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Subject Code

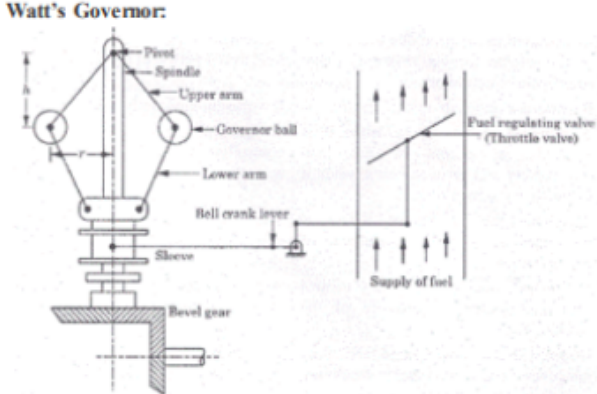
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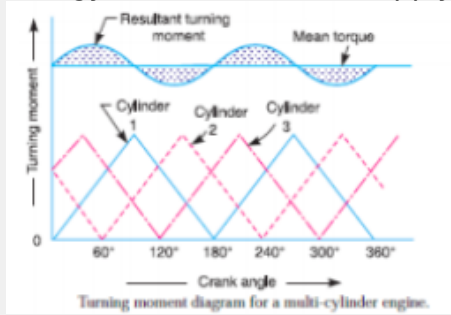
Chapter Name

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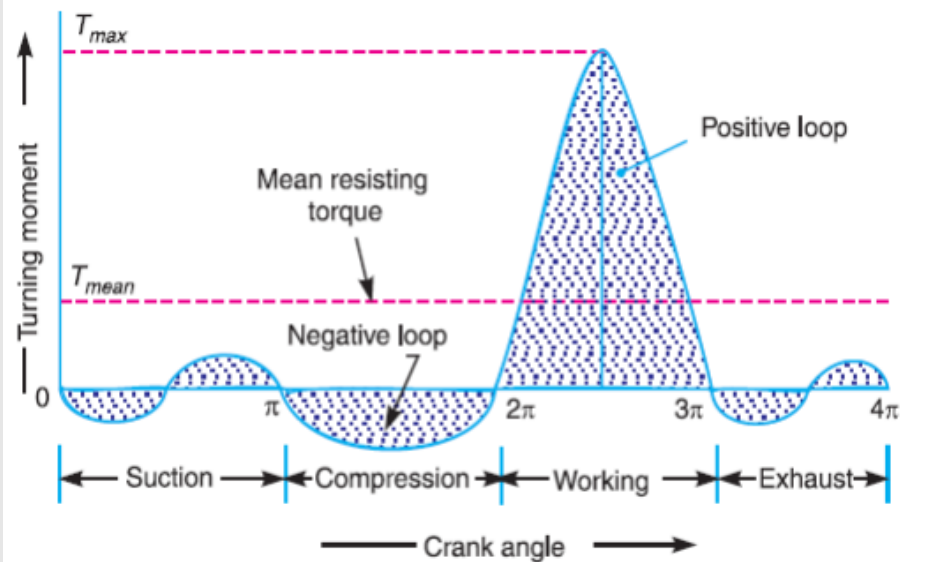
Que.No	Marks	
Q 3 e)	4	<p>Question:</p> <p>Explain the working of Watt governor with neat diagram.</p> <p>Answer:</p> <p>Watt's Governor:</p>  <p>Watt governor is the simplest and gravity controlled form of the centrifugal governors. It consists of two fly balls attached to the sleeve of negligible mass. The upper sides of arms are pivoted so that its balls can move upward and downward as they revolve with a vertical spindle. The engine drives the spindle through bevel gears. The lower arms are connected to the sleeves. The sleeve is keyed to the spindle in such a way that revolves with the spindle. At the same time, it can slide up and down according to the spindle speed. Two stoppers are provided at the bottom and top of the spindle to limit the movement sleeve.</p> <p>When the load on the engine decreases, the speed of the engine and then the angular velocity of the governor spindle increase. The centrifugal force on ball increase; that tends balls move outward and sleeve move upward. The upward movement of the sleeve actuates a mechanism that operates the throttle valve at the end of "bell crank" lever to decrease the fuel supply. The power output is reduced.</p> <p>When the speed of the engine decreases as the load on the engine increase, the centrifugal force decreases. The result is that the inward movement fly-balls and downward movement of the sleeve. The movement causes a wide opening of the throttle valve. The increase in the fuel supply also increases engine speed.</p>

