



Winter – 2016 EXAMINATION

Subject Code:-

17556

Model Answer

Important Instructions to examiners:

- 1) The answers should be examined by key words and not as word-to-word as given in the model answer scheme.
- 2) The model answer and the answer written by candidate may vary but the examiner may try to assess the understanding level of the candidate.
- 3) The language errors such as grammatical, spelling errors should not be given more importance. (Not applicable for subject English and Communication Skills)
- 4) While assessing figures, examiner may give credit for principal components indicated in the figure. The figures drawn by candidate and model answer may vary. The examiner may give credit for any equivalent figure drawn.
- 5) Credits may be given step wise for numerical problems. In some cases, the assumed constant values may vary and there may be some difference in the candidate's answers and model answer.
- 6) In case of some questions credit may be given by judgment on part of examiner of relevant answer based on candidate's understanding.
- 7) For programming language papers, credit may be given to any other program based on equivalent concept.



Winter – 2016 EXAMINATION

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17556

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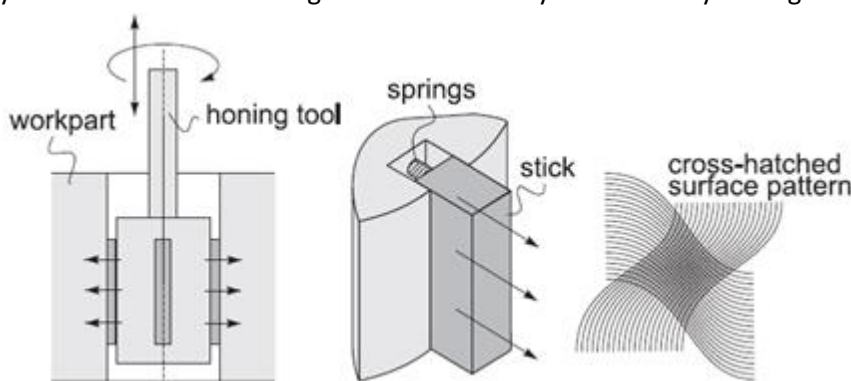
Q.No	Modal Answer	Marks	Total Marks
1 A)	Attempt Any Three	3x4	12 Marks
i)	<p>Classify Non-Traditional Machining Processes. Depending upon the type of energy used, the non-traditional processes are classified as:-</p> <p>1) Mechanical Processes – i. Abrasive Jet Machining (AJM) ii. Ultrasonic Machining (USM) iii. Water Jet Machining (WJM) iv. Abrasive Water Jet Machining (AWJM)</p> <p>2) Electrochemical Processes – i. Electrochemical Machining (ECM) ii. Electro Chemical Grinding (ECG) iii. Electro Jet Drilling (EJD)</p> <p>3) Electro-Thermal Processes i. Electro-discharge machining (EDM) ii. Laser Jet Machining (LJM) iii. Electron Beam Machining (EBM)</p> <p>4) Chemical Processes i. Chemical Milling (CHM)</p>	01 marks /point (For Any Four)	04 Marks
ii)	<p>Explain with block diagram closed loop control system. Closed Loop Control System:- Machine control unit in which there is provision to compare the actual position of the cutting tool or work piece with the input command value are called closed loop system. In the closed loop system the displacement can be achieved to a very high</p> <div data-bbox="470 1344 1006 1743"> <p>(b) Closed loop control system</p> </div> <p>degree of accuracy because a measuring or monitoring device is used to determine the displacement of the slide. Closed loop system is more expensive due to presence of monitoring devices and their maintenance is very complicated. Also this system is more accurate as compare to open loop control system.</p>	02 Marks for Figure 02 Marks for Exp.	04 Marks

Winter – 2016 EXAMINATION

Model Answer

Subject Code:-

17556

iii)	<p>Explain with figure honing process.</p> <p>Honning is abrading process used mainly for finishing round holes by means of bonded abrasive stone called hones. Honning is primary used to correct out of roundness, taper, toll marks and axial distortion. Mostly Honning is done on internal cylindrical surfaces such as automobile cylinder walls. The Honning tool consists of cylindrical body having 6 or 8</p>  <p>abrasive stick which is made up of common abrasive and bonding material. The sticks are equally spaced about the periphery of the honing tool. They are held against the work surface with controlled light pressure, usually exercised by small springs. The commonly used abrasives are silicon carbide and aluminium oxide having grit size of 80 to 600. Coolants are essential for the operation, to flush away small chips and to keep the temperature uniform.</p>	02 Marks for Figure	04 Marks												
iv)	<p>Enlist function of dielectric fluid used in EDM.</p> <p>A dielectric fluid should posses the following functions:</p> <ul style="list-style-type: none">a) It should act as an insulator until the required breakdown voltage is attained.b) It should act as a conductor, once the breakdown voltage is reached.c) It should clean the spark gap by carrying away the molten metal.d) It should deionize the spark gap rapidly after the discharge has occurred.e) It should cool the tool, work piece and the spark region.	01 Marks per functio n (For Any 4)	04 Marks												
1 B)	Attempt Any One	1x6													
i)	<p>Compare Capston and Turret Lathe. (Any Six Points)</p> <table><tr><th>Sr. No.</th><th>Capstan lathe</th><th>Turret lathe</th></tr><tr><td>01</td><td>It is light duty machine</td><td>Turret lathes are relatively more robust and heavy duty machine.</td></tr><tr><td>02</td><td>The turret head is mounted on the ram and the ram is mounted on the saddle and moves on the guide ways</td><td>The turret head is directly mounted on the saddle and the saddle slides over the bed ways</td></tr><tr><td>03</td><td>The saddle will not be</td><td>The saddle is moved along</td></tr></table>	Sr. No.	Capstan lathe	Turret lathe	01	It is light duty machine	Turret lathes are relatively more robust and heavy duty machine.	02	The turret head is mounted on the ram and the ram is mounted on the saddle and moves on the guide ways	The turret head is directly mounted on the saddle and the saddle slides over the bed ways	03	The saddle will not be	The saddle is moved along	1M / points (for Any 6)	06 Marks
Sr. No.	Capstan lathe	Turret lathe													
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Winter – 2016 EXAMINATION

