Code No: RT32033 **R13** SET - 1

III B. Tech II Semester Regular/Supplementary Examinations, April - 2018

DESIGN OF MACHINE MEMBERS– II

(Mechanical 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 **THREE** Questions from **Part-B**

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PART –A

1	a)	Differentiate between journal and roller bearings.	[4M]
	b)	What are the engineering applications of curved beams?	[2M]
	c)	What is the function of the piston and materials used for piston?	[4M]
	d)	Write advantages of belt drives over rope drives.	[4M]
	e)	Write short notes on gear drives giving their merits and demerits.	[4M]
	f)	Discuss the various types of cylinder liners.	[4M]

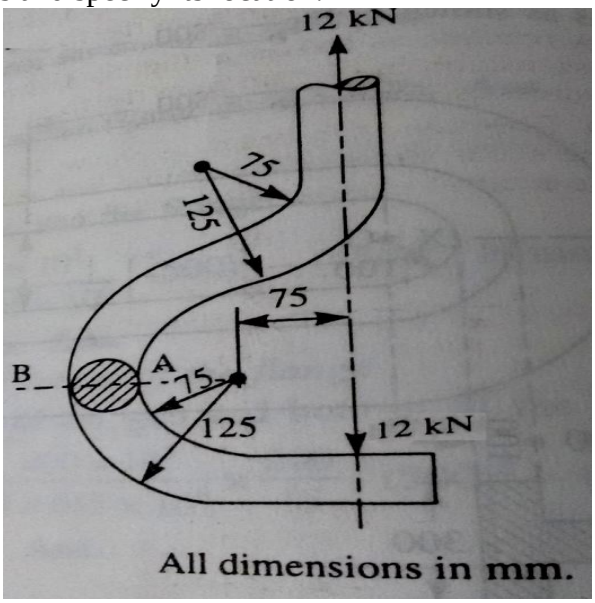
PART -B

2	a)	What are rolling contact bearings? Discuss their advantages over sliding contact bearings.	[6M]
	b)	A ball bearing subjected to a radial load of 5KN is expected to have a life of 8000 hours at 1450 rpm with a reliability of 99 percent. Calculate the dynamic load capacity of the bearing so that it can be selected from manufactures catalogue based on a reliability of 90 percent.	[10M]
3		The following data is given for the piston of a four stroke diesel engine. Cylinder bore=100 mm Material of piston rings=grey cast iron Allowable tensile stress=90 MPa Allowable radial pressure on the cylinder wall=0.035MPa Thickness of the piston head=16 mm Number of piston rings=4 Calculate (i) Radial width of piston rings (ii) Axial thickness of the piston rings (iii) Gap between the free ends of the piston ring before assembly (iv) Gap between the free ends of the piston ring after assembly (v) Width of the top land (vi) Width of ring grooves (vii) Thickness of piston barrel and (viii) Thickness of barrel at top end	[16M]
4		The following data is given for the cap and bolts of the big end of the connecting rod. Engine speed=1500rpm length of the connecting rod =320mm length of stroke=140mm mass of reciprocating parts=1.75kg length of crank pin=54mm diameter of the crank pin=38mm permissible tensile stress for the bolts=120MPa permissible bending stress for cap=120MPa Calculate the nominal diameter of the bolts and thickness of the cap for the big end.	[16M]

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5 A crane hook made from a 50mm diameter bar as shown in below figure. Find the maximum tensile stress and specify its location. [16M]



6 A V belt drive is required for a 15 KW, 1440 rpm electric motor, which drives a centrifugal pump running at 360 rpm for a service of 24 hours per day. From space considerations, the center distance should be approximately1m. Determine [16M]

(i) Belt specifications
(ii) Number of belts
(iii) Correct center distance and
(iv) Pulley diameters

7 A spur gear made of bronze drives a mild steel pinion with angular velocity ratio of 3.5. The pressure angle is 14.5 degrees. It transmits 5 KW at 1800 rpm of pinion. Considering only strength, design the smallest diameter gears and find also necessary face width. The number of teeth should not be less than15 teeth on either gear. The elastic strength of bronze may be taken 84 MPa and of steel as105 MPa. Lewis form factor for 14.5 degrees pressure angle may be taken as $y = 0.124 - \frac{0.684}{T}$ [16M]

Where T=No. of teeth.