Que.No	Marks	
Q 4 d)	4	<p>Question: Explain the working of flywheel with the help of turning moment diagram.</p> <p>Answer: Working of Flywheel with the help of Turning moment diagram: A flywheel used in machines serves as a reservoir, which stores energy during the period when the supply of energy is more than the requirement, and releases it during the period when the requirement of energy is more than the supply.</p>  <p>The fluctuation of energy may be determined by the turning moment diagram for one complete cycle of operation. Consider the turning moment diagram for a single cylinder double acting steam engine as shown in Fig. We see that the mean resisting torque line AF cuts the turning moment diagram at points B, C, D and E. When the crank moves from a to p, the work done by the engine is equal to the area aBp, whereas the energy required is represented by the area aABp. In other words, the engine has done less work (equal to the area aAB) than the requirement. This amount of energy is taken from the flywheel and hence the speed of the flywheel decreases. Now the crank moves from p to q, the work done by the engine is equal to the area pBbCq, whereas the requirement of energy is represented by the area pBCq. Therefore, the engine has done more work than the requirement. This excess work (equal to the area BbC) is stored in the flywheel and hence the speed of the flywheel increases while the crank moves from p to q. Similarly, when the crank moves from q to r, more work is taken from the engine than is developed. This loss of work is represented by the area C c D. To supply this loss, the flywheel gives up some of its energy and thus the speed decreases while the crank moves from q to r. As the crank moves from r to s, excess energy is again developed given by the area D d E and the speed again increases. As the piston moves from s to e, again there is a loss of work and the speed decreases. The variations of energy above and below the mean resisting torque line are called fluctuations of energy. The areas BbC, CcD, DdE, etc. represent fluctuations of energy.</p>

Que.No	Marks	
Q 6 b)	4	<p>Question: Define following terms : Fluctuation of energy, co-efficient of fluctuation of energy, co-efficient of fluctuation speed, maximum fluctuation of energy.</p> <p>Answer: Fluctuations of energy: The variations of energy above and below the mean resisting torque line are called fluctuations of energy. Coefficient of fluctuation of energy: It may be defined as the ratio of the maximum fluctuation of energy to the work done per cycle. Mathematically, Coefficient of fluctuation of energy, $E = \frac{\text{Maximum fluctuation of energy}}{\text{Work done per cycle}}$ Coefficient of fluctuation of speed: The difference between the maximum and minimum speeds during a cycle is called the maximum fluctuation of speed. The ratio of the maximum fluctuation of speed to the mean speed is called the coefficient of fluctuation of speed. Maximum fluctuation of energy: $\Delta E = \text{Maximum energy} - \text{Minimum energy} = (E + a_1) - (E + a_1 - a_2 + a_3 - a_4) = a_2 - a_3 + a_4$</p> <p>-----</p>

