Hall Ticket Number :

Code: 5G564

R-15

III B.Tech. II Semester Supplementary Examinations Nov/Dec 2019
Applied Thermodynamics-III
(Mechanical Engineering)

Max. Marks: 70

Time: 3 Hours

Answer *all five* units by choosing one question from each unit (5 x 14 = 70 Marks)
Use of refrigeration table is allowed
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UNIT–I

1. The following data refers to a 1.0 MW, open cycle gas turbine power plant. Air enters the compressor at 1.0 bar and 20°C and leaves at 6.0 bar. Temperature of the air entering the turbine is at 700°C. Isentropic efficiency of compressor as well as turbine is 80%. Combustion efficiency is 90%. Assuming the values of ratio of specific heats and specific heat at constant pressure for air 1.4 and 1.0 respectively, Calculate a) the quantity of air circulation, b) heat supplied per kg of air circulation, c) thermal efficiency of the cycle.   14M

OR

2. Discuss the different types of Rocket propulsion systems used.   14M

UNIT–II

3. A Room Airconditioner of 1.5 TR capacity works on vapour compression cycle. The temperature limits of the cycle are 52°C and 7°C. The refrigerant used is R-134a. Calculate a) the refrigerant flow rate, b) compressor exit temperature, c) power consumed by the compressor, d) compressor swept volume, e) heat rejected from the air conditioner to the environment, f) COP.   14M

OR

4. a) Derive the COP of a reversed Brayton cycle.   7M

   b) Explain the aircraft refrigeration system.   7M

UNIT–III

5. a) A heat operated refrigeration system draws heat from a source at 120°C and rejects heat to the environment at 35°C. The space is maintained at 5°C. Find the maximum COP of the system.   4M

   b) Draw a neat sketch of a vapour absorption refrigeration system working on H_2O – LiBr as the working fluid and write its working principle. Discuss its merits and demerits over NH_3 – H_2O system.   10M

OR

6. Discuss (with neat sketch) the working principle of a three-fluid refrigeration system. What is the role of the third fluid (inert gas) used. Why this system has not yet been commercialized.   14M

UNIT–IV

7. A sample of moist air at a pressure of 736 mm of Hg. Its dbt is 30°C and dpt is 20°C. Determine its humidity ratio, relative humidity, degree of saturation, specific enthalpy and specific volume.   14M

OR

8. a) What do you mean by 'Effective Temperature' and how does it affect in determining the human comfort. Discuss.   7M

   b) Draw a 'Comfort Chart' and discuss how the comfort zones are determined.   7M

UNIT–V

9. a) List out the different dehumidifiers. Explain working of any one type of dehumidifier.   7M

   b) What is the difference between a refrigerator and a heat pump? Draw and explain the circuit of a heat pump for winter room heating.   7M

OR

10. a) What criteria should be used in selecting a fan?   7M

    b) Explain the working of water to water heat pump circuit.   7M

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R-15

Code: 5G565

III B.Tech. II Semester Supplementary Examinations Nov/Dec 2019

Design of Machine Elements-II

(Mechanical Engineering)

Max. Marks: 70   Time: 3 Hours

Answer *all five* units by choosing one question from each unit (5 x 14 = 70 Marks)

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UNIT–I

1.   Design a journal bearing for a centrifugal pump from the following data:

Load on journal = 20 kN, Speed of the journal = 900 rpm, type of oil = SAE10 for which the absolute viscosity at 55°C = 0.017kg/m-s. Ambient temperature of the oil is 15.5°C. Maximum bearing pressure for the pump = 15 N/mm^2. Calculate the mass of the lubricating oil required for artificial cooling, if rise of temperature of oil be limited 10°C. Heat dissipation coefficient = 1232 W/m^2/°C   14M

OR

2.   Design a full hydrodynamic journal bearing with the following specification for machine tool application:

Journal diameter = 75 mm   Radial load = 10 kN

Journal speed = 1440 rpm   Minimum oil fil thickness = 22.5 microns

Inlet temperature = 40°C   Bearing material = Babbitt

Determine the length of the bearing and select a suitable oil for this application.   14M