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17556

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		moved during machining	with the turret head during machining.		
	04	The lengthwise movement of turret is less	The lengthwise movement of turret is more.		
	05	Only short work pieces can be machined	Long work pieces can be machined.		
	06	Collet is used to hold the work piece	Jaw chuck is used to hold the work piece.		
	07	It is easy to move the turret Head as it slides over the ram.	It is difficult to move the turret head along with saddle.		
	08	The turret head cannot be moved crosswise	The turret head can be moved crosswise in some turret lathes.		
	09	As the construction of lathe is not rigid heavy cut cannot be given.	As the construction of lathe is rigid, heavy cut can be given.		
	10	It is used for machining work pieces up to 60 mm diameter.	It is used for machining work pieces up to 200 mm diameter		
	11	Capstan lathes generally deal with short or long rod type blanks held in Collet.	Turret lathes mostly work on chucking type jobs held in the quick acting chucks.		
	12	The turret travels with limited stroke length within a saddle type guide block, called auxiliary bed, which is clamped on the main bed	In turret lathe, the heavy turret being mounted on the saddle which directly slides with larger stroke length on the main bed.		
	13	External screw threads are cut in capstan lathe using a self opening die being mounted in one face of the turret.	In turret lathes external threads are cut by a single point or multipoint chasing tool being mounted on the front slide and moved by a short lead screw and a swing type half nut.		
	14	The turret of capstan lathe is called as a capstan head which may be circular or hexagonal.	The turret of turret lathe is called as a turret head which may be square, octagonal or hexagonal.		
ii)	What are the various types of maintenance? Explain any one of them. The following are the types of maintenance followed in general: 1. Preventive maintenance. 2. Predictive maintenance. 3. Breakdown maintenance. 4. Corrective maintenance. 5. Schedule maintenance. Preventive Maintenance:-			02 marks for types	06 Marks



Winter – 2016 EXAMINATION

Model Answer

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17556

	<p>Preventive maintenance is predetermined work performed to a schedule with the aim of preventing the wear and tear or sudden failure of equipment components. Preventive maintenance helps to:</p> <p>Protect assets and prolong the useful life of production equipment</p> <ul style="list-style-type: none">• Improve system reliability• Decrease cost of replacement• Decreases system downtime• Reduce injury <p>Mechanical, process or control equipment failure can have adverse results in both human and economic terms. In addition to down time and the costs involved to repair and/or replace equipment parts or components, there is the risk of injury to operators, and of acute exposures to chemical and/or physical agents. Preventive maintenance, therefore, is a very important ongoing accident prevention activity, which you should integrate into your operations/product manufacturing process.</p>	04 marks for explain.																												
2.	Answer Any Four of the following	4x4	16 Marks																											
i)	<p>Differentiate between up milling and down milling.</p> <table><tr><th>Sr.No.</th><th>Up Milling</th><th>Down Milling</th></tr><tr><td>1</td><td>In conventional milling the cutter rotates in a direction opposite to that in which the work is fed.</td><td>In climb milling, the cutter rotates in the same direction to which the work is fed.</td></tr><tr><td>2</td><td>The chip thickness progresses gradually from start to cut to end of cut (i.e. chip thickness is minimum at the beginning of cut and maximum at end of the cut).</td><td>The chip thickness is maximum at the beginning of cut and minimum at end of the cut.</td></tr><tr><td>3</td><td>The cutting force tends to lift the w/p away from the fixture.</td><td>The cutting force tends to seat the w/p into the fixture.</td></tr><tr><td>4</td><td>It is difficult to pour coolant at the point of machining.</td><td>It is easy to pour coolant at the point of machining.</td></tr><tr><td>5</td><td>It is difficult to design the fixture.</td><td>Fixture designer is easy.</td></tr><tr><td>6</td><td>Wavy type of surface finish is obtained.</td><td>Better surface finish is obtained</td></tr><tr><td>7</td><td>The cutter does not start cutting metal as soon as it comes in contact with the work piece</td><td>The cutter starts cutting metal as soon as it contacts the w/p.</td></tr><tr><td>8</td><td>The cutting force is down wordatbeginning and reaches to upward at the end of the cut.</td><td>The cutting force is upward at beginning of cut and reaches to downward at the end of the cut</td></tr></table>	Sr.No.	Up Milling	Down Milling	1	In conventional milling the cutter rotates in a direction opposite to that in which the work is fed.	In climb milling, the cutter rotates in the same direction to which the work is fed.	2	The chip thickness progresses gradually from start to cut to end of cut (i.e. chip thickness is minimum at the beginning of cut and maximum at end of the cut).	The chip thickness is maximum at the beginning of cut and minimum at end of the cut.	3	The cutting force tends to lift the w/p away from the fixture.	The cutting force tends to seat the w/p into the fixture.	4	It is difficult to pour coolant at the point of machining.	It is easy to pour coolant at the point of machining.	5	It is difficult to design the fixture.	Fixture designer is easy.	6	Wavy type of surface finish is obtained.	Better surface finish is obtained	7	The cutter does not start cutting metal as soon as it comes in contact with the work piece	The cutter starts cutting metal as soon as it contacts the w/p.	8	The cutting force is down wordatbeginning and reaches to upward at the end of the cut.	The cutting force is upward at beginning of cut and reaches to downward at the end of the cut	01 mark/p oint (For Any 4)	04 Marks
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Winter – 2016 EXAMINATION

