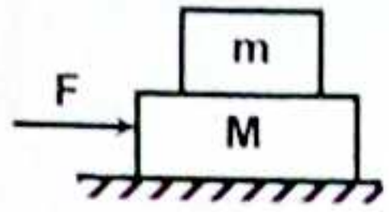
17. A block of mass m = 1 kg is placed on the other block of mass M = 2 kg, which in turns placed on a smooth horizontal surface as shown in the figure. The coefficient of friction between the blocks is 0.4. A constant horizontal force F = 6N is applied on M at time t = 0. Find the magnitude of the work done (in joule) by friction on the block of mass m = 1kg in first one second in ground frame.



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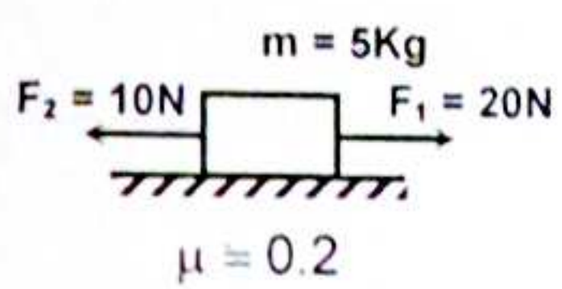
18. In the adjacent figure initially block is at rest and two horizontal forces F_1 and F_2 of magnitudes 20N and 10N respectively are applied simultaneously at time t = 0. The coefficient of friction between the block and the ground is $\mu = 0.2$. Calculate the work done by friction force on the block in first two second.



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19. Two particles A and B are located at points $(0, -10\sqrt{3})$ and (0, 0) respectively in xy plane. They start moving simultaneously at time t = 0 with constant velocities $\vec{v}_A = 5\hat{i}$ m/s and $\vec{v}_B = -5\sqrt{3}\hat{j}$ m/s, respectively. Time when they are closest to each other is found to be K/2 second. Find K. All distances are given in meter.

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20. Vectors $\vec{P}$, $\vec{Q}$ and $\vec{R}$ have magnitudes 5, 12, and 13 units respectively and $\vec{P} + \vec{Q} = \vec{R}$. If angle between $\vec{Q}$ and $\vec{R}$ is θ. Then find $\frac{13}{2}\cos\theta$.

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Space for rough work

SECTION – 3 : Multiple Correct Answer(s) Type

This section contains 6 multiple choice questions. Each question has four choices (A), (B), (C) and (D) out of which **ONE OR MORE are correct.**

15. Two particles projected from the same point with same speed u at angles of projection α and β strike the horizontal ground at the same point. If h_1 and h_2 are the maximum heights attained by the projectiles, R is the range for both and t_1 and t_2 are their time of flights, respectively, then:

(A) $\alpha + \beta = \frac{\pi}{2}$

(B) $R = 4\sqrt{h_1 h_2}$

(C) $\frac{t_1}{t_2} = \tan\alpha$

(D) $\tan\alpha = 4\sqrt{h_1/h_2}$

16. Let a_r and a_t represent radial and tangential accelerations. The motion of a particle may be circular if:

(A) $a_r = a_t = 0$

(B) $a_r = 0$ and $a_t \neq 0$

(C) $a_r \neq 0$ and $a_t = 0$

(D) $a_r \neq 0$ and $a_t \neq 0$

17. A swimmer swims in a flowing river. $\vec{v}_{s,r}$ = velocity of swimmer w.r.t. river water, $\vec{v}_{r,g}$ = velocity of river water w.r.t. ground, and $\vec{v}_{s,g}$ = velocity of swimmer w.r.t. ground. The swimmer intends to reach at the opposite bank of the river. It is possible only when

(A) $v_{r,g} > v_{s,r}$

(B) $v_{r,g} < v_{s,r}$

(C) $v_{s,g} < v_{s,r}$

(D) none of the above

18. A horizontal force of magnitude F is applied to a body of weight mg resting on a frictionless inclined plane to prevent it from sliding down. The plane makes an angle of ϕ with the horizontal. Then the normal reaction acting on the body satisfies the condition

(A) $N = mg\cos\phi + F\sin\phi$

(B) $N = mg\cos\phi$

(C) $N = mg/\cos\phi$

(D) $N = \{(mg)^2 + F^2\}^{1/2}$

19. In a car race, car A takes time t less than car B and passes the finishing point with a velocity of 12 m/s more than the velocity with which car B passes the finishing point. Assume that the cars A and B start from rest and travel with constant accelerations of 9 m/s^2 and 4 m/s^2, respectively. If v_A and v_B be the velocities of cars A and B, respectively, then

(A) t = 2 sec

(B) t = 3 sec

(C) v_A = 24 m/s, v_B = 12 m/s

(D) v_A = 36 m/s, v_B = 24 m/s

20. Read and examine the following statements. Which of these is/are true?

(A) The total work done by the conservative, non-conservative and external forces on a system equals to the change in kinetic energy of the system.

