Code No: R161232 **R16** SET - 1

I B. Tech II Semester Regular/Supplementary Examinations, April/May - 2019
ELEMENTS OF MECHANICAL ENGINEERING
(Civil Engineering)

Time: 3 hours Max. Marks: 70

Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B)**
2. Answering the question in **Part-A** is Compulsory
3. Answer any **FOUR** Questions from **Part-B**

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PART –A

1.	a)	Explain why air preheaters are used in a high pressure boiler.	(2M)
	b)	List out the mountings used in steam boiler.	(2M)
	c)	Define the term weldability with example.	(2M)
	d)	Discuss the elements of refrigeration systems.	(2M)
	e)	What do you mean by Initial Tension in a Belt Drive?	(2M)
	f)	What do you understand by Module and Gear ratio of a gear?	(2M)
	g)	What do you understand by Reverted Gear train?	(2M)

PART –B

2.	a)	Enumerate the factors which should be considered for the selection of a boiler.	(7M)
	b)	Explain the construction and working of Cochran Boiler with a neat sketch.	(7M)
3.	a)	Define welding. What are different welding joints and their characteristics?	(7M)
	b)	List out the advantages, limitations and applications of welding.	(7M)
4.	a)	Derive the equation for work done per kg of air compressed in a single stage single acting reciprocating compressor without cylinder clearance.	(7M)
	b)	Explain any two types of Refrigeration systems.	(7M)
5.	a)	A four cylinder, four stroke, spark ignition engine has a bore of 80 mm and a stroke of 80 mm. The compression ratio is 8. Calculate the cubic capacity of the engine and the clearance volume of each cylinder.	(7M)
	b)	Explain the working of 4 Stroke diesel engines.	(7M)
6.	a)	Derive the equation to find out the length of the belt in an Open belt drive.	(7M)
	b)	Two parallel shafts that are 9 m apart. The shafts contain one pulley each of diameters 600 mm and 800 mm and are connected by open belt drive. Calculate the length of the belt drive and the angle of contact between the belt and each pulley.	(7M)
7.	a)	Sketch two teeth of a gear and show the following: (i) Face; (ii) Flank; (iii) Addendum; (iv) Dedendum; (v) Face width; (vi) Circular Pitch.	(7M)
	b)	A compound gear train consists of four gears. The number of teeth on gears A, B, C and D are 54, 75, 36 and 81 respectively. Gears B and C constitute a Compound gear. Determine the torque on the output shaft if the gear A transmits 9 kW at 300 rpm.	(7M)
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Code No: R161232 **R16** SET - 2

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Time: 3 hours Max. Marks: 70

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2. Answering the question in **Part-A** is Compulsory
3. Answer any **FOUR** Questions from **Part-B**

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PART –A

1.	a)	Write the application of steam boiler.	(2M)
	b)	What is the purpose of a steam stop valve? Explain its working principle.	(2M)
	c)	Define (i) Friction Power; (ii) Brake Thermal Efficiency of an Internal Combustion Engine.	(2M)
	d)	Discuss the elements of refrigeration systems.	(2M)
	e)	State the advantages of Belt drive.	(2M)
	f)	What do you understand by Pitch circle and pitch point of a gear?	(2M)
	g)	What is the difference between Double helical and Herringbone gears?	(2M)

PART -B

2.	a)	Explain the working principle of steam turbine.	(7M)
	b)	With the help of a neat sketch explain (i) Fusible plug; (ii) Water level Indicator	(7M)
3.	a)	Distinguish gas welding and gas cutting. Illustrate with few examples.	(7M)
	b)	How many types of patterns are there? Explain them with neat sketches.	(7M)
4.	a)	What is a reciprocating compressor? Explain the working principle. Discuss the classification of Reciprocating compressors.	(7M)
	b)	Explain the working of simple vapor absorption refrigeration system.	(7M)
5.	a)	Discuss in detail the differences between Compression Ignition and Spark Ignition engines.	(7M)
	b)	A four stroke, compression ignition engine with four cylinders develops an indicated power of 125 kW and delivers a brake power of 100 kW. Calculate (i) frictional power; (ii) mechanical efficiency of the engine.	(7M)
6.	a)	Derive the relation for the ratio of belt tensions in a flat belt drive.	(7M)
	b)	Discuss about different belt, rope and chain drives used for power transmission. Write the relative merits and demerits of belt, rope and chain drives.	(7M)
7.	a)	What do you understand by a Gear Train? Discuss the various types of Gear Trains.	(7M)
	b)	What are the main tooth profiles of gear teeth which fulfill the law of gearing? Compare them.	(7M)
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Code No: R161232 **R16** SET - 3

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Time: 3 hours Max. Marks: 70

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2. Answering the question in **Part-A** is Compulsory
3. Answer any **FOUR** Questions from **Part-B**