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17556

ii)	<p>State any two application of a) PAM b) AJM.</p> <p>(a) Application of PAM:-</p> <ol style="list-style-type: none">1. For stock cutting, plate bevelling, shape cutting and piercing.2. In manufacturing of automotive and rail road components.3. It can cut hot extrusion to desired length.4. For removal of gates and riser from casting in foundry. <p>(b) Application of AJM:-</p> <ol style="list-style-type: none">1. Fine drilling and micro welding.2. Machining of semi conductor.3. Frosting and abrading of glass article.4. Machining of intricate profile on hard and fragile materials.5. Cleaning and cutting operations on material like germanium, silicon, quartz, and mica.6. Machining of brittle materials like glass, ceramics, refractoriness etc	02 Marks 02 Marks	04 Marks																		
iii)	<table><tr><th colspan="3">Differentiate between absolute and incremental co-ordinate system.</th></tr><tr><th>Sr. No.</th><th>Absolute System</th><th>Incremental System</th></tr><tr><td>01</td><td>Absolute positioning means that the tool locations are always defined in relation to the zero point.</td><td>In incremental system, the tool locations are indicated with reference to the previous location.</td></tr><tr><td>02</td><td>The main advantage of the absolute system as compared with the incremental system is in the cases of interruption that force the operator to stop the machine.</td><td>In incremental system, any time the work is interrupted, before switching on again, the operator must bring the tool manually to the exact place of the last operation in which the interruption occurred.</td></tr><tr><td>03</td><td>Almost all point to point positioning systems use absolute systems.</td><td>Incremental system is not often used for controlling point to point machine tools.</td></tr><tr><td>04</td><td>Absolute system is used for general program.</td><td>Incremental system is used for canned cycle, Do loop and Sub program.</td></tr></table>	Differentiate between absolute and incremental co-ordinate system.			Sr. No.	Absolute System	Incremental System	01	Absolute positioning means that the tool locations are always defined in relation to the zero point.	In incremental system, the tool locations are indicated with reference to the previous location.	02	The main advantage of the absolute system as compared with the incremental system is in the cases of interruption that force the operator to stop the machine.	In incremental system, any time the work is interrupted, before switching on again, the operator must bring the tool manually to the exact place of the last operation in which the interruption occurred.	03	Almost all point to point positioning systems use absolute systems.	Incremental system is not often used for controlling point to point machine tools.	04	Absolute system is used for general program.	Incremental system is used for canned cycle, Do loop and Sub program.	01 Mark / Point (For Any 4)	04 Marks
Differentiate between absolute and incremental co-ordinate system.																					
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iv)	<p>Classify Grinding Machines.</p> <p>Grinding machines are classified as follows.</p> <p>A) According to the quality of surface finish:</p> <ol style="list-style-type: none">1. Rough or Non precision Grinders:<ul style="list-style-type: none">• Bench pedestal or floor grinders.• Swing frame grinders.• Portable and flexible shaft grinders.• Belt grinders.2. Precision grinders. <p>B) According to the type of the surface generated or work done:</p>	01 Mark / Point	04 Marks																		



Winter – 2016 EXAMINATION

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17556

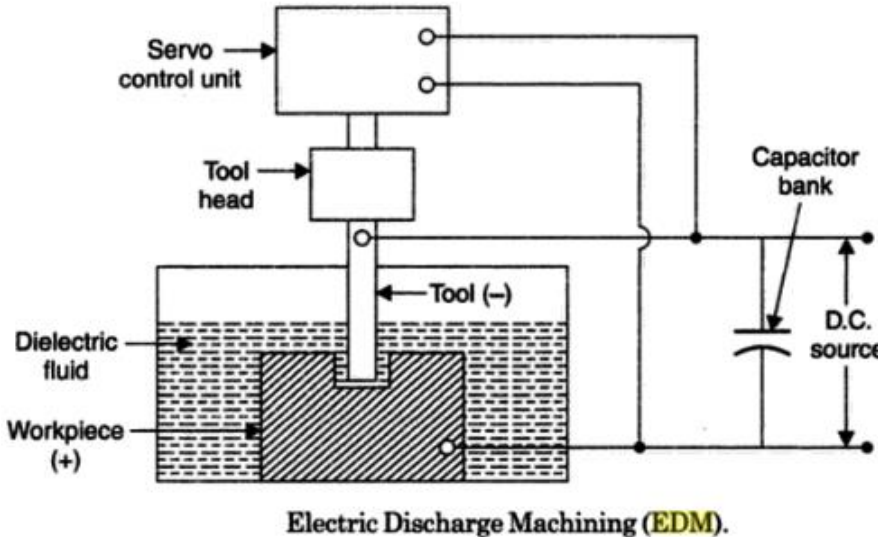
Model Answer

	<ol style="list-style-type: none">1. Cylindrical grinders.<ul style="list-style-type: none">• Plain cylindrical grinders.• Universal cylindrical grinders.• Centre less internal grinders.2. Internal Grinders.<ul style="list-style-type: none">• Plain internal grinders.• Universal internal grinders.• Chucking internal grinders.• Planetary internal grinders.• Centre less internal grinders. <p>C) Surface Grinders.</p> <ol style="list-style-type: none">1. Reciprocating table.<ul style="list-style-type: none">• Horizontal spindle.• Vertical spindle.2. Rotating table.<ul style="list-style-type: none">• Horizontal spindle.• Vertical table. <p>D) Tool and cutter grinders.</p> <ul style="list-style-type: none">• Universal.• Special.		
v)	<p>Draw a neat sketch of horizontal boring machine and label different parts of it.</p> <p>Block diagram of a horizontal boring,</p>	03 Marks for Figure	04 Marks