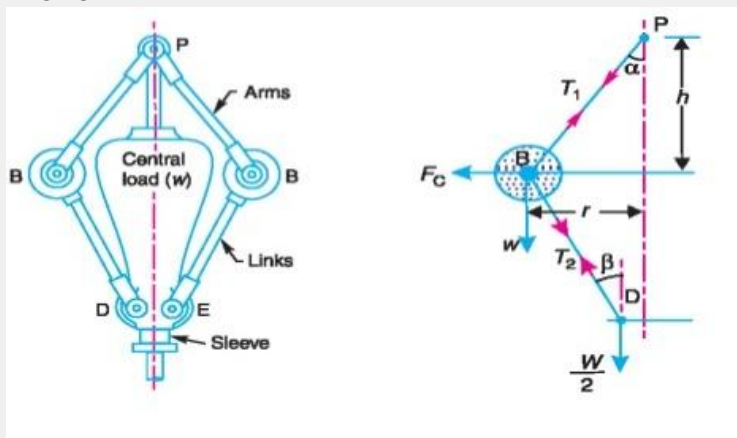
Examination: 2017 WINTER

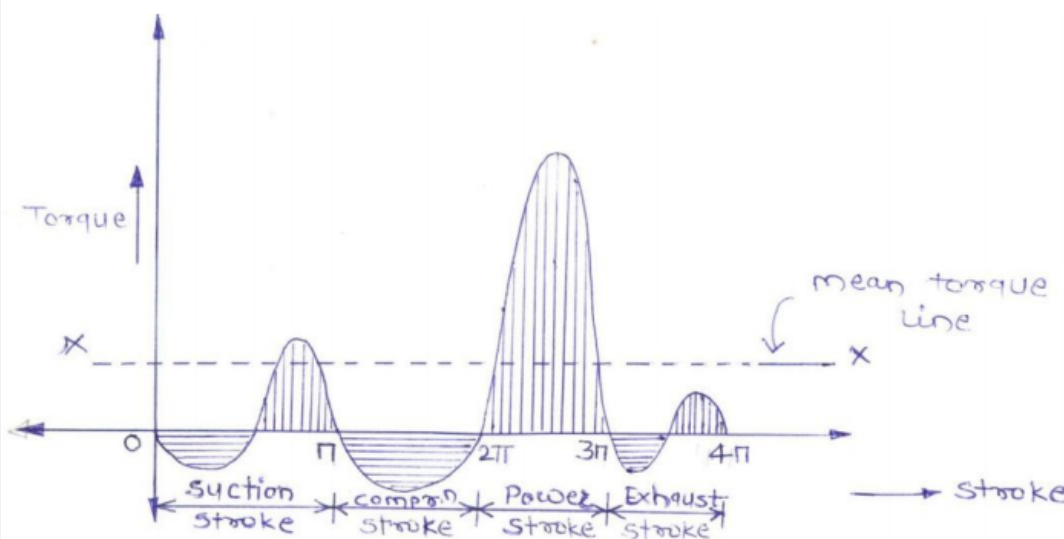
Que.No	Marks	
Q 1a)(e)	2	<p>Question: State the function of flywheel in I.C. Engine.</p> <p>Answer: A flywheel used in machines serves as a reservoir, which stores energy during the period when the supply of energy is more than the requirement, and releases it during the period when the requirement of energy is more than the supply. In other words, a flywheel controls the speed variations caused by the fluctuation of the engine turning moment during each cycle of operation.</p> <p>-----</p>
Q 1a)(f)	2	<p>Question: State the function of governor.</p> <p>Answer: The function of a governor is to regulate the mean speed of an engine, when there are variations in the load e.g. when the load on an engine increases, its speed decreases, therefore it becomes necessary to increase the supply of working fluid. On the other hand, when the load on the engine decreases, its speed increases and thus less working fluid is required. The governor automatically controls the supply of working fluid to the engine with the varying load conditions and keeps the mean speed within certain limits</p> <p>-----</p>

Que.No	Marks	
Q 6a)(ii)	8	<p>Question: Draw turning moment diagram for single cylinder four stroke I.C. Engine.</p> <p>Answer: ii) Turning Moment Diagram:</p>  <p>Turning moment diagram for a four stroke cycle internal combustion engine.</p>