UNIT–II

3.   A bearing for an axial flow compressor is to carry a radial load of 2500 N and thrust of 1500 N. The service imposes light shock and the bearing will be in use for 40 hours/week for 5 years. The speed of the shaft is 1000 rpm. Select suitable ball bearing for the purpose and give the required tolerances on the shaft and the housing. Diameter of the shaft is 50 mm.   14M

OR

4.   The radial reaction on a bearing is 8000 N. It also carries a thrust of 5000 N. The shaft diameter is 140 mm and it rotates at 1700 rpm. Outer ring is stationery. Load is smooth, 8 hours/day for a life of 17000 hours.

(a) Select a deep groove ball bearing

(b) What is the rated 90% life of the selected bearing?

(c) For b = 1.34, compute the probability of the selected bearing surviving 17000 hours.   14M

UNIT–III

5. a) What are the forces acting on the connecting rod?   2M

    b) A vertical cylinder petrol engine has a bore of 100 mm and stroke 120 mm. The length of the connecting rod between centres is 250 mm. The mass of the piston is 1.1 kg. The speed of the engine is 1500 rpm. In the expansion stroke with a crank at 30° from TDC, the gas pressure is 700 kN/m^2. Determine:

    (i)   Net force on the piston

    (ii)   Force on the connecting rod

    (iii)   Thrust on the cylinder wall

    (iv)   Speed above which the gudgen pin force would reverse in direction.   12M

OR

6. a) A cast iron flywheel for a blanking press has a mean diameter of 1.5 m. the normal operating speed of 275 rpm slows down to 250 rpm during the punching operation. The required energy fluctuation is 6500 joules and the density of the cast iron is 7000 kg/m^3. Find the area of flywheel rim if the arms and hub provide 7% of the flywheel effect. 12M

   b) Explain the functions of oil rings and compression rings on piston. 2M

UNIT–IV

7. a) Design a close coiled helical compression spring for a service load ranging from 2250 N to 2750 N. The axial deflection of the spring for the load range is 6 mm. Assume a spring index of 5. The permissible shear stress intensity is 420 MPa and modulus of rigidity, G = 84 kN/mm^2.

   Neglect the effect of stress concentration. Draw a fully dimensioned sketch of the spring, showing details of the finish of the end coils. 12M

   b) What is nipping in a leaf spring? Discuss its role. 2M

OR

8. Two pulleys, one 450 mm diameter and the other 200 mm diameter, on parallel shafts 1.95 m apart are connected by a crossed belt. Find the length of the belt required and the angle of contact between the belt and each pulley.

   What power can be transmitted by the belt when the larger pulley rotates at 200rev/min, if the maximum permissible tension in the belt is 1 kN, and the coefficient of friction between the belt and pulley is 0.25? 14M

UNIT–V

9. A motor shaft rotating at 1500 r.p.m. has to transmit 15 kW to a low speed shaft with a speed reduction of 3:1. The teeth are $14\frac{1}{2}^{\circ}$ involute with 25 teeth on the pinion. Both the pinion and gear are made of steel with a maximum safe stress of 200 MPa. A safe stress of 40 MPa may be taken for the shaft on which the gear is mounted and for the key.

   Design a spur gear drive to suit the above conditions. Also sketch the spur gear drive. Assume starting torque to be 25% higher than the running torque. 14M

OR

10. a) A pair of helical gears consist of a 20 teeth pinion meshing with a 100 teeth gear. The pinion rotates at 720 r.p.m. The normal pressure angle is 20° while the helix angle is 25°. The face width is 40 mm and the normal module is 4 mm. The pinion as well as gear are made of steel having ultimate strength of

   600 MPa and heat treated to a surface hardness of 300 B.H.N. The service factor and factor of safety are 1.5 and 2 respectively. Assume that the velocity factor accounts for the dynamic load and calculate the power transmitting capacity of the gears. 12M

    b) What is a herringbone gear? Where they are used? 2M

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III B.Tech. II Semester Supplementary Examinations Nov/Dec 2019
Industrial Management
(Mechanical Engineering)