Winter – 2016 EXAMINATION

Subject Code:- **17556**

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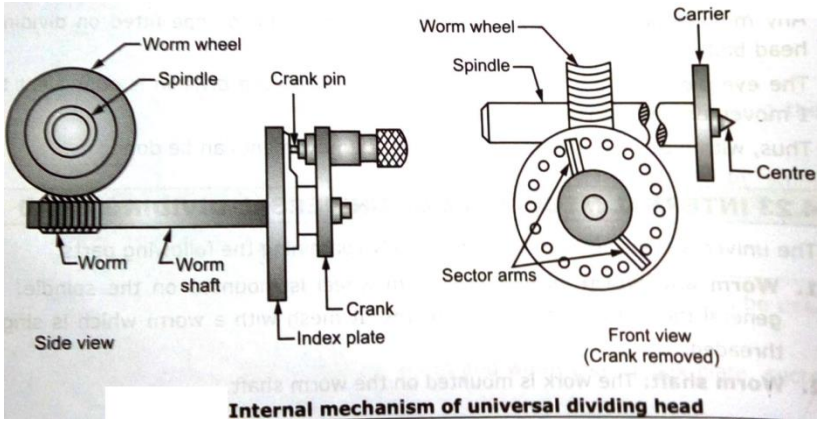
3.	Attempt any Two.	2x8	16 Marks
i)	<p>With neat sketch explain working of EDM process and also list two application of EDM process.</p> <p>Working of Electrical Discharge Machining (EDM):-</p> <ul style="list-style-type: none"> The Electric Discharge Machining (EDM) process involved controlled erosion of electrically conducting materials by the initiation of rapid and repetitive electrical discharge between the tool (Cathode) and work piece (Anode) separated by a dielectric fluid medium. A suitable gap between work piece and tool is maintained to cause to spark discharge. The gap can be varied to match the machining condition such as metal removal rate. As soon as the voltage gradient set up between tool and work piece is sufficient to break down the dielectric medium, a conducting electric path is developed for spark discharge owing to ionization of the fluid medium and thereby causes the current flow. The temperature of the spot hit by the spark may rise up to 10000°C causing the work surface to melt and vaporize and ultimately to take the form of sphere as it is quenched by the surrounding fluid. <div data-bbox="302 1008 1174 1541">  <p style="text-align: center;">Electric Discharge Machining (EDM).</p> </div> <ul style="list-style-type: none"> If the tool is fed downwards maintaining the predetermine gap, the tool shape profile will be reproduce on the work piece. The spark gap, generally 0.01 to 0.1 mm is adjusted so that the gap voltage is around 70 percent of supply voltage for charging the capacitor bank. Higher gap although increases the discharge energy but it decreases the spark frequency due to increase in charging time of the capacitor. The servo control unit is provided to maintain the predetermine gap. It senses the gap voltage and compare with the preset value and the 	04 M Explain	08 Marks
		02 M Fig.	

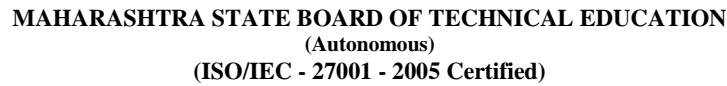
Winter – 2016 EXAMINATION

Model Answer

Subject Code:-

17556

	<p>difference voltage is the used to control the movement of servomotor to adjust the gap.</p> <p>Application of EDM:-</p> <ul style="list-style-type: none"> i) Very useful in tool manufacturing due to ease with which the hard materials and alloyed can e machined. ii) Resharpener of cutting tool and broach, trepanning of holes with straight or curved axis. iii) Machining of cavities of dies and reaching of die cavities without annealing operations. 	02 M Appl.	
ii)	<p>What is meant by indexing? Explain with neat sketch working of “Universal Dividing Head”.</p> <p>Indexing:- The process of dividing a circular or straight part into equal spaces by means of a dividing head is known as indexing. The indexing head Is also known as dividing head.</p> <p>Universal Dividing Head:- Universal dividing head is an important work holding and indexing device used on a milling machine. With the help of the dividing head the work pieces can be accurately index to any fraction of revolution enabling the correct spacing of the grooves that can be machined on the periphery of the work piece. Universal dividing head find wide use in the production of spur gears, helical gears and other indexing requirement on the milling machine.</p> <div style="text-align: center;">  <p>Internal mechanism of universal dividing head</p> </div> <p>The normal positional accuracy that can be obtained using a universal dividing head is 1 minute. The work pieces are usually held between the centres of the dividing head and the tail stock. Suitable supporting blocks</p>	<p>02 M Def.</p> <p>02 M Fig.</p> <p>04 M Explain.</p>	08 Marks





