

**MARRI LAXMAN REDDY****INSTITUTE OF TECHNOLOGY AND MANAGEMENT**

(AN AUTONOMOUS INSTITUTION)

(Approved by AICTE, New Delhi & Affiliated to JNTUH, Hyderabad)

Accredited by NBA and NAAC with 'A' Grade & Recognized Under Section 2(f) & 12(B) of the UGC act, 1956

II B.Tech II Sem Supply End Examination, March 2022**Basic Mechanical Engineering For Civil Engineers****(CIVIL)****Time: 3 Hours.****Max. Marks: 70**

Note: 1. Answer any FIVE questions.

2. Each question carries 14 marks and may have a, b as sub questions.

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|---|--|----|-----|-----|
| 1 | a) What is a cam? Give some examples. | 7M | C01 | BL1 |
| | b) What do you understand by the term efficiency of a riveted joint? Explain the necessity of a riveted joint. | 7M | C01 | BL4 |
| 2 | a) Define composites. What are the advantages of composite materials over engineering alloys? | 7M | C01 | BL1 |
| | b) Define undercutting in cam. How it occurs. | 7M | C01 | BL1 |
| 3 | a) Explain various methods of power transmission in detail. | 7M | C02 | BL4 |
| | b) Derive an expression for length of belt in crossed belt drive. | 7M | C02 | BL6 |
| 4 | a) Explain the classification of material handling equipment's in detail. | 7M | C02 | BL4 |
| | b) Differentiate between External and Internal combustion engines. | 7M | C03 | BL2 |
| 5 | a) What is a refrigerant? Explain the properties of an ideal refrigerant. | 7M | C03 | BL4 |
| | b) Discuss the mechanism of thermal conduction in gases and solids with a neat sketch. | 7M | C03 | BL2 |
| 6 | a) Describe the various processes in sheet metal working and draw a neat sketch of die and punch assembly. | 7M | C04 | BL2 |
| | b) Compare and contrast brazing and soldering. | 7M | C04 | BL2 |
| 7 | a) Define casting. Explain the various steps involved in casting process. | 7M | C04 | BL4 |
| | b) Differentiate between shaper and planar. | 7M | C05 | BL2 |
| 8 | a) With the help of a neat sketch, describe the basic principle of milling machine. | 7M | C05 | BL2 |
| | b) Explain in detail about drilling machine. | 7M | C05 | BL4 |

EXAMINATION BRANCH

Academic Year	2021-22.
Year & Semester	I-II. - Supply.
Regulation	R20.
Branch	Civil
Course Code	1940303
Course Name	Basic Mechanical Engg. for civil Engineers.
Course Faculty's	J. Seetunya.
Course Moderator	J. Seetunya.
Date of Exam	09-03-2022.
Reporting Time & Sign	9:10. Seetunya. J.

KEY PAPER

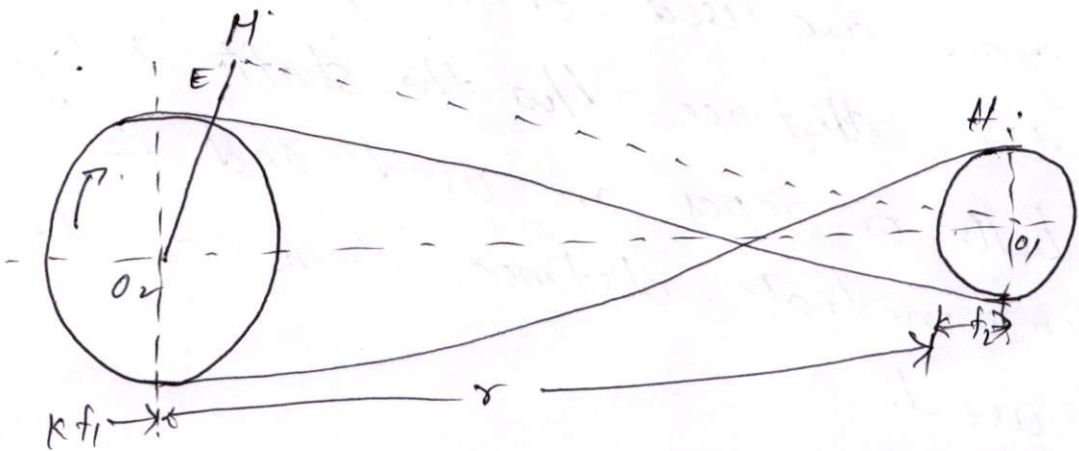
QNO	ANSWER	MARKS
1a)	A cam is a rotating or sliding piece in a mechanical linkage especially in transforming rotary motion into linear motion. Examples: → Radial Cams → Cylindrical Cams → Wedge Cam → Conjugate Cam	(2M)