Examination: 2016 SUMMER

Que.No	Marks	
Q 1a)(iv)	2	<p>Question: Define: (i) Coefficient of fluctuation of speed. (ii) Coefficient of fluctuation of energy.</p> <p>Answer:</p> <p>(i) Coefficient of fluctuation of speed: Coefficient of fluctuation of speed is defined as the ratio of the maximum fluctuation of speed to the mean speed. It is denoted by C_s. Mathematically, $C_s = (N_1 - N_2) / N$ Where, N_1 = maximum speed in rpm; N_2 = minimum speed in rpm; N = mean speed in rpm</p> <p>(ii) Coefficient of fluctuation of energy: Coefficient of fluctuation of energy may be defined as the ratio of the maximum fluctuation of energy to the work done per cycle. It is denoted by C_e. Mathematically, $C_e = \text{Maximum fluctuation of energy} / \text{Work done per cycle}.$</p>

Que.No	Marks															
Q 1a)(vi)	2	<p>Question:</p> <p>Draw line diagram of porter governor</p> <p>Answer:</p> <div></div>														
Q 4 c)	4	<p>Question:</p> <p>Differentiate between flywheel and governor.</p> <p>Answer:</p> <p>Difference between Flywheel and Governor :</p> <table><tr><th>FLYWHEEL</th><th>GOVERNOR</th></tr><tr><td>1.Function- To control the speed variations caused by fluctuations of engine turning moment during a cycle.</td><td>Function- To regulate the mean speed of engine within prescribed limit when there are variations of load.</td></tr><tr><td>2 .Mathematically it controls $\frac{\delta N}{\delta t}$</td><td>2. Mathematically it controls δN</td></tr><tr><td>3. Flywheel acts as a reservoir; it stores energy due to its mass moment of inertia and releases energy when required during a cycle.</td><td>3. A governor regulates the speed by regulating the quantity of charge/working fluid of prime mover.</td></tr><tr><td>4.It regulates speed in one cycle only</td><td>4. It regulates speed over a period of time.</td></tr><tr><td>5.Flywheel has no control over supply of fluid/charge</td><td>5. Governor takes care of quantity of fluid</td></tr><tr><td>6. It is not an essential element of every prime mover. It is used when there are undesirable cyclic fluctuations.</td><td>6. It is an essential element of prime mover since varying demand of power is met by it.</td></tr></table>	FLYWHEEL	GOVERNOR	1.Function- To control the speed variations caused by fluctuations of engine turning moment during a cycle.	Function- To regulate the mean speed of engine within prescribed limit when there are variations of load.	2 .Mathematically it controls $\frac{\delta N}{\delta t}$	2. Mathematically it controls δN	3. Flywheel acts as a reservoir; it stores energy due to its mass moment of inertia and releases energy when required during a cycle.	3. A governor regulates the speed by regulating the quantity of charge/working fluid of prime mover.	4.It regulates speed in one cycle only	4. It regulates speed over a period of time.	5.Flywheel has no control over supply of fluid/charge	5. Governor takes care of quantity of fluid	6. It is not an essential element of every prime mover. It is used when there are undesirable cyclic fluctuations.	6. It is an essential element of prime mover since varying demand of power is met by it.
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Q 6a)(ii)	4	<p>Question: Explain single cylinder 4-stroke I.C. engine using turning moment diagram.</p> <p>Answer: A turning moment diagram for a four stroke cycle internal combustion engine, we know that in a four stroke cycle internal combustion engine, there is one working stroke after a crank has turned through two revolution i.e. 720°. Since the pressure inside the engine cylinder is less than the atmospheric pressure during suction stroke therefore a negative loop is formed. During the compression stroke, the work is done on gases, therefore a higher negative loop is obtained.</p>  <p>During the expansion or working stroke, the fuel burns and the gases expand, therefore a positive loop is obtained. In this stroke the work done is by the gases. During exhaust stroke, the work is done on the gases, therefore negative loop is formed. It may be noted that effect of inertia forces on the piston is taken in account.</p>