(B) Work done by conservative forces equals to the change in potential energy of the system.

(C) The total work done by the non-conservative and external forces on a system equals to the change in mechanical energy of the system.

(D) Work is done by the battery in glowing an electric bulb.

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PART - III: MATHEMATICS

SECTION – 1 : Single Correct Answer Type

This section contains **8 multiple choice questions**. Each question has four choices (A), (B), (C) and (D) out of which **ONLY ONE** is correct.

1. The equation of a straight line passing through the point (–2, 3) and making intercepts of equal length on the axes is
(A) $2x + y + 1 = 0$
(B) $x - y = 5$
(C) $x - y + 5 = 0$
(D) $x + y + 5 = 0$

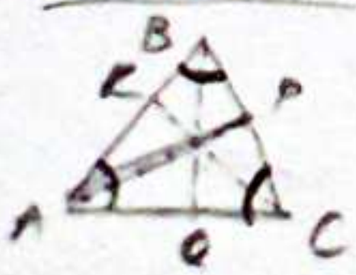
2. The equation of the two lines each passing through (5, 6) and each making an acute angle of 45° with the line $2x - y + 1 = 0$ is
(A) $3x + y - 21 = 0,\ x - 3y + 13 = 0$
(B) $3x + y + 21 = 0,\ x + 3y + 13 = 0$
(C) $y = 2x,\ y = 3x$
(D) $3x + y - 21 = 0,\ x - 3y - 13 = 0$

3. A variable chord of circle $x^2 + y^2 = 4$ is drawn from the point P(3, 5) meeting the circle at the points A and B. A point Q is taken on this chord such that $2PQ = PA + PB$ locus of Q is
(A) $x^2 + y^2 + 3x + 4y = 0$
(B) $x^2 + y^2 = 36$
(C) $x^2 + y^2 = 16$
(D) $x^2 + y^2 - 3x - 5y = 0$

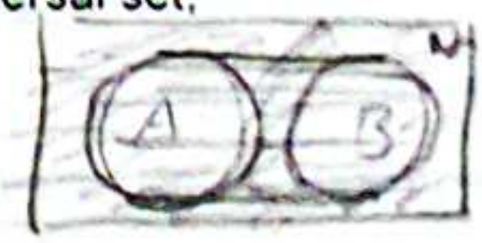
4. The angle at which the circles $(x - 1)^2 + y^2 = 10$ and $x^2 + (y - 2)^2 = 5$ intersect is
(A) $\frac{\pi}{6}$
(B) $\frac{\pi}{4}$
(C) $\frac{\pi}{3}$
(D) $\frac{\pi}{2}$

5. If $\cot(\alpha + \beta) = 0$, then $\sin(\alpha + 2\beta)$ is equal to
(A) $-\sin\alpha$
(B) $\sin\beta$
(C) $\cos\alpha$
(D) $\cos\beta$

6. In a triangle ABC, $\tan A + \tan B + \tan C = 6$ and $\tan A.\tan B = 2$, then the value of tanA, tanB and tanC are
(A) 1, 2, 3
(B) $3, \frac{2}{3}, \frac{7}{3}$
(C) $4, \frac{1}{2}, \frac{3}{2}$
(D) none the these



7. If A = {1, 3, 5, 7, 9, 11, 13, 15, 17}, B = {2, 4, ..., 18} and N is the universal set, then $A' \cup ((A \cup B) \cap B')$ is
(A) A
(B) N
(C) B
(D) None of these



8. If $|2x + 5| \le x + 3$, then x lies in the interval
(A) $\left[-\frac{8}{3}, -\frac{5}{2}\right]$
(B) $\left[-\frac{8}{3}, -2\right]$
(C) $\left[-\frac{5}{2}, -2\right]$
(D) none of these

Space for rough work