QNO	ANSWER	MARKS
	→ DRDRD Cam → DRD Cam → DRRD Cam → RRR Cam.	Explain any 3 Examples above (5M)
<u>1b)</u>	Efficiency of riveted joint : The efficiency of a riveted joints is defined as the ratio of the strength of riveted joint to the strength of unriveted or solid plate. The strength of rivited joint = least of P_t, P_s & P_c. Strength of unrivited or solid plate per pitch length $P = p t \sigma_t$ $\therefore$ Efficiency $\eta = \frac{\text{least of } P_t, P_s \text{ \& } P_c}{p t \sigma_t}.$	(5M)

QNO	ANSWER	MARKS
	Necessity : → The necessity of riveted joints are for more strength & holding capacity of two different joints → for longer life span	(2M)
29)	<u>Composites:</u> A material system composed of two or more physically distinct phases whose combination produces aggregate properties that are different from those of its constituents. <u>Advantages:</u> → light in weight → strength to weight & stiffness to weight are greater than steel & Al.	(3M) (4M)

QNO	ANSWER	MARKS
	→ Composites does not corrode. → fatigue Properties are better	
2b)	Undercutting in Cam. undercutting occurs whenever the radius of the curvature of the cam profile is less than the radius roller. The only way to eliminate this condition is having a larger base. Conditions to minimize undercutting in Cam & follower mechanism. a. By using larger roller diameter b. By using internal Cams. c. By decreasing the size of the Cam. d. All the above.	

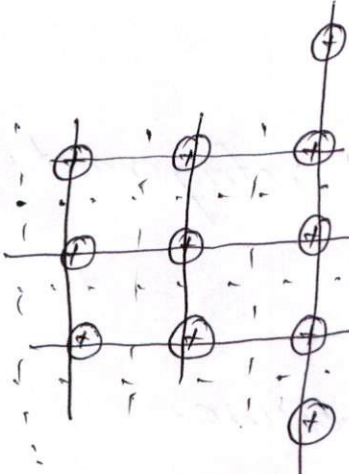
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3a)	<u>Power transmission Elements:</u> Power transmission devices are very commonly used to transmit power from one shaft to another belts, chains & gears are used for the purpose. when the distance b/w the shafts is large, belts or ropes are used and for intermediate distance chains can be used. <u>Methods of transmission:</u> → Gears. → Belts Drives → Chains.	(7M)

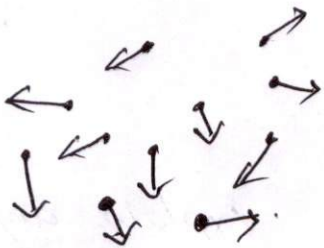
QNO	ANSWER	MARKS
3b)	length of belt in crossed belt drive let the angle $\angle MO_2O_1 = \alpha$ radians.  It may be noted that the above expression is a function of $(r_1 + r_2)$ let r_1 & r_2 = Radii of larger & small pulleys x = Dist. b/w centre of 2 pulleys L = Total length of belt.	

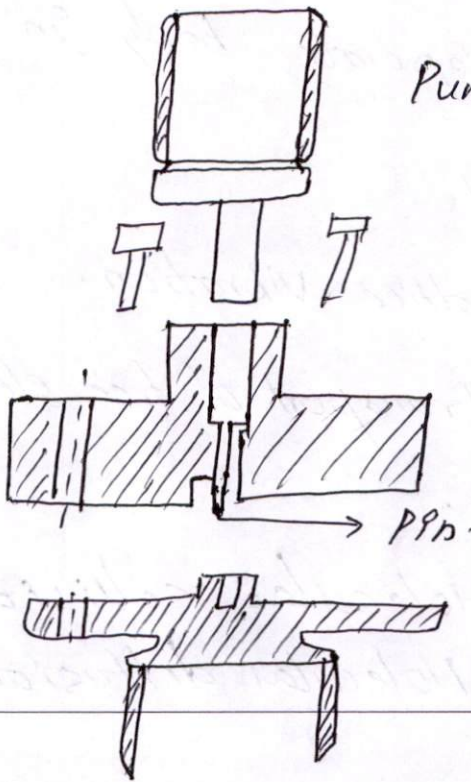
QNO	ANSWER	MARKS
	length of belt $L = \text{Arc } GJE + EF + \text{Arc } FKH + HG$ $= 2 (\text{Arc } JE + FE + \text{Arc } FK) \rightarrow (i)$ $\sin \alpha = OM / OI$ $= (OE + EM) / OI$ $= (r_1 + r_2) / x$ $\sin \alpha = \alpha \text{ (in radians)}$ $= \frac{r_1 + r_2}{x} \rightarrow (ii)$ $\text{Arc } JE = r_1 \left(\frac{n}{2} + \alpha \right) \rightarrow (iii)$ $\text{Arc } FK = r_2 \left(\frac{n}{2} + \alpha \right) \rightarrow (iv)$ $\therefore EF = x \left[1 - \frac{1}{2} \left(\frac{r_1 + r_2}{x} \right)^2 \right]$	