Winter – 2016 EXAMINATION

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17556

	N190	G01 X-60 Z40 F200 EOB	Taper Turning Position I.		
	N200	G00 X30 Z2 EOB	Rapid Travel Of Tool To The Position F.		
	N210	G00 X0 Z2 EOB	Rapid Travel Of Tool To The Position B.		
	N220	G01 Z0 F100 EOB	Linear Interpolation (Position C).		
	N230	G03 X30 Z-15 K-15 F120 EOB	Circular Interpolation Position J.	01 M	
	N240	G00 X40 Z02	Rapid Motion of Tool away from workpiece.		
	N250	G01 X40 Z-100 F200 EOB	TURNING OF 40mm Diameter UPTO 100mm length.	01 M	
	N260	M06 T001 EOB	Tool Change To Parting Tool		
	N270	G00 X30 Z-25 EOB	Rapid Tool Travel To Position L for Grooving operation.		
	N280	G01 X24 Z-25 EOB	Grooving operation reduce diameter.		
	N290	G01 Z-30 F0.03 EOB	Tool travel and reduce diameter over length of 5mm and make groove.		
	N300	G00 X40 Z02 EOB	Rapid motion of tool away from workpiece		
	N310	G28 EOB	Rapid return to machine reference position.		
	N320	M05 M09 M30 EOB	Spindle stop, coolant off, program end tape rewind.	01 M	
4 A)	Attempt Any Three of the following.			3x4	12 Marks
i)	Draw and explain axis identification for VMC Machine. The axes on machining centres are divided into two types. (i) Linear axes: X, Y and Z axes are identified as linear axes (ii) Rotary axes: A, B and C axes are identified as rotary axes Z-axis: <ul style="list-style-type: none"> First the Z-axis is fixed for the machine tool. It is the main spindle axis. In a vertical milling machine, the vertical axis of the machine spindle is set as the Z axis. The positive Z-axis is taken in the direction that causes the cutting tool to move away from the work piece. (i.e. it increases the distance between the work piece and the tool. It means that movement of the cutter in upward direction is positive Z-axis. The movement of the tool in downward direction i.e. towards the work piece is set as negative Z-axis. 			02 M Exp.	04 Marks

Winter – 2016 EXAMINATION

Subject Code:-

17556

Model Answer

X-axis:

- It is always horizontal and parallel to the work piece holding surface.
- It indicates the longitudinal travel of the work table.

Y-axis:

- It is perpendicular to both X and Z-axes.
- It is also horizontal and indicates the cross travel of the table

A-axis:

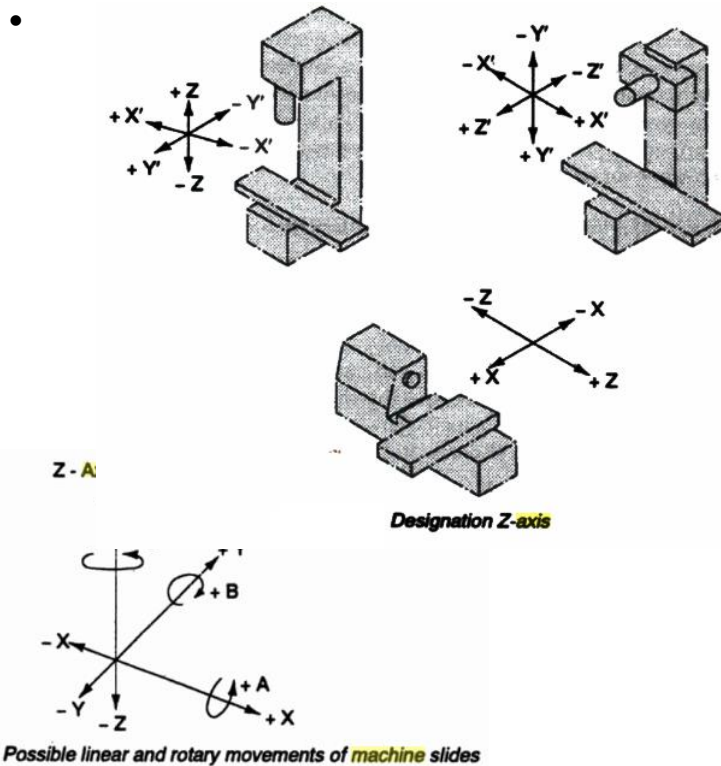
- It is the axis of rotary motion of a tool along -axis.
- Clockwise rotation is considered as positive movement looking in +X direction.

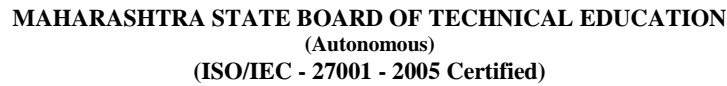
B-axis:

- It is the axis of rotary motion of a tool along Y-axis.
- Clockwise rotation is considered as positive movement looking in +Y direction.

C-axis:

- It is the axis of rotary motion of a tool along Z-axis.
- Clockwise rotation considered as positive movement looking in +Z direction.



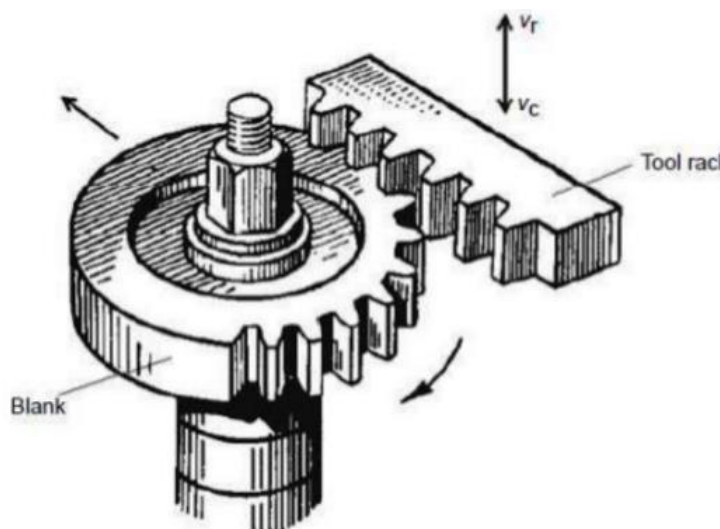


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iii)	<p>How preventive maintenance is better than break down maintenance? Preventive maintenance is better than the break down maintenance for the following reason:-</p> <ol style="list-style-type: none"> 1) It prevents occurring of break down. 2) It can be done at the pre schedule time without disturbing the production. 3) It prevents the equipment from a large failure. 4) It provides safety to operator. 5) It is less costly over a large period of time. 6) Less stand by or reserve equipment and spare parts. 	01 M /Point	04 Marks
		Any Four	
iv)	<p>Explain with sketch the rack cutter gear shaping process. Rack Cutter Gear shaping Process:-</p> <ul style="list-style-type: none"> • In this method, the cutter has a rack form for the gear to be generated. • The gear blank is rotate slowly and uniform about the vertical axis. • The rack cutter reciprocates with the required cutting speed to remove the material from the gear blank. • The cutter is radically fed to obtain the correct teeth depth by means of cam. • The cutter removes the material only during cutting stroke and relieved during return stroke. • Thus, because of reciprocating motion of cutter and angular relative motion of gear blank, gear teeth is generated on the gear blank. • The main limitation of this method is that once the full length of rack is utilized the cutting operation in required to stop. • In such case the blank is indexed next and the cut started as usual. 	02 M Exp.	04 Marks
		02 M Figure	