Max. Marks: 70   Time: 3 Hours

Answer *all five* units by choosing one question from each unit (5 x 14 = 70 Marks)
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UNIT–I

| 1. | Explain clearly about Fayol's principles of Management. | CO1 | 14M |

OR

| 2 | Describe Line organization, Line and staff organization, and Functional organization. Also list the merits and demerits of each organization. | CO1 | 14M |

UNIT–II

| 3. | a) | Define plant layout. Explain about the objectives of good plant layout. | CO2 | 7M |
| | b) | Describe the criteria for locating plant at rural and urban sites. | CO2 | 7M |

OR

4. A small project is composed of seven activities .Time estimates are listed in the table are as follows.

Activity		1-2	1-3	1-4	2-5	3-5	4-6	5-6
Estimated duration (days)	Optimistic	1	1	2	1	2	2	3
	Most likely	1	4	2	1	5	5	6
	Pessimistic	7	7	8	1	14	8	15

(a) Draw the project Network.

(b) Find the expected duration of the project.

(c) Calculate the variance and standard deviation of project length. What   is the probability that the project will be completed

   (i) At least four weeks earlier than expected?

   (ii) No more than 4 weeks later than expected?   CO2   14M

UNIT–III

| 5. | a) | Distinguish between micro-motion and memo-motion studies. | CO3 | 7M |
| | b) | Define Work Study. Explain its objectives. | CO3 | 7M |

OR

| 6. | a) | Illustrate briefly about time study equipment. | CO3 | 7M |

b) An 8 hours work measurement study in a plant reveals the following:

Number of units produced = 320   Idle time = 15%

Performance rating = 120%   Allowances = 12% of normal time

Determine the standard time per unit produced.   CO3   7M

UNIT–IV

| 7. | a) | Discuss about various costs associated with inventory models. | CO4 | 7M |
| | b) | Describe the duties of a purchase manager. | CO4 | 7M |

OR

| 8. | a) | Distinguish between Inspection and Quality Control. | CO4 | 7M |
| | b) | Explain about single sampling plan with an example. | CO4 | 7M |

UNIT–V

| 9. | Define Merit rating. Explain about different methods of Merit rating. | CO5 | 14M |

OR

| 10. | Define wage incentive. Explain about various types of wage incentive schemes. | CO5 | 14M |

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R-15

Code: 5G563

III B.Tech. II Semester Supplementary Examinations Nov/Dec 2019

Metrology and Surface Engineering

(Mechanical Engineering)

Max. Marks: 70   Time: 3 Hours

Answer *all five* units by choosing one question from each unit (5 x 14 = 70 Marks)

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UNIT–I

1. Design a Go & NoGo limit gauge for checking of a hole having a size 40±0.02mm. Assume gauge tolerance as 10 % of working tolerance and wear allowance equal to 10 % of gauge tolerance. Draw the diagrammatic presentation.

OR

2. Explain the difference between interchangeable and selective assembly. For what type of application is selective assembly used?

UNIT–II

3. Explain interferometry applied to flatness testing by using optical flat.

OR

4. Describe with neat sketches of Auto collimator and sine bar.

UNIT–III

5. What do you mean by waviness and roughness? Describe the methods for numerical assessment of surface texture.

OR

6. Explain working, construction of any one mechanical comparator and what are it's limitations?

UNIT–IV

7. Explain three wire method used in screw thread measurement.

OR

8. Derive an expression for best wire size for measuring effective diameter. Calculate effective diameter and best wire dia. For M22×2.5 screw plug gauge by using floating carriage Micrometer for which reading were taken as diameter of standard cylinder 20mm micrometer reading over standard cylinder with two wire is = 15.9334mm micrometer reading over plug screw gauge with two wire is=15.2245mm.

UNIT–V

9. What are the Requirements of Machine Tool Alignment Tests? Name the different alignment tests to be performed on a drilling machine.

OR

10. What is Coating? Write down the types of coating and explain any one of the coating with neat sketch.

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