QNO	ANSWER	MARKS															
4a)	classification of material handling equipment in detail. The different types of handling equipment can be classified into 4 major categories: → Transport Equipment → positioning equipment → Unit load formation & → Storage equipment Any 3 indpts (3M)	(2M)															
4b)	<table border="1"> <thead> <tr> <th></th><th>Internal</th><th>External</th></tr> </thead> <tbody> <tr> <td>1.</td><td>Temp. is higher.</td><td>Temp is lower.</td></tr> <tr> <td>2.</td><td>Efficiency is higher</td><td>Efficiency is lower.</td></tr> <tr> <td>3.</td><td>Combustion takes internally.</td><td>Combustion takes externally.</td></tr> <tr> <td>4.</td><td>Pressure is higher.</td><td>Pressure is lower.</td></tr> </tbody> </table>		Internal	External	1.	Temp. is higher.	Temp is lower.	2.	Efficiency is higher	Efficiency is lower.	3.	Combustion takes internally.	Combustion takes externally.	4.	Pressure is higher.	Pressure is lower.	
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QNO	ANSWER	MARKS
5.	light in weight	heavy in weight.
6.	Costly	Cheaper.
7.	Fuel tank required	Boiler & water storage required
5a) =	A refrigerant is a working fluid used in the refrigeration cycle of air conditioning systems and heat pumps where in most cases they undergo a repeated phase transition from a liquid to a gas & back again. Requirements of ideal refrigerant: → low freezing point. → high condensing pressure. → high evaporator pressure. → high critical pressure.	

QNO	ANSWER	MARKS
	→ High Vapour Density → High Dielectric Strength. → High latent Heat of Vaporization. → High heat transfer Coefficient.	
5b)	Thermal conduction in solids & gases. <u>Solids:</u>  * Lattice Vibrations. * free electron flow	

QNO	ANSWER	MARKS
	Gases:  * Molecular collision, (AM) Thermal conduction is known as diffusion. Heat flow is the term used when conduction is within a single body while heat transfer is the term when conduction is b/w two separate body in physical contact. In Solids. → Lattice vibration. → Transport of free electrons. In Gases. → Molecular collisions → Molecular diffusion.	

QNO	ANSWER	MARKS
6a	The Common methods for sheet metal working are: (1) Curling. (2) Bending. (3) Ironing, (4) laser cutting (5) Hydro forming. (6) Punching. Explain any 3  (2M)	(6M)

QNO	ANSWER		MARKS
6b)	<u>Brazing</u>	<u>Soldering</u>	
1.	Melting point $\geq 427^{\circ}\text{C}$	Melting point $< 427^{\circ}\text{C}$	different
2.	produces joints stronger than Soldering.	joints are weak.	
3.	joints resists Corrosion.	Does not resist Corrosion.	
4.	low stresses in joints	low stresses in joints.	Same.
5.	Base metal doesn't fuse	Base metal doesn't fuse.	
6.	low Temp, low power	low Temp, Low power.	
7.	Thin sheet can be joined	Thin sheet can be joined.	
7a	Casting is a manufacturing process in which a liquid material is usually poured into a mold, which contains a hollow cavity of the desired shape, & then allowed to solidify		(3M)

QNO	ANSWER	MARKS										
	The Steps involved in Casting are: → pattern making → Molding. → Melting & pouring. → Shake out. → Heat treatment & inspection.	(4M)										
7b)	<table><thead><tr><th>Shaper</th><th>Planer</th></tr></thead><tbody><tr><td>1. Requires less floor space area.</td><td>More floor area.</td></tr><tr><td>2. These are light in construction.</td><td>large & heavy.</td></tr><tr><td>3. Tool reciprocate, the work piece is stationary.</td><td>Tool Stationary, workpiece move</td></tr><tr><td>4. Sharp tools are simple.</td><td>quite massive</td></tr></tbody></table>	Shaper	Planer	1. Requires less floor space area.	More floor area.	2. These are light in construction.	large & heavy.	3. Tool reciprocate, the work piece is stationary.	Tool Stationary, workpiece move	4. Sharp tools are simple.	quite massive	
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QNO	ANSWER	MARKS
5.	only one tool use.	More than one tool use.
6.	Cost of machine is less.	Cost of machine is high.
7.	Adopted for small work.	Adopted for large work.
<u>8a)</u>	Working principle of milling machine: The working principle of milling machine, applied in the metal removing operation, on a milling machine. The work is rigidly clamped on the table of the machine and revolving multi teeth cutter mounted on either side on a spindle. The cutter revolves at a normal speed and the work fed slowly past the cutter. The work can be fed in a longitudinal, vertical or cross direction.	

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QNO	ANSWER	MARKS
8b)	The drilling machine is defined as a machine which is used to make a circular hole, a tool used to drill the holes of different size & other related operations using a drill bit. Parts of Drilling Machine: 1. Base 2. Column. 3. Table. 4. Radial Arm. 5. Drill Head. 6. Spindle Speed & Feed mechanism.	(1.5M) Any 4 (4M)
	Working principle: Working principle of drilling machine is when the power is given to the	

QNO	ANSWER	MARKS
	motor, the spindle rotates and thereby the stepped pulley attached to it also rotates. On the other end, one more stepped pulley is attached and that is inverted to increase or decrease the speed of the rotational motion.	11