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PART –A

1.	a)	Classify Steam boilers.	(2M)
	b)	What do you understand by the following Casting terms: (i) Sprue; (ii) Runner	(2M)
	c)	Define (i) Brake Power; (ii) Indicated Thermal Efficiency, of an Internal Combustion Engine.	(2M)
	d)	Define (i) Theoritical COP and (ii) Relative COP of a refrigeration system	(2M)
	e)	Define Soldering and brazing.	(2M)
	f)	Define: (i) Velocity ratio; (ii) slip of a belt drive.	(2M)
	g)	What do you understand by a Compound Gear train?	(2M)

PART -B

2.	a)	Explain the different components used in steam power plant.	(7M)
	b)	Explain the construction and working of Lancashire Boiler with a neat sketch.	(7M)
3.	a)	Explain the Steps involved in making a casting.	(7M)
	b)	Describe in detail all the types of arc welding with figures.	(7M)
4.	a)	Describe with a neat sketch, the construction and working of a single stage, single acting reciprocating air compressor.	(7M)
	b)	Explain the working of vapour compression refrigeration system with neat sketch.	(7M)
5.	a)	A two stroke compression ignition engine delivers 5000 kW, while using 1000 kW to overcome friction losses. It consumes 2300 kg of fuel per hour at an air fuel ratio of 20:1. The heating value of fuel is 42000 kJ/kg. Find the (i) Indicated power; (ii) Brake power; (iii) Indicated thermal efficiency; (iv) Brake thermal efficiency.	(7M)
	b)	Compare two Stroke and four stroke IC Engines.	(7M)
6.	a)	Derive the equation to find out the length of the belt in a Cross belt drive.	(7M)
	b)	Two parallel shafts 6 m apart are provided with 300 mm and 400 mm diameter pulleys and are connected by means of a cross belt. The direction of rotation of the follower pulley is to be reversed by changing over to an open belt drive. How much length of the belt has to be reduced?	(7M)
7.	a)	With neat sketches explain briefly the following with their merits and demerits (i) Spur gear (ii) Helical gear (iii) Bevel Gear.	(7M)
	b)	The number of teeth on each of the two equal spur gears in mesh are 40. The teeth have 200 involute profile and the module is 6 mm. If the arc of contact is 1.75 times the circular pitch, find the addendum.	(7M)

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(Civil Engineering)

Time: 3 hours Max. Marks: 70

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2. Answering the question in **Part-A** is Compulsory
3. Answer any **FOUR** Questions from **Part-B**

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PART –A

1.	a)	Explain why air preheaters are used in a high pressure boiler.	(2M)
	b)	List the Primary requirements of a Steam Boiler.	(2M)
	c)	What are the distinguishing features between a Casting and a Pattern?	(2M)
	d)	Define (i) Indicated Power; (ii) Specific Fuel Consumption of an Internal Combustion Engine.	(2M)
	e)	What is the difference between Open belt drive and a Crossed belt drive?	(2M)
	f)	Explain Addendum and Dedendum of a gear. What is clearance?	(2M)
	g)	What do you understand by Reverted Gear train?	(2M)

PART -B

2.	a)	Explain the construction and working of Babcock and Wilcox Boiler with a neat sketch.	(7M)
	b)	Enumerate the factors which should be considered for the selection of a boiler.	(7M)
3.	a)	What is solid state welding? What are different types of solid state welding explain one with neat sketch?	(7M)
	b)	Explain the causes of welding defects and their remedies with neat sketch.	(7M)
4.	a)	Discuss the differences between Reciprocating and Rotary air compressors.	(7M)
	b)	Air to be compressed in a single acting reciprocating compressor from 1.013 bar and 15^0C to 7 bar, neglecting clearance. Calculate the indicated power required for a free air delivery of 0.3 m^3/min, when the compression process is (i) Isentropic; (ii) Polytropic with n=1.25.	(7M)
5.	a)	Explain with suitable sketches, the working of a Four Stroke Spark Ignition Engine.	(7M)
	b)	The stroke and cylinder diameter of a compression ignition engine are 250 mm and 150 mm respectively. If the clearance volume is 0.0004 m^3 and fuel injection takes place at constant pressure for 5 % of the stroke determine the efficiency of the engine. Assume the engine working on the diesel cycle.	(7M)
6.	a)	Discuss the effect of slip of belt on the pulleys on the velocity ratio of a belt drive.	(7M)
	b)	The pulleys of two parallel shafts that are 8 m apart are 600 mm and 800 mm in diameters and are connected by a open belt drive. Calculate the length of the belt drive and the angle of contact between the belt and each pulley.	(7M)
7.	a)	A compound gear train consists of four gears. The number of teeth on gears A, B, C and D are 54, 75, 36 and 81 respectively. Gears B and C constitute a Compound gear. Determine the torque on the output shaft if the gear A transmits 9 kW at 300 rpm.	(7M)
	b)	What is the difference between a simple gear train and a compound gear train? Explain with the help of neat sketches.	(7M)

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