Winter – 2016 EXAMINATION

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4 B)	Attempt Any One of the following.	1x6	06Marks
i)	<p>Explain with neat sketch AJM process.</p> <ul style="list-style-type: none"> A typical set up of abrasive jet machining as shown in figure.. The abrasive particles are held in the hopper(7) through which it is fed into the mixing chamber (11). A regulator(8) controls the flow of abrasive particles. Gas at high pressure is supplied to the mixing chamber through a pipe line as shown in figure. A pressure gauge(9) and a regulator(10) is incorporated in the pipe line to control the gas flow and its pressure. The mixing chamber, carrying the abrasive particles is vibrated by the device (12) and the amplitude of these vibrations controls the flow of abrasive particles. These abrasive particles travel through the hose (4) and enter into the nozzle (3). The control valve (5) and pressure gauge (6) controls the flow of abrasive particles. This out going high speed stream that comes out of the nozzle is known as abrasive jet (2). When such jet impinges on the work piece (1), the erosion caused by their impact enables the removal of metal. <div style="text-align: center;"> <p>1. Hopper 2. Mixing Chamber 3. Regulator 4. Pressure gauge 5. Gas Supply 6. Vibrating Device 7. Hose 8. Nozzle 9. Regulator Control valve for jet flow 10. Pressure gauge 11. Abrasive Jet 12. Workpiece</p> <p style="text-align: center;">Abrasive Jet Machining</p> </div>	<p>03 M Explain.</p> <p>03 M Figure</p>	<p>06 Marks</p>



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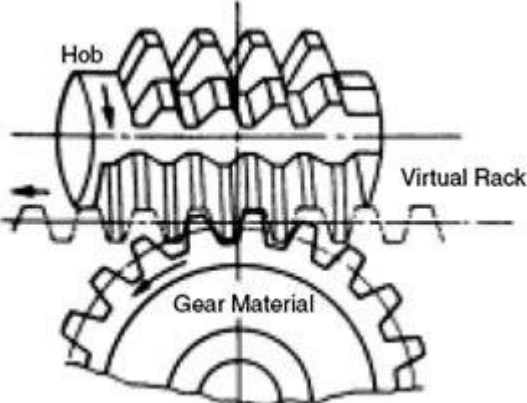
ii)	<p>State advantages, limitations of broaching process and draw any two sample cross sections of work piece being machined by broaching operation.</p> <p>Advantages:-</p> <ol style="list-style-type: none"> 1. The process can be done for both internal and external machining. 2. It is simple operation, hence does not required highly skilled operator. 3. As loading and unloading is rapid, the rate of production is high. 4. As both rough and finishing can be done in one pass, so broaching is fast operation. 5. Broaching is faster than any other machining operation. 6. High accuracy and high surface finish can be obtained. 7. The cutting force of the broach serves to clamp the work piece and hold it firmly in position. 8. Any form that can be produced on a broaching tool can be produced by the tool. <p>Limitiations:-</p> <ol style="list-style-type: none"> 1. It is a single purpose tool.Tool cost is very high, so the process is justified only for mass production. 2. In some cases, it is not suitable for low production rates. 3. The parts to be broached must be strong enough t o withstand high cutting forces. 4. Surface to be broached must be acessble. 5. Blind hole can not be easily produced. 6. Tool sharpening is difficult and expensive process. <div data-bbox="430 1270 1047 1858"> <p style="text-align: center;">Internally broached profiles</p> </div>	<p>02 M Adv.</p> <p>02 M Limitati on</p> <p>02 M Figure.</p>	06 Marks
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Winter – 2016 EXAMINATION

Model Answer

Subject Code:-

17556

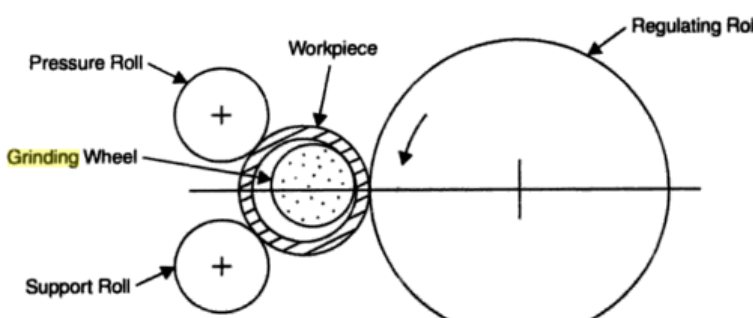
5	Attempt any Four of the following	4x4	16 Marks
i)	<p>What is preparatory function and miscellaneous function in case of CNC?</p> <p>Preparatory Function (G-code):-</p> <ul style="list-style-type: none"> The preparatory function and G-code informs the controller what types of motion or action is to be carried out. The mode of movement is indicated by the numerical value following the G address. G-codes thus may be modal or non-modal. For modal type, G-code specification will remain effect for all subsequent block unless replaced by another modal G-code. For non-modal type, G-code specification will only effect the block in which it contains. For example G90 is cancelled by G91, G21 is cancelled by G20. <p>Miscellaneous Function (M-Codes):-</p> <ul style="list-style-type: none"> The miscellaneous function is used to specify certain miscellaneous or auxiliary functions which do not relate to dimensional movement of the machine. The miscellaneous function may be spindle start, spindle stop, coolant ON/OFF, etc. All M-codes are modal. 	<p>02 M</p> <p>02 M</p>	<p>04 Marks</p>
ii)	<p>Explain with figure gear hobbing process.</p> <p>Gear Hobbing:- Hob teeth are shaped to match the tooth space and are interrupted with grooves to provide cutting surfaces. It rotates about an axis normal to that of the gear blank, cutting into the rotating blank to generate the teeth as shown in Figure.</p> <div style="text-align: center;">  </div> <p>It is the most accurate of the roughing processes since no repositioning of tool or blank is required and each tooth is cut by multiple hob-teeth, averaging out any tool errors. Excellent surface finish is achieved by this method and it is widely used for production of gears.</p>	<p>03 M Explain</p> <p>01 M Figure</p>	<p>04 Marks</p>