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Code No: RT32033 **R13** SET - 2

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(Mechanical Engineering)

Time: 3 hours Max. Marks: 70

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

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PART –A

1	a)	Define the term 'Bearing Life.'?	[4M]
	b)	Draw the stress distribution over the depth of curved beam?	[2M]
	c)	What is the function of the cylinder and materials used for cylinder?	[4M]
	d)	Write advantages of rope drives over belt drives.	[4M]
	e)	What is the function of connecting rod of IC engine?	[4M]
	f)	Explain various engineering applications of sliding contact bearings?	[4M]

PART -B

2	a)	List the important physical characteristics of a good bearing material.	[6M]
	b)	The main bearing of a steam engine is 100 mm and 175 mm long. The bearing supports a load of 28 KN at 250 rpm. If the ratio of diametral clearance to the diameter is 0.001 and absolute viscosity of the lubricating oil is 0.015 kg/m-s. Find: i) the coefficient of friction and ii) heat generated at the bearing due to friction.	[10M]
3	a)	Explain the various types of cylinder liners.	[8M]
	b)	Discuss the design of piston for an internal combustion engine.	[8M]
4		A connecting rod is to be designed for a high speed, four stroke IC engine. The following data are available. Piston diameter=88mm; Mass of reciprocating parts=1.6kg; Length of the connecting rod (centre to centre)=300mm; Stroke=125mm; RPM=2200 (when developing 50kw); Possible over speed=3000rpm; compression ration = 6.8:1; Probable explosion pressure=3.5MPa. Design and draw fully dimensioned drawing of the connecting rod.	[16M]
5		Derive Winkler-Bach formula for the given curved beam from first principles. Also sketch stress distribution across the depth of the section.	[16M]
6		A100 mm wide and 10 mm thick belt transmits 5 KW between two parallel shafts. The distance between the shaft centers is 1.5 m and the diameter of the smaller pulley is 440 mm. The driving and driven shafts rotate at 60 rpm and 150 rpm respectively. Find the stress in the belt, if the two pulleys are connected by i) open belt ii) a cross belt. The coefficient of friction is 0.22	[16M]
7		A double threaded power screw, used for lifting the load, has a nominal diameter of 25 mm and a pitch of 6mm. The coefficient of friction of screw threads is 0.1. Neglecting collar friction, calculate. i) efficiency of the screw with the square threads ii) efficiency with Acme threads	[16M]

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Code No: RT32033 **R13** SET - 3

III B. Tech II Semester Regular/Supplementary Examinations, April - 2018

DESIGN OF MACHINE MEMBERS– II

(Mechanical 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 **THREE** Questions from **Part-B**

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PART –A

1	a)	What is the significance of bearing Number?	[4M]
	b)	Define Bending Stiffness?	[2M]
	c)	Enumerate the different types of materials used for the cylinder liners.	[4M]
	d)	Write short note on classifications and different types of anti friction bearings.	[4M]
	e)	Sketch the cross section of a V belt and label its important parts.	[4M]
	f)	What is the function of connecting rod of IC engine?	[4M]

PART -B

2	a)	A 100 mm long and 60 mm diameter journal bearing supports a load of 2500 N at 600 rpm. If the room temperature is 20^oC, what should be the viscosity of oil to limit the bearing surface temperature to 60^oC? Diametral clearance = 0.06 mm. Energy dissipation coefficient based on the projected area of the bearing = 210 $W/m^{2o}C$	[8M]
	b)	A 250×250 mm bearing carries a load of 108 KN. The bearing rotates at 1500 rpm. The clearance ratio is 670. For full journal bearing the power lost in friction is 14.36 KW. Find the viscosity of the oil.	[8M]
3		The following data is given for a connecting rod: Engine speed =1500 rpm Length of connecting rod=320 mm Length of stroke=140 mm Density of the material=7830 Kg/m^3 Thickness of web flanges= 6 mm The cross section of the connecting rod is I section. Upper and bottom flange dimensions are = 4mm Web dimensions are = 3mm Calculate the whipping stress in connecting rod.	[16M]
4		a)Explain different materials used for piston	[6M]
		b)The following data is given for the piston of a four stroke diesel engine. The following data is given for the piston of a four stroke diesel engine. Cylinder bore = 120 mm Maximum gas pressure = 6 MPa Allowable bearing pressure for skirt = 0.45 MPa Ratio of side thrust on liner to maximum gas load on piston=0.1 Width of top land =20 mm Width of ring grooves = 3 mm Total number of piston rings = 4 Axial thickness of piston rings = 3.5 mm Calculate (i)length of skirt (ii) length of piston	[10M]