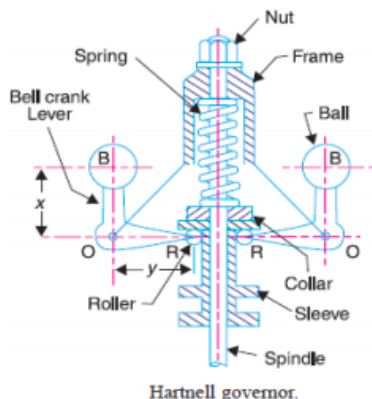
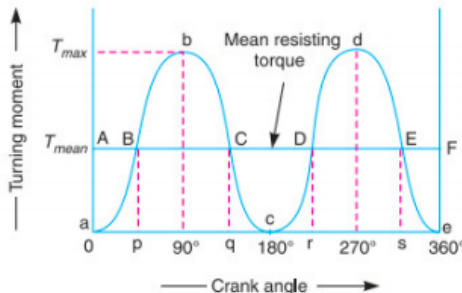
Examination: 2016 WINTER

Que.No	Marks	
Q 1a)(vii)	2	<p>Question: Define fluctuation of energy and coefficient of fluctuation of energy.</p> <p>Answer: a) Fluctuation of energy -- The difference of maximum and minimum kinetic energy of flywheel is known as Fluctuation of energy b) Coefficient of fluctuation of energy -- It is defined as the ratio of the maximum fluctuation of energy to the work done per cycle. It is denoted by $k_e = (E_1 - E_2)/\text{work done per cycle}$</p>

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Q 4 c)	4	<p>Question: Distinguish between flywheel and governor.</p> <p>Answer:</p> <table border="1"> <thead> <tr> <th>Sr. No.</th><th>Flywheel</th><th>Governor</th></tr> </thead> <tbody> <tr> <td>1</td><td>The flywheel stores the energy and gives up the energy whenever required during cycle.</td><td>It regulates the speed by regulating the quantity of charge of prime mover.</td></tr> <tr> <td>2</td><td>It has no control over the quantity of working fluid.</td><td>Governor takes care of quantity of working fluid.</td></tr> <tr> <td>3</td><td>It regulates the speed during one cycle only.</td><td>It regulates the speed over period of time.</td></tr> <tr> <td>4</td><td>It is not essential element for every prime mover.</td><td>It is an essential element of a prime mover.</td></tr> <tr> <td>5</td><td>It is used in toys, IC engine, hand watches.</td><td>It is used in automobile vehicles.</td></tr> </tbody> </table> <p>-----</p>	Sr. No.	Flywheel	Governor	1	The flywheel stores the energy and gives up the energy whenever required during cycle.	It regulates the speed by regulating the quantity of charge of prime mover.	2	It has no control over the quantity of working fluid.	Governor takes care of quantity of working fluid.	3	It regulates the speed during one cycle only.	It regulates the speed over period of time.	4	It is not essential element for every prime mover.	It is an essential element of a prime mover.	5	It is used in toys, IC engine, hand watches.	It is used in automobile vehicles.
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Examination: 2015 SUMMER

Que.No	Marks	
Q 1a)(e)	2	<p>Question: State the function of Governor in an I.C. engine.</p> <p>Answer: The function of a governor is to regulate the mean speed of an engine, when there are variations in the load e.g. when the load on an engine increases, its speed decreases, therefore it becomes necessary to increase the supply of working fluid. On the other hand, when the load on the engine decreases, its speed increases and thus less working fluid is required. The governor automatically controls the supply of working fluid to the engine with the varying load conditions and keeps the mean speed within certain limits.</p> <p>-----</p>
		<p>Question: State four applications of flywheel.</p> <p>Answer: Applications of flywheel : Used in Internal combustion engines, press machines, mills, punching machines.</p> <p>-----</p>