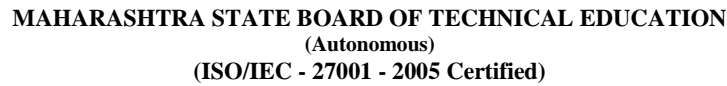
Winter – 2016 EXAMINATION

Subject Code:-

17556

Model Answer

iii)	<p>With neat sketch explain internal centreless grinding operation.</p> <p>Centre-less Internal Grinder</p> <ul style="list-style-type: none"> • In centre-less grinding the work piece is supported between the three rolls. The rolls are pressure roll, supporting roll and a regulating roll (grinding wheel). A • All the three rolls rotate in the same direction and rotate the work piece with them. • The work piece and grinding wheel rotates in the same direction. • The direction of rotation of the three rolls and work piece is opposite. T • The grinding wheel always contacts the work piece at the horizontal centerline of the regulating wheel. • This ensures uniform wall thickness of the work piece and also ensures concentricity of the bore with the external surface of the work piece. • To load or unload the work piece, the pressure roll can be swung away. • The grinding wheel is given in feed so as to obtain the required depth of cut. <div style="text-align: center;">  <p>Internal Centreless Grinding</p> </div> <ul style="list-style-type: none"> • This type of machine is used for work having repetitive nature. • It has advantages similar to external centre-less grinding. 	02 M Explain	04 Marks
iv)	<p>State the importance of maintenance activity.</p> <p>Importance of Maintenance Activity:-</p> <ul style="list-style-type: none"> • Effective maintenance is a crucial component in any organization's operating strategy. This is because it sustains the organization's reputation in the eyes of its current and potential customers, its owners and the general public. • Effective maintenance activity reduce injury to people, both employees and the general public. • Increased efficiency and speed of the equipment. • It helps to avoid the replacing of the parts of the equipments before schedule time. 	01 M / point For Any Four	04 Marks.



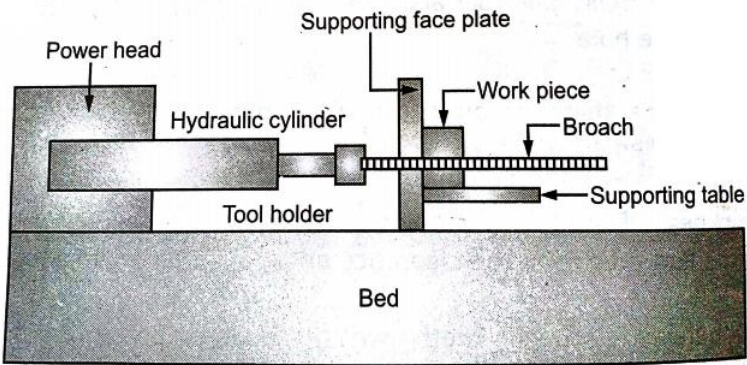
17556

Winter – 2016 EXAMINATION

Model Answer

Subject Code:-

17556

	<p>Where, N= number of division required. N1= hole circle used by crank pin. N2= hole circle used by lock pin. n1= hole moved by crank pin in N1, hole circle plate. n2= holes moved by plate and crank pin in N2 hole circle.</p>		
vi)	<p>draw a labelled sketch of horizontal broachin machine and state function of each part in brief.</p> <p>the function of various parts of a horizontal broaching machine are:</p> <ol style="list-style-type: none"> Power Head:- it provides arrangement for getting required power to run the system. Machine bed:- it is support to all machine members. It also absorb shock and vibrations as it is made of cast iron. Tool holder:- it is a device to hold the tool correctly in position in order to maintain precision and accuracy in all machined work piece. Supporting table:- it gives enough support to the work piece. It provides stability to the work piece during operation. <div style="text-align: center;">  <p>Parts of a horizontal broaching machine</p> </div>	02 M Function	04 Marks
6	Attempt any four of the following	4x4	16 Marks
i)	<p>Explain with figure working principle of LBM process.</p> <p>Working Principle of LBM:-</p> <p>Laser beam Machining (LBM) is based on the conversion of electrical energy into light energy and then to thermal energy.</p> <ul style="list-style-type: none"> In the beginning in atom all the crystal are in ground state. When the light is flash over the crystal, most of the atoms are raised to the excited state. some light waves incline to the axis of the crystal will leave the box either after only a few reflections or without strike on mirror. Some of the waves that travel parallel to the axis of the crystal, will spontaneously emit photon from chromium ions. These photon stimulate another atom to contribute a second photon. these process continues as the photons are reflected to and fro between 	02 M Principle	04 Marks

Winter – 2016 EXAMINATION

Subject Code:-

17556

Model Answer

the mirror.