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5 The curved beam in Fig:1 has a circular cross section 50 mm in diameter. The inside diameter of the curved beam is 40 mm. Determine the stress at B for P=20 KN. [16M]

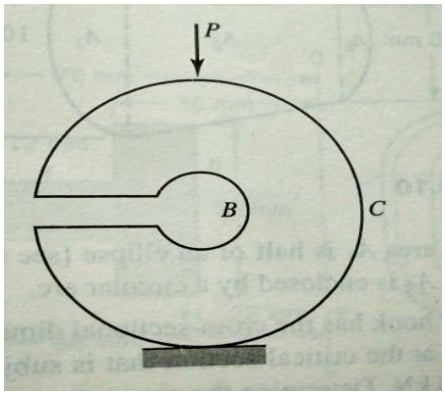


Fig:1

6 A pair of helical gears with 30^0 helix angle is used to transmit 15 KW at10000 rpm of the pinion. The velocity ratio is 4:1. Both gears are to be made of hardened steel of static strength 100MPa. The gears are 20^0stub and the pinion is to have 24 teeth. The face width may be taken as14 times the module. Find the module and face width from the stand point of strength and check the gears for wear. [16M]

7 a) Explain various materials used for machine tool beds. [8M]

b) Write various steps involved in design of lathe bed. [8M]

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III B. Tech II Semester Regular/Supplementary Examinations, April - 2018

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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 **THREE** Questions from **Part-B**

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PART –A

1	a)	What is a Gear? Classify.	[4M]
	b)	Why trapezoidal cross – section is more appropriate for crane hook?	[2M]
	c)	Enumerate materials used for the bearings.	[4M]
	d)	What is the function of the piston ring. Explain the materials used for the piston rings.	[4M]
	e)	What are the methods and materials used for manufacture of crank shaft?	[4M]
	f)	Why are square threads preferable over V-threads for power transmission?	[4M]

PART -B

2	a)	What are the various terms used the journal bearings analysis and design. Give their definitions in brief.	[8M]
	b)	Explain with reference to the neat sketch the importance of the bearing characteristic curve.	[8M]
3		Design a cast iron piston for a four stroke IC engine for the following specifications Cylinder bore=120 mm Stroke length=150 mm Maximum gas pressure=5 MPa Brake mean effective pressure=0.7 MPa Fuel consumption=0.25 Kg/KW/hr Speed=2400 rpm Assume any other data necessary for the design	[16M]
4	a)	Explain the various types of cylinder liners.	[8M]
	b)	Discuss the design of piston for an internal combustion engine.	[8M]
5		A curved beam with a rectangular cross section strikes a 90^0 arc and is loaded and supported as shown in Fig.2. The thickness of the beam is 50mm. Determine the hoop stress $\sigma_{\theta\theta}$ along line A-A at the inside and outside radii and at the centroid of the beam.	

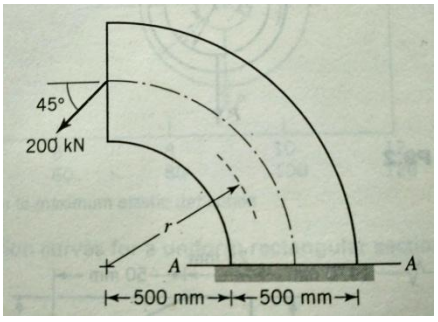


Fig.2

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6 It is required to select a v-belt drive to connect a 20 KW, 1440 rpm motor to a compressor running at 480 rpm for 15 hours per day. Space is available for a center distance approximately 1.2m. Determine [16M]

i)The specifications of the belt
ii)Diameter of the motor and compressor pulleys
iii)The correct center distance and the number of belts

7 a) How the gears are classified and what are the various terms used in spur gear technology? [8M]

b) Discuss the design procedure of spur gears. [8M]

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