Que.No	Marks	
Q 4 c)	4	<p>Question: Explain with sketch working of hartnell governor.</p> <p>Answer:</p> <p>A Hartnell governor is a spring loaded governor as shown in Fig. 18.18. It consists of two bell crank levers pivoted at the points O, O to the frame. The frame is attached to the governor spindle and therefore rotates with it. Each lever carries a ball at the end of the vertical arm OB and a roller at the end of the horizontal arm OR. A helical spring in compression provides equal downward forces on the two rollers through a collar on the sleeve. The spring force may be adjusted by screwing a nut up or down on the sleeve.</p>  <p>Hartnell governor.</p>
Q 6a)(ii)	4	<p>Question: Explain the concept of fluctuation of energy related with turning moment diagram with sketch.</p> <p>Answer:</p> <p>Fluctuation of energy: It is the difference between the maximum and minimum energy of Flywheel.</p>  <p>Consider the turning moment diagram for a single cylinder double acting steam engine as shown in Fig. on X axis crank angle is taken We see that the mean resisting torque line AF cuts the turning moment diagram at points B, C, D and E. The variations of energy above and below the mean resisting torque line are called fluctuations of energy. The areas BbC, CcD, DdE, etc. represent fluctuations of energy. More fluctuation of energy of energy indicates more variation in the speed and so, bigger requirement of a flywheel.</p>

Examination: 2015 WINTER

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Q 1a)(v)	2	<p>Question: State the function of flywheel in IC engine.</p> <p>Answer: A flywheel controls the speed variations caused by the fluctuation of the engine turning moment during each cycle of operation. A flywheel used in machines serves as a reservoir, which stores energy during the period when the supply of energy is more than the requirement, and releases it during the period when the requirement of energy is more than the supply.</p> <p>-----</p>																		
Q 1a)(vi)	2	<p>Question: Define stability and hunting of governor.</p> <p>Answer: Stability of governor : A governor is said to be stable when for every speed within the working range there is a definite configuration i.e. there is only one radius of rotation of the governor balls at which the governor is in equilibrium. For a stable governor, if the equilibrium speed increases, the radius of governor balls must also increase. Hunting of governor : A governor is said to be hunt if the speed of the engine fluctuates continuously above and below the mean speed. This is caused by a too sensitive governor which changes the fuel supply by a large amount when a small change in the speed of rotation takes place.</p> <p>-----</p>																		
Q 4 c)	4	<p>Question: Draw turning moment diagram for single cylinder four stroke I.C. Engine. Label all parts.</p> <p>Answer: -----</p>																		
Q 6a)(ii)	4	<p>Question: Compare flywheel and governor.</p> <p>Answer:</p> <table border="1"> <thead> <tr> <th>Sr.NO.</th><th>Flywheel</th><th>Governor</th></tr> </thead> <tbody> <tr> <td>1</td><td>Flywheel is a device which stores when produced in excess & release when required by m/c.</td><td>Governor is a device controls the supply of energy of fuel to engine & controls mean speed.</td></tr> <tr> <td>2</td><td>It regulates fluctuation of speed when there is a variation in cyclic torque of m/c</td><td>It regulates speed of engine when there is a external load variation.</td></tr> <tr> <td>3</td><td>It acts by virtue of its inertia</td><td>It acts as a mechanism to control fuel supply</td></tr> <tr> <td>4</td><td>If torque variation is high, flywheel required is larger size.</td><td>If external load variation is higher, more control on fuel supply necessary.</td></tr> <tr> <td>5</td><td>Used in Engines, forging m/c, Sheet metal press, shearing m/c.</td><td>Used in Engines.</td></tr> </tbody> </table> <p>-----</p>	Sr.NO.	Flywheel	Governor	1	Flywheel is a device which stores when produced in excess & release when required by m/c.	Governor is a device controls the supply of energy of fuel to engine & controls mean speed.	2	It regulates fluctuation of speed when there is a variation in cyclic torque of m/c	It regulates speed of engine when there is a external load variation.	3	It acts by virtue of its inertia	It acts as a mechanism to control fuel supply	4	If torque variation is high, flywheel required is larger size.	If external load variation is higher, more control on fuel supply necessary.	5	Used in Engines, forging m/c, Sheet metal press, shearing m/c.	Used in Engines.
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