- At the each refelction a certain loss occurs.
- It is very intresting that laser has to be used on materials where it absorbs laser energy.
- Upon absorption of the laser energy, ther is rapid rise in the temperature leading once again to melting and vaporization and material removal.
- Although several types of laser exist, all laser produce (emit) intense, coherent, highly collimated beam of single wavelength light. In material processing applications, this narrow beam is focused by an optical lense to produce a small, intense spot of light on the work piece surface.

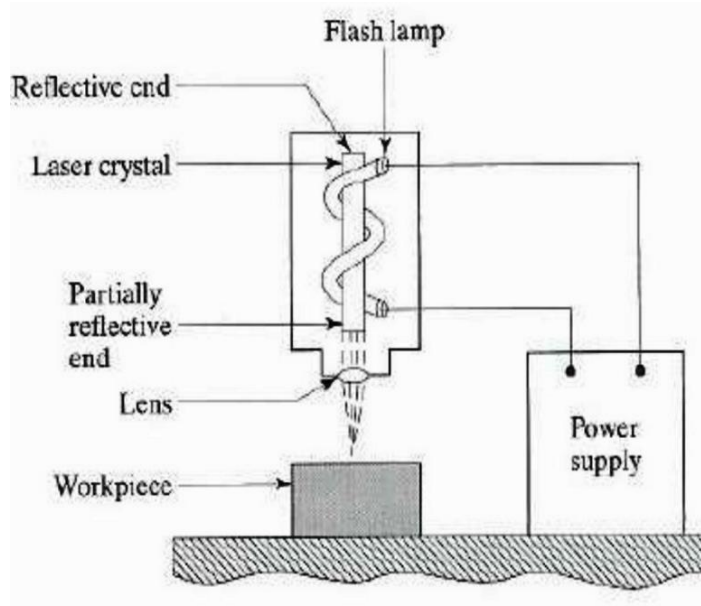


Fig. Laser Mechanism

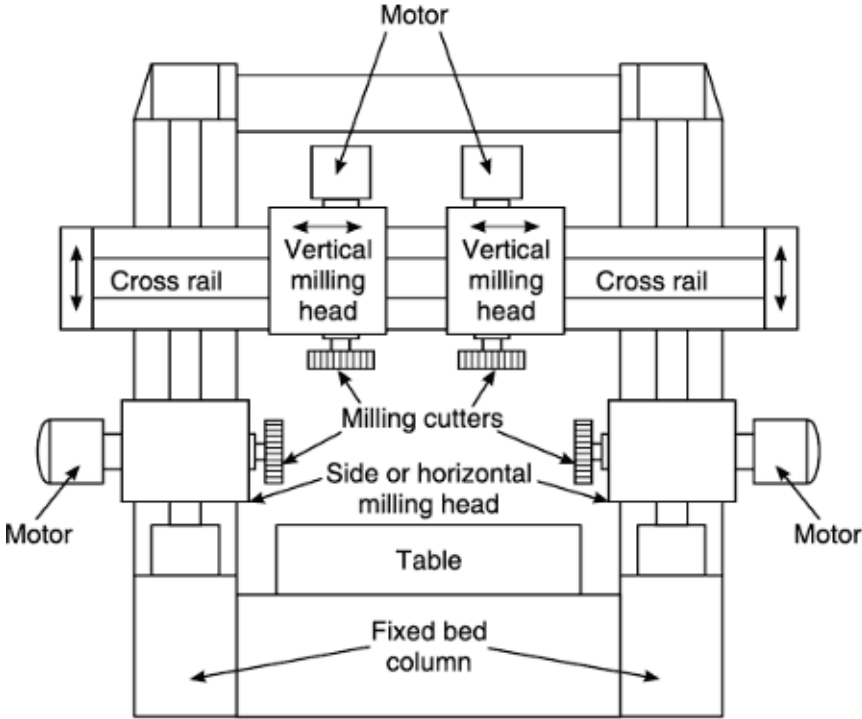
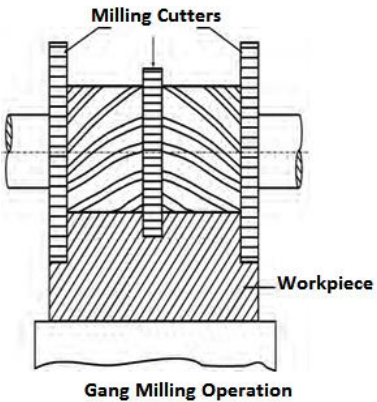
02 M
Figure

Winter – 2016 EXAMINATION

Subject Code:-

17556

Model Answer

<p>ii)</p>	<p>Explain with neat sketch Planomiller.</p> <p>It is used for heavy duty works. It resembles a planer as it has cross rail, cutter head and column or uprights. They may be a number of independent spindles carrying cutters on the cross rail along with two tool heads on the uprights. This is most power ful milling machine and the modern plano-millers have high power driven spindles powered upto 100H P ensuring tremendous metal removal capacity.</p>  <p>Planer type milling machine.</p>	<p>02 M Explain</p> <p>02 M Figure</p>	<p>04 Marks</p>
<p>iii)</p>	<p>Explain with figure the process of straddle milling and gang milling.</p> <p>Gang Milling:-</p> <ul style="list-style-type: none"> • The gang milling is the operation of machining several surface of a workpiece simultaneously by feeding the table against a number of cutters having same or different diameters mounted on the machine. • The distance between the two cutters is adjusted by placing spacer in between 	<p>02 Marks With figure</p>	<p>04 Marks</p>

Winter – 2016 EXAMINATION

Subject Code:-

17556

Model Answer

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